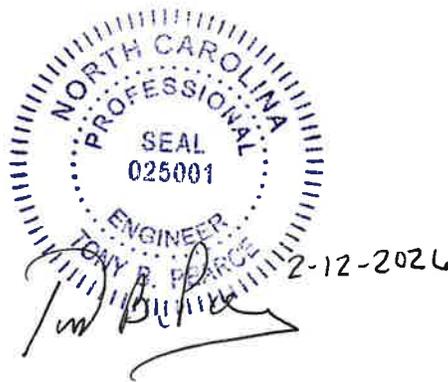


**Town of Smithfield  
Smithfield, North Carolina**

**Hospital Road Substation  
Specifications and Bid Documents  
For  
115 kV Outdoor Gas Circuit Breaker**



NC Firm No. F-0429

**Town of Smithfield  
Smithfield, North Carolina**

**Hospital Road Substation  
Specifications and Bid Documents  
for  
115 kV Outdoor Gas Circuit Breaker**

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### **APPENDICES**

Appendix A: Breaker Data Sheets

### **BID SCHEDULE**

# NOTICE TO PROSPECTIVE BIDDERS

## Invitation to Submit Proposals to

### TOWN OF SMITHFIELD SMITHFIELD, NORTH CAROLINA

#### In Accordance With Procurement Documents For

#### 115 kV OUTDOOR GAS CIRCUIT BREAKER

- 1.0 Sealed Proposals to furnish specified materials and services for 115 kV Outdoor Gas Circuit Breaker will be received by the Town of Smithfield, Smithfield, North Carolina until **2:00 pm, local time March 26, 2026** at which time all bids will be publicly opened and read at the Town of Smithfield Utilities Operations Building.
- 2.0 It is the sole responsibility of the Bidder to ensure delivery of the bid at the designated place and time. Late delivery of bids for any reason including delivery by the USPS or by other courier shall disqualify the bid. All proposals received after the designated time for bid opening will be considered invalid and promptly returned to the Bidder unopened.
- 3.0 Proposals must be submitted in a sealed envelope bearing the name and address of the bidder. Proposals should be delivered to the following address:  
  

**Ted Credle, P.E.**  
**Director of Public Utilities**  
**Town of Smithfield**  
**230 Hospital Road**  
**Smithfield, NC 27577**
- 4.0 Proposals transmitted via facsimile (fax) or e-mail directly to the Town will not be considered sealed bids and will be rejected.
- 5.0 Bidders shall clearly identify their proposal as a sealed bid by including the following text on a conspicuous area of the envelope:  
  

**“PROPOSAL FOR 115 kV OUTDOOR GAS CIRCUIT BREAKER. DO NOT OPEN UNTIL 2:00 P.M., March 26, 2026 ”.**
- 6.0 All proposals (2 copies) must be submitted on the appropriate preprinted quotation forms (Bid Schedule) provided in these Procurement Documents. All blank spaces for bids, unit prices, completion time etc. shall be filled in unless otherwise noted. Failure to provide all requested information may result in the bid being considered incomplete. The Bidder’s quotations and data on these forms must either be typewritten or hand written in permanent ink. Any alterations to these entries must be initialed and dated by the authorized agent for the bidder. The bidder shall submit the Proposal and Contract section, completed Bid Schedule, Breaker Data (Appendix A) and any supporting documentation. The Bidder does not need to return a copy of the procurement documents nor technical specifications.

7.0 No alterations, corrections, or modifications to any proposal will be allowed after bids have been received and opened. However, the bidder may submit modifications in writing prior to the time of bid opening under sealed envelope bearing the bidder's name and address. Such modifications shall be clearly identified as an amendment to a pending proposal by including the following text on a conspicuous area of the envelope:

**“AMENDMENT TO PROPOSAL 115 kV OUTDOOR GAS CIRCUIT BREAKER DO NOT OPEN UNTIL 2:00 P.M., March 26, 2026”.**

8.0 All supporting documentation as may be required by the Specifications must be submitted at the time of bid and included with the sealed proposal. If a manufacturer is submitting proposals through more than one Bidder, the supporting documentation may be submitted directly by the manufacturer in a separately sealed envelope. The envelope must bear the names of the Bidders to whom the literature applies. Conversely, the corresponding Bidders must clearly identify and refer to the separately sealed manufacturer's literature.

9.0 No bid may be altered, withdrawn, or resubmitted within 60 days from and after the date set for the bid opening. All bids shall remain firm and binding proposals during this period.

10.0 The bidder bears responsibility to comprehend the project work and to make all inquiries as necessary to achieve comprehension prior to submission of a sealed proposal. Submission of a proposal shall be evidence that the bidder has fully reviewed the scope of work and confident as to the content of the work requirements.

11.0 A copy of the Procurement Documents, including technical specifications and bid forms, are on file with the Town and are available for public review. Inquiries regarding technical aspects of the project work may be directed to the Town's consulting engineer. Additional copies of the Procurement Documents are also available from the Engineer. The Engineer may be contacted as follows:

**Electrical Consulting Engineers**  
**Attention: Tony B. Pearce, PE**  
**Mobile: 919.632.7426**  
**tpearce@ecepower.com**

12.0 The Town reserves the right to reject any and all bids, and to waive minor errors in the bidder's proposal if the errors are deemed by the Town to be obviously inadvertent and do not affect the scope of work. If minor errors are evident in a proposal pending award of contract, the correction of these errors shall be resolved in writing to the satisfaction of the Town prior to execution of a contract.

13.0 Do not include NC sales tax in the bid amount. NC sales tax is paid by the Town and can be included on invoices.

14.0 Do not include Federal Excise Tax in bid amount. The Town will provide a Federal Exemption Certificate upon request.

**Town of Smithfield**  
**Smithfield, NC**

By: Electrical Consulting Engineers

Date: February 12, 2026

# INSTRUCTIONS TO BIDDERS

## 1.0 Bidder Qualifications

- 1.1 Determination of “Responsible Bidder” is based upon quality, performance, and time. The terms responsibility, quality, and performance are subjective and the Owner reserves the right to award the contract to a bidder based upon this criteria as deemed to best suit the needs of the Owner.

## 2.0 Obtaining Copies of Bidding Documents

- 2.1 Invitations to bid may be automatically forwarded to prospective bidders that have demonstrated “responsibility” in the past.
- 2.2 When extending invitations to bid, the Owner and the Owner’s Engineer will make copies of the Procurement Documents available to all Bidders only for the purpose of obtaining bids for the stated materials and services and do not confer or grant a license for any other use. All Procurement Documents are instruments of service and remain the intellectual property of the Engineer whose name appears thereon.
- 2.3 Complete sets of the Procurement Documents may be obtained in the number and for the fee sum, if any, stated in the Notice to Bidders from the issuing office as named in the Notice to Bidders.

## 3.0 Submission of Proposals

- 3.1 Proposals must be submitted in accordance with the directives outlined in the Notice to Bidders and with the instructions contained herein to be considered for evaluation and award of contract. Failure to comply with requirements of the Notice to Bidders or these Instructions to Bidders may result in outright rejection of the proposal.
- 3.2 All proposals must be submitted on the appropriate preprinted quotation forms (Bid Schedule) provided in these Procurement Documents. The Bidder’s quotations and data on these forms must either be typewritten or hand written in permanent ink. Any alterations to these entries must be initialed and dated by the authorized agent for the bidder.
- 3.3 The Bidder must fully complete all Bid Schedule forms and also adequately furnish all information requested by the Procurement Documents and the Technical Specifications regarding pricing, quantities, delivery, services, spare parts, descriptive information, etc. Failure to supply sufficient information may cause a bid to be rejected as unresponsive.

- 3.4 The Bidder must supply two (2) copies of the Proposal, including the original forms and one duplicate set of forms. Supplemental literature offered by the Bidder must be supplied in duplicate.
- 3.5 It is understood that by submitting a bid, the Bidder acknowledges that he has carefully examined the documents pertaining to the work, has understood same and is satisfied that he will, if successful, perform said work in accordance with the documents as well as any other rules, ordinances, codes, regulations, laws etc. pertaining thereto.
- 3.6 The Bidder must explicitly note all exceptions, clarifications, and deviations from the requirements of this specification by the products offered. Each notation must be referenced to the specific sections and paragraphs in question. The Table of Exceptions must be presented with the proposal at the time of bid opening. Failure to identify an exception, clarification, or deviation will be considered certification that all products and services perform in full compliance with the Procurement Documents. Substitution of the Bidders standard terms and conditions or other documents will not be construed as constituting an exception. Exceptions and deviations noted in the Bidder's Proposal will not necessarily eliminate a proposal from consideration. The impact of exceptions and deviations will be considered together with all factors of the bid when determining which proposal best represents the interests of the Owner.
- 3.7 Proposals must include a complete list of materials or "DELIVERABLES" to be furnished. The list of deliverables shall include quantities and model number identification where applicable.
- 3.8 Proposals must include a Delivery Schedule illustrating in either tabular or graphic form critical benchmarks for the production cycle of the materials and services offered. Chronological information should be identified in days or weeks as appropriate, from receipt of order to completion of all deliveries and field services.
- 3.9 No alterations, corrections, or modifications to any proposal will be allowed after bids have been received and opened. However, the bidder may submit modifications in writing prior to the time of bid opening under sealed envelope bearing the bidder's name and address. Such modifications shall be clearly identified as an amendment to a pending proposal by including text as designated in the Notice to Bidders on a conspicuous area of the envelope.
- 3.10 The Bidder shall sign the Proposal as follows:
  - 3.10.1 If the documents are executed by a sole owner, that fact shall be evidenced by the word "owner" appearing after the name of the person.
  - 3.10.2 If the documents are executed by a partnership that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing

them.

3.10.3 If the documents are executed on the part of a corporation they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary and the title of the office of such persons shall appear after their signatures, the seal of the corporation shall be impressed on each signature page.

3.10.4 If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation which herein is applicable.

3.10.5 All signatures shall be properly witnessed.

3.10.6 Anyone signing the proposal as an agent shall file, with the proposal, legal evidence of his authority to do so.

#### **4.0 Bid Security**

Bid security is not required on this project.

#### **5.0 Clarifications and Addenda**

5.1 The bidder bears responsibility to comprehend the project work and to make all inquiries as necessary to achieve comprehension prior to submission of a sealed proposal. Submission of a proposal shall be evidence that the bidder has fully reviewed the scope of work and is confident as to the content of the work requirements. If the prospective bidder discovers discrepancies in the procurement documents or requires further clarification of their intent, the prospective bidder should immediately notify the Engineer. Significant clarification or corrections will be issued by the Engineer in writing to all prospective bidders by addendum.

5.2 Addenda officially issued by the Engineer and received by a prospective bidder prior to bid opening must be acknowledged by the bidder by including the addendum notice with the proposal. Forms of addenda will provide a space for bidder's signature to certify this acknowledgment.

5.3 Any contract awarded to a proposal shall include the conditions and/or clarifications set forth by the addenda.

5.4 Neither the Engineer nor the Owner will be held responsible for a bidder's interpretation of oral instruction.

## **6.0 Firm Bids Retained**

- 6.1 Pricing and delivery for all proposals shall remain firm and valid for a minimum of sixty (60) days following the date and time of the bid opening.

## **7.0 Opening of Bids and Bid Evaluation**

- 7.1 Bids will be received and opened in strict accordance with the requirements of the General Statutes of North Carolina. All bids will be opened publically and read aloud.
- 7.2 The proposal which, in the opinion of the Owner, best fulfills the technical, budgetary, chronological, and operational objectives of the project scope will be the recommended candidate for an award of contract. The Owner shall take into consideration past performance of the Bidder on Contracts of a similar nature with other utilities. Subsequent to the bid opening, the bidder may be required to furnish additional data or make plant facilities available for inspection to assist the Owner in evaluating the merits of a proposal. The Owner may award on the basis of the base bid and any alternates the Owner chooses.
- 7.3 The Owner reserves the right to reject any and all bids, and to waive minor errors in the bidder's proposal if the errors are deemed to be obviously inadvertent by the Owner and do not affect the scope of work. If minor errors are evident in a proposal pending award of contract, the correction of these errors shall be resolved in writing to the satisfaction of the Owner prior to execution of a contract.
- 7.4 If the contract is to be awarded, the Owner will give the recommended Bidder an Acceptance Notice within sixty (60) days after the bid opening date.
- 7.5 In the event that the recommended bidder fails to enter a contract, the next most favorable proposal will be considered for award of contract based upon firm quotations offered in the proposal.

# GENERAL CONDITIONS

## 1.0 Intent of Procurement Documents

- 1.1 The Procurement Documents comprise the entire agreement between the Purchaser and the Seller concerning technical specifications and commercial arrangements for materials and services. The Procurement Documents are initially issued as an instrument for receiving bids from qualified Bidders and may at times be alternately referred to as Bidding Documents during the interim when invitations to bid have been extended. Once a successful Bidder is selected, the Procurement Documents constitute the Contract between the Purchaser and the Seller.
- 1.2 The Contract Documents may be altered only by the following:
  - 1.1.1 Written addenda issued prior to bid opening and to be officially acknowledged by the prospective Bidder;
  - 1.1.2 Written Change Order issued to the Seller by the Purchaser following the effective date of the Contract and authorizing specific additions, deletions, or revisions in materials and services, and authorizing specific adjustments in the Contract price or project schedule.
  - 1.1.3 Written orders issued by the Engineer clarifying interpretation of the Procurement Documents and resulting in minor changes that do not affect the Contract price or project schedule.
- 1.3 The Procurement Documents are complementary; what is called for by one is binding as if called for by all.
- 1.4 All materials and services that may reasonably be inferred from the Procurement Documents as being required to produce the intended result will be supplied whether or not specifically called for.
- 1.5 Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, or code in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provisions of any referenced standard specification, manual, or code shall change the duties and responsibilities of the Seller.
- 1.6 When words which have a well-known technical or trade meaning are used to describe materials, equipment, or services, such words will be interpreted in accordance with such meaning.

## **2.0 Ownership of Procurement Documents**

- 2.1 When extending invitations to bid, the Purchaser and the Purchaser's Engineer will make copies of the Procurement Documents available to all qualified Bidders only for the purpose of obtaining bids for the stated materials and services and do not confer a license or grant for any other use. All Procurement Documents are instruments of service and remain the intellectual property of the Engineer whose name appears thereon.
- 2.2 Complete sets of the Procurement Documents in the number and for the fee sum, if any, stated in the Notice to Bidders may be obtained from the issuing office as named in the Notice to Bidders.
- 2.3 Complete sets of Procurement Documents must be used in preparing bids. Neither the Purchaser nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Procurement Documents.

## **3.0 Discrepancies and Clarifications**

- 3.1 If a prospective Bidder discovers discrepancies in the Procurement Documents or requires further clarification of their intent, the prospective Bidder should promptly notify the Engineer at the earliest discovery and prior to the bid date. Significant clarification or corrections will be issued by the Engineer to all prospective bidders by written addenda in the most time effective manner. Inquiries received less than seven days prior to the date of bid opening may not be answered. Only questions answered by formal written addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 3.2 If, during the performance of the Contract, the Seller finds a conflict, error, or discrepancy in the Contract Documents, the Seller shall so report to the Engineer in writing at once and shall obtain a written interpretation or clarification from the Engineer before proceeding further with those tasks which may be affected by the error, conflict, or discrepancy. The Engineer will issue with reasonable promptness written clarifications or interpretations as the Engineer may deem necessary regarding the requirements of the Contract Documents.

## **4.0 Insurance**

- 4.1 The Seller shall maintain in force and effect the following types of insurance with coverage as indicated:
  - 4.1.1 Worker's Compensation Insurance in the statutory amount.
  - 4.1.2 Comprehensive General Liability Insurance of not less than \$1,000,000 each occurrence and \$3,000,000 aggregate, including Comprehensive Broad Form Endorsement, with Contractual Liability Coverage.
  - 4.1.3 Automobile Liability Insurance of not less than \$250,000 per person, \$500,000 per occurrence bodily injury and \$100,000 property damage.
- 4.2 The Seller shall provide notarized certification of the appropriate insurance stating to wit: "The policies of insurance described herein are hereby certified to have been issued to the insured for whom this certificate is executed and that these policies are in force at this time".
- 4.3 In the event of cancellation or material change in a policy affecting the certificate holder, the Seller shall provide 30 days written notice of such cancellation or material change to the Purchaser.
- 4.4 The Seller shall assume all risk of loss or damage to the materials prior to the acceptance of delivery by the Purchaser at the designated point of delivery, and shall purchase and maintain insurance on the materials during the process of fabrication and while in transit to insure against the perils of fire and extended coverage including "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse, water damage and such perils.

## **5.0 Patent Fees, Licenses, and Royalties**

- 5.1 The Seller shall pay all license fees and royalties and assume all costs incident to the use in the production of materials or the incorporation in the materials of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others.
- 5.2 The Seller shall indemnify and hold harmless the Purchaser and the Engineer and anyone directly or indirectly employed by either of them from and against all claims, damages, losses, and expenses (including attorney's fees) arising out of any infringement of patent rights or copyrights incident to the use in production of the materials or incorporations therein of any invention, design, process, product, or device and shall defend all such claims in connection with any alleged infringement of such rights.

## 6.0 Indemnity

- 6.1 To the fullest extent permitted by Laws and Regulations, the Seller shall indemnify and hold harmless the Purchaser, the Engineer, the Engineer's Consultants and the officers, directors, employees, agents, and other consultants of each and any of them from and against all claims, damages, losses, and expenses (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of, or resulting from performance of the Work, provided that any such claim, damage, loss, or expense:
- a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and
  - b) is caused in whole or in part by any negligent act or omission of the Seller, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.
- 6.2 In any and all claims against the Purchaser or the Engineer or any of their respective consultants, agents, officers, directors, or employees by any employee (or the survivor or personal representative of such employee) of the Seller, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.1 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Seller or any such Subcontractor, Supplier, or other person or organization under Workers Compensation Acts, disability benefit acts, or other employee benefit acts.
- 6.3 The indemnification obligations of the Seller under Paragraph 6.1 shall not extend to the liability of the Engineer and the Engineer's Consultants, officers, directors, employees, or agents caused by the professional negligence, errors, or omissions of any of them.

## **7.0 Assignments and Subcontractors**

- 7.1 The Seller shall competently and efficiently direct procurement of materials and supervise services and coordinate all operations required to deliver the materials and services required by the Contract.
- 7.2 The Seller shall designate in writing to the Purchaser and the Engineer the name of the person authorized and assigned to act on the behalf of the Seller with respect to the Seller's obligations under the Contract Documents. All communications given to or received from that person will be binding on the Seller.
- 7.3 The Seller shall not assign any portion of the Contract nor subcontract the Contract Work in its entirety except as fully disclosed in the Proposal at the time of bid opening and as fully accepted by the Purchaser. No funds or sums of money due or to become due the Seller may be assigned under this Contract.

## **8.0 Contract Price and Change Orders**

- 8.1 The Contract price constitutes the total compensation, excluding taxes, payable to the Seller for furnishing the specified materials and services in connection with performance of the Contract. All duties, responsibilities, and obligations assigned to or undertaken by the Seller shall be at his expense without change in the Contract price.
- 8.2 The Purchaser or the Engineer acting on the behalf of the Purchaser may make changes to the work defined by the Contract Documents after the award of the Contract or while the Seller's work is in progress. Where such changes result in an adjustment to the Contract price or project schedule, all parties including the Purchaser, the Engineer, and the Seller must formally concur on the amount of compensated adjustment prior to undertaking any changes in the contracted work. The formal agreement shall take the form of a Change Order.
- 8.3 If the Seller believes that compliance to written clarification or interpretation issued by the Engineer after award of the Contract justifies an increase in the Contract price or the Contract project schedule, the Seller may make a claim therefor under provisions for a Change Order. It is the Seller's responsibility to show cause for a Change Order claim and to provide all documentation to support the claim. The Purchaser or the Engineer on the Purchaser's behalf reserves the right to review, approve, or deny any Change Order adjustments requested by the Seller.
- 8.4 The Contract price shall not be altered without a fully executed Change Order nor will any payments be made to the Seller for any additional work performed without a fully executed Change Order authorizing such work.

## **9.0 Project Schedule and Extensions of Time**

- 9.1 Time required for completion of the Contract shall be as stated in the Seller's proposal as submitted at the time of the bid opening. The Seller shall commence work in accordance with the project schedule upon receipt of a written Acceptance Notice from the Purchaser authorizing work to begin.
- 9.2 The Contract project schedule will be extended in an amount equal to time lost due to delays beyond the control of the Seller. Such delays may include, but are not limited to, acts of neglect by the Purchaser, changes issued by the Engineer, or to fires, flood, labor disputes, epidemics, abnormal weather conditions, governmental procedures, or acts of God.
- 9.3 The Seller must apply for extension to the Contract project schedule in writing to the Purchaser or the Purchaser's Engineer at earliest discovery of conditions which may cause a project delay. It is the Seller's responsibility to show cause for a schedule delay and to provide all documentation to support the claim. The Purchaser or the Engineer on the Purchaser's behalf reserves the right to review, approve, or deny any project schedule extensions requested by the Seller.

## **10.0 Quality and Workmanship**

- 10.1 Unless otherwise specified, the materials incorporated into the Seller's work shall be new and of good quality. All services and workmanship shall be of good quality and free from defects.
- 10.2 The Seller shall, if required by the Engineer, furnish satisfactory evidence as to the source, kind and quality of the materials incorporated in the work.
- 10.3 All services provided by the Seller shall be performed by competent and qualified personnel.
- 10.4 The Seller shall provide the Engineer, the Engineer's representatives and other representatives of the Purchaser proper and safe access to materials in the process of production at reasonable times as is necessary for the performance of their function in connection with the Contract Documents.
- 10.5 On behalf of the Purchaser, the Engineer will have authority to disapprove or reject materials or services which are defective or lack compliance with the Contract Documents.

## **11.0 Delivery**

- 11.1 Material components of the project shall be delivered to the person(s) and site(s) specifically designated as Point(s)-of-Delivery in the Technical Specifications and in accordance with the terms and conditions designated in the Technical Specifications.
- 11.2 All materials will be delivered F.O.B. point-of-delivery at the Seller's cost and risk of delivery.
- 11.3 The Seller shall confer property title on all materials to the Purchaser upon delivery to the designated person(s) and site(s). However, the Purchaser will not be obligated to accept any delivery of materials not made in accordance with the requirements noted in the Contract Documents. Unacceptable deliveries shall be returned at the expense of the Seller.
- 11.4 The Purchaser reserves the right to alter the designated delivery site(s) and to accelerate or postpone delivery dates by Change Order. If the Seller can show documented proof of additional costs incurred for such changes, the Seller may make claim for adjustments in Contract price for the changes in delivery.

## **12.0 Warranty and Guarantee**

- 12.1 The Seller's obligation to provide materials and perform services in accordance with the Contract Documents is absolute, and the Seller warrants and guarantees to the Purchaser and to the Engineer that all materials and services will be in accordance with the Contract Documents and free from defects.
- 12.2 The Seller shall guarantee his Work against material defect and faulty workmanship and negligence for the period designated by the Technical Specifications or as elsewhere duly noted in the Contract Documents, commencing on the date of final acceptance of the Work by the Purchaser.
- 12.3 Materials supplied by the Seller but not manufactured by the Seller shall be guaranteed against defects in accordance with the warranty requirements of the Technical Specifications or as elsewhere duly noted in the Contract Documents, unless the manufacturer of origin's warranty exceeds the specified requirements, then the Seller's warranty shall be for a term equal to the warranty of the manufacturer.
- 12.4 The Purchaser shall be entitled to the benefits of all warranties provided on all materials and services supplied by the Seller, regardless of manufacturer or origin.

### 13.0 Remediating Faulty Work

- 13.1 If there are apparent defects in the materials supplied by the Seller, the Purchaser or the Engineer will give prompt written notice thereof to the Seller. The Seller shall without cost to the Purchaser correct the defect or replace the materials with non-defective or conforming materials and shall take action to do so within 14 days after receiving written notification of defects.
- 13.2 If the Seller fails to promptly correct defects to the satisfaction of the Purchaser and the Engineer, the Purchaser may elect to replace or correct defective materials and recover all expenses of replacement and correction with an appropriately corresponding reduction in the Contract price.
- 13.3 If, at any time, the Purchaser or the Engineer notifies the Seller in writing that any services provided by the Seller fail to meet performance standards set forth by the Procurement Documents and prudent judgment, the Seller shall promptly provide service of quality acceptable to the Purchaser and the Engineer.
- 13.4 If the Seller fails to promptly remedy faulty performance to acceptable standards, the Purchaser may elect to obtain acceptable services elsewhere at the expense of the Seller.

### 14.0 Application for Payments

- 14.1 Payments will be allowed by the Purchaser to the Seller, based upon the Contract amount and successful completion of the project milestones specifically noted herein.

Receipt of final drawings and documentation:	0% of Contract Amount
Receipt of materials and services:	90% of Contract Amount
Final Inspection and Acceptance:	10% of Contract Amount

The Bidder may offer a deduct in his proposal based upon a different payment schedule.

- 14.2 Requests for payment should be submitted in triplicate to the Purchaser's consulting engineer as designated below for review and approval. Contingent upon a favorable review, the engineer will forward invoices to the Purchaser within ten days for remittance of funds due. The Purchaser shall have 30 days after receipt from the engineer to forward payment.

Electrical Consulting Engineers  
155 US Hwy 70 W.  
Garner, North Carolina 27529  
Attention: Tony B. Pearce, PE  
tpearce@ecepower.com

- 14.3 Based upon the recommendations of the Engineer, the Purchaser reserves the right to deny payment where, in the opinion of the Engineer, materials and services delivered by the Seller do not meet the milestone requirements set forth in the Technical Specifications for workmanship, quality, or performance.
- 14.4 If a request for payment does not meet favorable review by the Engineer, the Engineer will provide written notice to the Seller identifying the perceived deficiencies responsible for rejection of the invoice. The Seller shall take immediate action in accordance with the “Remedying Faulty Work” section of these General Conditions to correct all deficiencies to the satisfaction of the Purchaser and the Engineer before resubmitting requests for payment.

## **15.0 Final Inspection, Affidavit, and Final Payment**

- 15.1 After all materials and services have been incorporated into the Purchaser’s project, tested in accordance with such field tests as specified, and apparently functioning as intended, the Engineer will make a final inspection of the Work. Based upon his findings, the Engineer will advise the Purchaser and the Seller whether or not the Work appears to be acceptable in accordance with the Contract Documents. If not so acceptable, the Engineer will identify the apparent defects in writing. The Seller shall take such measures as are necessary to remedy all defects in accordance with these General Conditions.
- 15.2 The Seller may submit a request for final payment after the following:
- 15.2.1 The Seller has successfully delivered all materials and provided all services in compliance with the Procurement Documents;
- 15.2.2 The Seller has delivered all maintenance and operating instructions, schedules, guarantees, certificates, and other documents required by the Contract Documents;
- 15.2.3 The Seller has furnished to the Engineer a signed, sworn, and notarized affidavit to certify that payment for all materials, services, and other activity in connection with the Contract has been satisfied and that no claims or liens exist against the Seller in connection with the performance of the Contract;
- 15.2.4 The Engineer has completed the final inspection of the Work; and
- 15.2.5 The Seller has remedied all apparent defects to the satisfaction of the Engineer and the Purchaser.
- 15.3 If, on the basis of the final inspection of the Seller’s Work and review of the Seller’s Affidavit, the Engineer is satisfied that the materials and services fulfill the technical and performance requirements of the Contract Documents, the Engineer will forward invoices to the Purchaser within ten days for remittance of funds due.

- 15.4 If the request for final payment does not meet favorable review by the Engineer, the Engineer will return the request for final payment to the Seller, identifying in writing the deficiencies which prevent recommendation of final payment. The Seller shall take immediate action in accordance with the “Remedying Faulty Work” section of these General Conditions to correct all deficiencies to the satisfaction of the Purchaser and the Engineer before resubmitting requests for payment.
- 15.5 The Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the materials and work provided by the Seller. In his capacity as interpreter and judge, the Engineer will not show partiality to the Purchaser or the Seller and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.
- 15.6 Claims, disputes, and other matters relating to the Engineers judged acceptability of Seller’s performance or the Engineer’s interpretation of the requirements of the Contract Documents related to the Seller’s performance and claims in respect to Contract Price or Contract Time will be referred initially to the Engineer in writing with a request for a formal decision in accordance with this paragraph, which the Engineer will render in writing within a reasonable time not to exceed 14 days. Written notice of each such claim, dispute or other matter shall be delivered by the claimant to the Engineer within 15 days after the occurrence or discovery of the event or condition giving rise thereto, and written supporting data will be submitted to the Engineer within 45 days after such occurrence or discovery unless the Engineer allows an additional period of time to ascertain more accurate data.

## **16.0 Taxes**

- 16.1 The Seller shall pay all sales, consumer, use, and other similar taxes, required by law to be paid in respect of the production and delivery of the materials and furnishing of services.
- 16.2 Amounts payable by the Purchaser to the Seller for tax arising from the sale, purchase, or use of materials or services will be clearly and separately identified as tax on all invoices and will not be included in any sums in proposals or contractual agreements.
- 16.3 Requests for payment of sales taxes shall be accompanied by the Seller’s notarized statement certifying the amount of sales taxes paid during the performance of the Contract Work.

## 17.0 Suspension, Cancellation, and Termination

### 17.1 Suspension by the Purchaser

The Purchaser may, at any time and without cause, suspend production of the materials or any portion thereof or the furnishing of work or other services for a period of not more than 90 days by notice in writing to the Seller and the Engineer. Upon fifteen days written notice from the Purchaser, the Seller shall resume performance. The Seller will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the Seller makes an approved claim therefore as provided in the applicable sections of these General Conditions.

### 17.2 Termination by the Purchaser

The Purchaser may, after giving the Seller and the surety ten day's written notice and to the extent permitted by law, terminate the services of the Seller. In such case, the Seller shall not be entitled to receive any further payment until all materials are provided and all work furnished in accordance with the Contract Documents. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs to the Purchaser of such termination (including compensation for additional professional services), such excess will be paid to the Seller. If such costs exceed such unpaid balance, the Seller shall pay the difference to the Purchaser. Such costs incurred by the Purchaser will be approved as to reasonableness by the Engineer and incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, the Purchaser shall not be required to obtain the lowest price. Where the Seller's services have been so terminated by the Purchaser, the transaction will not affect any rights and remedies of the Purchaser against the Seller then existing or which may thereafter accrue. Any retention or payment of moneys due the Seller by the Purchaser will not release the Seller from liability.

The Purchaser may terminate the Contract upon the occurrence of any one or more of the following events:

17.2.1 if the Seller commences a voluntary case under any chapter of the Bankruptcy code (Title 11, U.S. Code), as now or hereafter in effect, or if the Seller takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to bankruptcy or insolvency;

17.2.2 if a petition is filed against the Seller under any chapter of said Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against the Seller under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

- 17.2.3 if the Seller makes a general assignment for the benefit of creditors;
- 17.2.4 if a trustee, receiver, custodian or agent of the Seller is appointed under applicable law, or under contract, whose appointment or authority to take charge of property of the Seller is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of the Seller's creditors;
- 17.2.5 if the Seller admits in writing an inability to pay its debts generally as they become due; or
- 17.2.6 a breach by the Seller in any substantial way of any provision of the Procurement Documents and such breach continues for a period of 15 days after written notice to correct the breach from the Purchaser to the Seller;

## **18.0 Equal Employment Opportunity Agreement**

During the performance of the Contract Work, the Contractor agrees that:

- 18.1 The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap. The Contractor will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap. Such action shall include but not be limited to the following employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices setting forth the provisions of the nondiscrimination clause.
- 18.2 The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap.
- 18.3 The Contractor will send to each labor union or representative of workers, with which he has a collective notice to be provided, advising the labor union or worker's representative of the Contractor's commitments under the Equal Employment Opportunity Section of this Contract, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

- 18.4 In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further contracts with the Owner.
- 18.5 The Contractor will include the provisions of this section in every Subcontract unless exempted by rules, regulations, or orders of the Owner so that such provisions will be binding upon each Subcontractor.

## **19.0 Dispute Resolution**

Disputes which cannot be resolved to the satisfaction of the contracted parties shall be resolved according to the applicable laws of the State of North Carolina.

## **20.0 Severability**

The invalidity, illegality, or un-enforceability of any portion or provision of this Contract shall in no way affect the validity, legality and/or enforceability of any other portion or provision of this Contract. Any invalid, illegal or unenforceable provision of this Contract shall be deemed severed from this Contract, and the balance of the Contract shall be construed and enforced the same as if the Contract had not contained any portion or provision which was invalid, illegal or unenforceable. Provided, however, this section 20.0 shall not prevent this entire Contract from being void in the event any portion or provision of this Contract which is of the essence of this Contract shall be void.

# CONTRACT

## Town of Smithfield SMITHFIELD, NORTH CAROLINA

### In Accordance With Procurement Documents For A

#### 115 kV OUTDOOR GAS CIRCUIT BREAKER

### (BID SCHEDULE AND DATA SHEETS ARE LOCATED IN THE BACK OF THE TECHNICAL SPECIFICATIONS AND MUST BE COMPLETED TO QUALIFY AS A RESPONSIBLE BID)

- 1.0 The undersigned (hereinafter called the “Bidder”) hereby proposes to provide, sell, and deliver to the Town of Smithfield (hereinafter called the “Owner”) the equipment, hardware, software, services and/or incidental items (hereinafter collectively known as the “Materials”) identified in the Bid Schedules attached herewith for an 115 kV OUTDOOR GAS CIRCUIT BREAKER in accordance with the terms and conditions described herein and in accordance with the following documents and instruments attached hereto and made a part thereof:
- 1.1 the Technical Specifications and Appendices, plans and drawings;
  - 1.2 all Procurement Documents, including Notice to Bidders, Instructions to Bidders, General Conditions, Special Conditions, Proposal, Contract
  - 1.3 the Bidder’s Table of Exceptions and supporting literature; and
  - 1.4 the Bidder’s List of Deliverables;
  - 1.5 the Bidder’s Delivery Schedule; and
  - 1.6 Any documented negotiations subsequent to the Owner’s acceptance of the Proposal
- 2.0 The Bidder warrants that the materials and services will conform to the performance data and guarantees which are attached hereto and by this reference made a part thereof.
- 3.0 The Bidder warrants that this Proposal is made in good faith and that all bid prices have been derived independently and confidentially without collusion or connection with any other person or persons bidding for the same work as a separate Bidder identity or entity.
- 4.0 All prices quoted in the Bid Schedules shall be firm for a period not less than 60 days.
- 5.0 The prices quoted in the Bid Schedules do not include any amounts due for tax arising from the sale, purchase, or use of materials or services and that are payable by the Bidder.
- 6.0 If the Bidder is awarded a contract, amounts payable by the Owner to the Bidder for tax

arising from the sale, purchase, or use of materials or services will be clearly and separately identified as tax on all invoices and will not be included in any sums in any contractual agreements.

- 7.0 The prices quoted in the Bid Schedules include the cost of delivery of all materials and services to all sites designated in the Technical Specifications at the Bidder's risk.
- 8.0 Title to materials shall pass to the Owner upon delivery in accordance with the conditions designated in the Technical Specifications.
- 9.0 Delivery of materials and performance of services will be in accordance with the Project Schedule as proposed in the Bid Schedules and commencing subsequent to the date that a written Purchase Order or Acceptance notice is provided by the Owner to the Bidder.
- 10.0 At the discretion of the Owner, the Bidder, if awarded the order, will be allowed extensions for delivery of materials and performance of services for delays due to circumstances beyond the control of the Bidder and beyond the control of the parties under subcontract to the Bidder for materials and services. The Bidder will notify the Owner in writing upon detecting such circumstances and advise the Owner as to the nature and anticipated extent of the delay. The Owner will grant project schedule extensions to the Bidder, if, in the opinion of the Owner, the delays are beyond the control of the Bidder and his subcontractors.
- 11.0 The Bidder warrants the accuracy of all statements and exhibits contained herein and as may be attached herewith and furthermore agrees that the Owner shall rely upon such accuracy as a condition of the Contract in the event that this Proposal is accepted by the Owner.
- 12.0 The Bidder agrees that this Proposal, upon its acceptance by the Owner, will constitute a binding Contract between the two parties. Such Contract shall become effective upon acceptance of the Proposal by the Owner.
- 13.0 It is understood that by submitting a bid, the Bidder acknowledges that he has carefully examined the documents pertaining to the work, has understood same and is satisfied that he will, if successful, perform said work in accordance with the documents as well as any other rules, ordinances, codes, regulations, laws etc. pertaining thereto. The Bidder must explicitly note all exceptions, clarifications, and deviations from the requirements of this Contract (including General Conditions and all other Bid Documents). Each notation must be referenced to the specific sections and paragraphs in question. The Table of Exceptions must be presented with the proposal at the time of bid opening. Failure to identify an exception, clarification, or deviation will be considered certification that all products and services perform in full compliance with the Contract. **Blanket substitution of the Bidders standard terms and conditions or other documents will not be construed as constituting an exception.** The terms and conditions as stated in this Contract govern in event of conflict with any terms of Bidder's proposal, and are not subject to change by reason of any written or verbal statements by Bidder or by any terms stated in Bidder's proposal unless same be accepted in writing by the Owner.

## PROPOSAL SIGNATURE PAGE

Bidder does hereby covenant and agree with the Owner that Bidder will faithfully furnish the materials as above set out in accordance with each and every one of the conditions, covenants, stipulations, terms, and provisions contained in the specifications at the prices and rates respectively named thereof in the proposal attached hereto, and will faithfully comply with each and every obligation imposed upon Bidder by said specifications or the terms of said award.

Refer to the Instruction to Bidders for proper signing procedure.

Respectfully submitted this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

\_\_\_\_\_  
*Name of Firm*

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

\_\_\_\_\_  
*Title*

Witness:

\_\_\_\_\_  
(Proprietorship or Partnership)

Attest:

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

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec. only)

## OWNER'S ACCEPTANCE

The Owner hereby accepts the foregoing Proposal by the Bidder \_\_\_\_\_ and hereby agrees to enter a Contract on this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_ with the Bidder for purchase of 115 kV Outdoor Gas Circuit Breaker for a total Contract Price of \_\_\_\_\_

As a supplement to the contract, the Owner will issue a standard Purchase Order with a basic description of the purchase and a reference to this Contract. This Contract, together with the Purchase Order, shall signify the Owner's acceptance of the Bidders Proposal, including any explicitly-named negotiations, clarifications and amendments established during the bid evaluation period and shall constitute a binding Contract between the Owner and the Bidder predicated upon such conditions.

Town of Smithfield  
Smithfield, North Carolina

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

WITNESS:

\_\_\_\_\_

**This instrument has been preaudited in the manner required by the Local Government  
Budget and Fiscal Control Act.**

\_\_\_\_\_  
**(Signature of Finance Officer)**

**Certificate(s) of Insurance**

**TOWN OF SMITHFIELD  
SMITHFIELD, NORTH CAROLINA**

**TECHNICAL SPECIFICATIONS  
FOR  
115 kV OUTDOOR CIRCUIT BREAKER**

# TECHNICAL SPECIFICATIONS FOR 115 kV OUTDOOR CIRCUIT BREAKER

## 1.0 GENERAL SCOPE

- 1.1 The Town of Smithfield (Owner) intends to procure two outdoor 115 kV circuit breakers for use in its Hospital Road Substation. The primary function of the circuit breaker will be switching and protection of a 115 kV station bus, and 115 kV-25/12 kV two-winding delta-wye power transformer. The breaker shall be complete and ready for operation upon completion of erection and the application of the Owner's supply voltage and relaying package. The Seller's work consists of providing all labor, materials, equipment, tools and supplies required to design, manufacture, test and deliver the outdoor circuit breaker and associated components as described herein.  
**Both SF6 Insulated/SF6 Interrupter and Air Insulated/Vacuum Interrupter designs will be considered.**
- 1.2 The circuit breaker shall be designed to accommodate the automatic interruption of bus and transmission faults occurring on the load side of the breaker. The circuit breaker shall initiate an automatic trip operation when such fault conditions are detected by an appropriate external relay system. Using a shunt trip mechanism, the circuit breaker shall provide safe interruption of service to the faulted bus and transmission facilities when applied within the guidelines of ANSI C37 and other applicable standards.
- 1.3 Automatic reclosing may be applied to the circuit breaker for up to three sequential operations. The breaker design shall incorporate a stored energy system to provide multiple reclosing operations of the breaker following loss of power input.
- 1.4 The breaker shall utilize a motor-compressed spring-operated mechanism which can provide an open-close-open operation at rated short-circuit current or at other required capabilities after loss of control power to the mechanism and thereafter recharge the spring mechanism within 15 seconds following application of control power.
- 1.5 The Owner will supply 48 V DC control voltage and 120/240 V single-phase AC power. The Seller shall not provide equipment that does not operate at the voltages provided unless prior approval is obtained from the Owner. If the Owner approves, the manufacturer is responsible for providing all transformation necessary to convert the Owner's supplied voltage to the required utilization voltage.
- 1.6 The Seller shall assume all costs and risks for delivery of the products to the designated site.

- 1.7 Seller must provide pricing for commissioning of breaker (optional adder).
- 1.8 All components incorporated into the manufactured product shall be new and of high quality. All workmanship shall be of good quality and free from defects. The Seller shall, if required by the Engineer, furnish satisfactory evidence as to the source, kind and quality of the components incorporated into the system configuration.
- 1.9 The Seller's products shall include the major material items as required in the technical specifications for each enclosure or assembly. Incidental materials, tools and fabrications not included herein, but required for construction of a completely assembled and functional product shall be furnished by the Seller.
- 1.10 All services provided by the Seller during the course of assembly, testing and training shall be performed by competent personnel technically qualified for the service to be performed.
- 1.11 All components and services furnished in the manufacture of the product shall be subject to inspection, tests and approval by the Owner. The Seller shall provide adequate facilities for inspecting and testing the system prior to shipment.
- 1.12 The Owner reserves the right to reject any or all components failing to comply with the technical specifications or failing to comply with the characteristics represented by the Seller's proposal, and as mutually agreed upon by the terms of the contract. The elapsed time for discovery of such noncompliance and subsequent rejection shall, at a minimum, include factory test dates and extend to one year following delivery of the manufactured product.
- 1.13 On behalf of the Owner, the Engineer will have authority to disapprove or reject materials or services that are defective or lack compliance with the Technical Specifications.
- 1.14 Upon discovery of noncompliance, the Owner shall notify the Seller in writing as to the nature of the defect within 60 days after such discovery. Upon receipt of notice, the Bidder shall replace the rejected components to the extent necessary to comply with the specifications and contract. In doing so, the Seller shall bear all costs for shipment of rejected components and replacement components. Should the Seller fail to replace rejected components, the Owner may elect to replace such components directly and deduct the cost of replacement from final payments due the Seller.

## 2.0 STANDARDS

Circuit breakers furnished in accordance with these technical specifications shall conform to the latest revision of ANSI C37 and all other applicable standards of ANSI, USEPA, IEEE, NEMA, OSHA and ASTM. Circuit breakers shall be designed tested and constructed to meet the requirements of the latest applicable standards of ANSI, NEMA and the ASME code for unfired pressure vessels. Where any conflict exists between ANSI/NEMA standards and this specification, this specification shall govern.

## 3.0 OPERATING ENVIRONMENT AND RATINGS

- 3.1 Circuit breakers shall deliver the full ratings of performance in ambient temperatures ranging from -30° C to +40° C, and at altitudes up to 1000 meters (3300 feet). Operating altitude shall not adversely affect the fault current interrupting rating of the circuit breaker or the rated interrupting time of the circuit breaker.
- 3.2 When installed in accordance with manufacturer's structural design, circuit breakers shall withstand seismic loadings in accordance with the accelerations and ground motions of ASCE 7-22 (using Seismic Design Category D) and deliver the full ratings of performance during and after the occurrence of such loadings. Seismic conditions within these limits shall not adversely affect the fault current interrupting rating of the circuit breaker or the rated interrupting time of the circuit breaker. This loading shall not cause the circuit breaker, frame, bushings, control cabinet, contact assembly or fastenings to be overstressed or lose alignment.
- 3.3 Circuit breakers shall deliver the full ratings of performance in wind loading of 120 miles per hour without adverse effect upon the fault current interrupting rating of the circuit breaker or the rated interrupting time of the circuit breaker.
- 3.4 Circuit breakers shall deliver the full ratings of performance under one inch of ice accumulation without adverse effect upon the fault current interrupting rating of the circuit breaker or the rated interrupting time of the circuit breaker.
- 3.5 Circuit breakers shall be designed for outdoor use on high voltage electric buses at 60 Hz ac. The breaker ratings shall be in accordance with ANSI C37.
- 3.6 All circuit breakers shall provide synchronized, three-pole interruption of loads and faults up to the maximum rated interrupting capacity in accordance with ANSI and NEMA rating schedules.
- 3.7 Ratings for this specific application are identified as follows:

Nominal Voltage Class (kV)		115
Impulse Insulation Level (kV)		550
Rated Continuous Current @ 60 Hz (amperes)		1200
Rated Short Circuit Current @ Max kV (amperes)		40,000
Rated Interrupting Time (cycles)		3
Maximum Symmetrical Interrupting & 3-second Short time Current Rating (amperes)		40,000
Close-and-Latch Capability	Amperes, RMS (1.6)	64,000
	Amperes, Crest (2.7)	108,000
Minimum Clearances ft.	Base to Bottom of Bushing	8.5
	Base to Live Parts	12
	Phase-to-Phase/ Metal-to-Metal	5

## 4.0 INTERRUPTER DESIGN

### 4.1 GAS

- 4.1.1 Interruption shall employ a “dead-tank” design containing 3 single-gap puffer-type chambers, one per pole, using pressurized and sealed sulfur hexafluoride (SF<sub>6</sub>) gas as the arc suppression medium. Each chamber shall be equipped with an externally visible target mechanism to signal loss of adequate gas pressure for safe circuit interruption.
- 4.1.2 Full pressurization and sealing of the interruption chamber at the factory prior to shipment is preferred. If the gas interrupter design requires an SF<sub>6</sub> charge in the field for full operational pressurization, field services for gas charging shall be provided by the gas circuit breaker manufacturer. The cost of providing such service shall be included in the purchase price of the gas circuit breaker as a basic component of the equipment. All field services shall be provided by technicians fully trained and proficient in all aspects of the product.
- 4.1.3 Each SF<sub>6</sub> gas interruption chamber shall be equipped with a safety valve, rupture mechanism or similar pressure-relief device for the safe and control venting of pressures exceeding the designated operational limits of the vessel.

- 4.1.4 Each SF<sub>6</sub> gas interruption chamber shall be equipped with a pressure monitor to provide visual indication that there is adequate or inadequate gas pressure for safe operation. The indicator may be in the form of a mechanical target, semaphore or gauge, but must identify the “pass / fail” integrity of the interruption chamber in a clearly discernible manner to any station operator standing at ground elevation.
- 4.1.5 Each SF<sub>6</sub> gas interruption chamber shall be equipped with electrical contacts interlocked with the breaker control trip coil circuit so as to prevent a trip whenever the pressure monitor detects inadequate gas pressure for safe operation. Two “SF<sub>6</sub> Lockout” alarm contacts shall be provided and wired to a terminal in the breaker control cabinet for the Owner’s use.
- 4.1.6 The SF<sub>6</sub> gas interruption chambers shall maintain full rated dielectric strength when contacts are in the open position without reliance upon any external disconnect device.
- 4.1.7 Interrupters shall be of modular design and mechanically interchangeable such that any pole unit may be exchanged for another unit.
- 4.1.8 Manufacturers shall furnish a complete SF<sub>6</sub> gas system for each breaker. The system shall include pressure alarms as required, valves, heaters, dryers, filters and all necessary accessories for filling, operation, and maintenance of the circuit breakers. SF<sub>6</sub> fill hoses shall be stainless steel reinforced and be no more than 6'0" in length. Leak-tight swaged compression fittings or welds shall be used for all gas piping. The SF<sub>6</sub> gas system shall be designed to automatically maintain the moisture content of the SF<sub>6</sub> at an adequate level for proper operation of the circuit breaker.
  - 4.1.8.1 The insulating gas system shall include pressure switches to automatically monitor and control insulating gas pressure. A minimum of two control switch contacts and two alarm switch contacts shall be provided by each of these devices.
  - 4.1.8.2 Each interrupter pole using pressurized SF<sub>6</sub> gas for insulating media shall be equipped with dial-type pressure and temperature gauges to provide local and remote indication of SF<sub>6</sub> conditions.
  - 4.1.8.3 For breakers employing a common SF<sub>6</sub> gas system for all poles, the pressurized manifold and associated connections common to the entire gas system shall be equipped with a monitoring gauge to indicate and remotely alarm total system pressure conditions. The monitoring gauge shall be centrally located for convenient view by operating personnel. Location shall be subject to Purchaser’s approval.

- 4.1.8.4 Gas manifold shall be designed for pressure maintenance and/or leak testing without the need to remove or add SF<sub>6</sub> gas.
- 4.1.9 Temperature-compensated gas pressure gauges or gas density monitors shall be provided. These devices shall have at least one alarm and one block/trip contact. Provide temperature compensation curves in increments of no less than 2 degrees.
  - 4.1.9.1 Air and gas valves and connections shall be furnished to permit unit servicing. Seller shall verify gas-fitting connections with the customer before construction.
  - 4.1.9.2 All tubing used for SF<sub>6</sub> gas pressure or differential pressure monitoring shall be stainless steel. All tubing used for discharge outlets to pneumatic systems (where applicable) shall be stainless steel. Copper tubing is not acceptable for any of these applications.
- 4.1.10 The manufacturer shall make provisions for filling the breaker which allows for the SF<sub>6</sub> gauge/density monitor to be in service during filling. Provisions shall be made for testing the alarm contact settings of said gauge/monitor.
- 4.1.11 Multiple tank circuit breakers shall have inter-tank connections and valves configured so an individual tank can be isolated for service without disturbing gas in any other tank.
- 4.1.12 For each SF<sub>6</sub> breaker quoted, the following information shall be provided.
  - 4.1.12.1 Normal SF<sub>6</sub> operating pressure.
  - 4.1.12.2 Minimum SF<sub>6</sub> pressure to interrupt full rated fault current.
  - 4.1.12.3 Minimum SF<sub>6</sub> pressure to interrupt full rated load current.

Each breaker shall be furnished with sufficient SF<sub>6</sub> gas to maintain positive pressure and provide for safe transport under pressure. The SF<sub>6</sub> gas shall be free of moisture and impurities. SF<sub>6</sub>-nitrogen gas mixtures shall not be used. Seller to supply gas to fill breakers to operating pressure.

- 4.1.13 Gas sampling valves shall be located as near to live parts area of the system as safely possible for sampling while energized. Valves required for gas sampling shall be such that pressure on gauge is maintained so that sampling will not alarm or trip breaker
- 4.1.14 Gas system plumbing shall provide sampling valves for attachment of external monitoring and service equipment for maintenance purposes. The point of connection shall be located as near as safely practical to the gas interrupter assembly to allow use when the assembly is energized at nominal

operating voltage. The sampling provisions shall feature a check valve design to minimize the loss of gas and guard against initiating alarm or trip circuitry when in use.

- 4.1.15 The circuit breaker, if closed, shall remain closed and locked and initiate alarms if the air or gas pressure should decrease to the point where the breaker is not capable of a successful operation at rated interrupting capabilities. If open, the circuit breaker shall lock open (block closing) and initiate alarms. The detection schemes for these air and/or gas pressure conditions shall be fail-safe. All alarms shall provide contacts wired via intermediate terminal blocks to an SEL Remote I/O data collection device as described in Section 17.0.

## 4.2 Vacuum

- 4.2.1 The breaker shall employ hermetically sealed, maintenance free vacuum interrupters for arc interruption with one interrupter per phase.
- 4.2.2 Breaker shall have readily accessible provisions for measuring the contact wear on each interrupter.
- 4.2.3 Interrupter tanks for all circuit breakers shall be cast aluminum and have adequate mechanical strength and remain air tight to a leakage of 1% or less per year. The tanks shall be capable of withstanding all pressure resulting from maximum rated fault current, sustained for 30 cycles, without the use of a rupture disk.
- 4.2.4 Circuit breakers shall be of the dead-tank design. The breaker design shall be such that each vacuum phase interrupter is in its own Air tank.
- 4.2.5 No special devices shall be required to access the interrupter for maintenance or inspection. Bushing removal shall not be required for maintenance or inspection of the breaker, contacts and nozzles.
- 4.2.6 The contacts shall be designed to have adequate thermal and current carrying capacity for carrying full rated current and short circuit loadings without exceeding the allowable temperature rise as specified in ANSI Standard C37.04. They shall be designed to have long life so that frequent replacement or maintenance will be unnecessary.
- 4.2.7 The system shall be complete with all valves, piping, filters, and auxiliary devices required for breaker operation and maintenance. Suitable sampling valves shall be provided to allow taking air samples. Sample valves shall be located so as to be accessible to ground personnel. All air lines, fittings and valves shall be stainless steel. All cover seats, flange joints, threaded connections and pipe fittings shall be properly machined, fitted and

gasketed, if necessary, so as to be and to remain air tight. Special tools required for filling shall be furnished by the manufacturer.

## **5.0 INSULATION DESIGN**

- 5.1 Within the rated nominal kV and applicable BIL, the circuit breaker shall be capable of continuously withstanding an out-of-phase voltage differential occurring across terminals of any open phase pole with phase angle of the voltage differential continuously varying.
- 5.2 All components of insulation shall be constructed of inherently stable materials that inhibit tracking when subjected to dielectric stress equal to the full ratings of the circuit breaker.
- 5.3 (Applicable for gas breaker) Insulation materials shall not react to continuous contact with the SF<sub>6</sub> gas media in any way that would accelerate deterioration of the insulation, support combustion, generate toxic byproducts or absorb moisture.
- 5.4 All insulating materials shall be designed to withstand dynamic shocks produced by operation of the circuit breaker.
- 5.5 Bushings, post insulators and similar insulating materials shall be designed to support and continuously withstand the maximum permissible terminal loadings defined by ANSI C37.
- 5.6 Ancillary current transformers shall be arranged onto circuit breaker bushings in a manner that does not decrease the rated insulation level. Current transformers shall be located external to the pressure vessel. Shield/housing on current transformer shall be grounded.

## **6.0 BUSHINGS**

- 6.1 Bushings shall be enclosed in high strength wet-process ANSI 70, sky gray porcelain and shall provide creep length and leakage distance for the specified BIL application.
- 6.2 The manufacturer may provide pricing options for substitution of composite/polymer bushings in lieu of porcelain bushings.

- 6.3 Bushing assemblies shall provide continuous current capacity equal to the continuous current rating of the breaker.
- 6.4 Bushings shall conform to the requirements of applicable ANSI Standards.
- 6.5 Each bushing stud shall be equipped with a tinned bronze NEMA four-hole spade terminal connector.
- 6.6 Bushing assemblies with terminal pads shall be designed to withstand a minimum conductor loading of 350 pounds in any direction. The allowable terminal physical loads for bushings shall be stated on the breaker outline drawing.
- 6.7 Bushing mounting hardware shall be stainless steel.
- 6.8 All bushings shall have stainless steel nameplates with ANSI required information.
- 6.9 If removed by manufacturer prior to shipment, bushings shall be match-marked so that bushings will be installed in the same location as in factory testing.
- 6.10 The bushings shall be labeled 1-6 with typical 1-3-5 and 2-4-6 association. A permanent label shall be attached to the breaker near the base of the bushing indicating the number of the bushing.

## 7.0 CURRENT TRANSFORMERS

- 7.1 Bushing current transformers (BCT's) shall be manufactured in accordance with IEEE C.57. BCT's shall be considered part of the circuit breaker and shall be coordinated with the circuit breaker to meet all currents, voltages and mechanical requirements of the circuit breaker for steady state, surge and fault conditions.
- 7.2 The circuit breaker shall provide nameplates designating the bushing current transformers installed thereupon. Nameplate data for BCT's shall conform to the requirements of ANSI.
- 7.3 Required BCT's
  - 7.3.1 Each line side (1-3-5) bushing shall be equipped with **two (1) 600:5** multi-ratio bushing current transformer, ANSI accuracy class **10C800** (minimum), with ANSI standard taps between X1 and X5.
  - 7.3.2 Each load side (2-4-6) bushing shall be equipped with **two (1) 600:5** multi-ratio bushing current transformer, ANSI accuracy class **10C800** (minimum), with ANSI standard taps between X1 and X5.

- 7.4 BCT's shall provide a thermal rating factor of not less than 2.0.
- 7.5 BCT's shall be installed on bushings such that BCT polarities are oriented toward the field terminal end of the bushing for each pole.
- 7.6 All taps from each BCT secondary shall be factory-wired without splicing to a shorting-type terminal block located within the control cabinet of the breaker. The full ratio of each BCT secondary shall be shunted by wire jumper and connected to case ground prior to shipment of the breaker. Marathon 1600 SC or equivalent GE series six-terminal blocks shall be provided with at least three shorting screws per block.
- 7.7 Documentation provided with breaker shall include all BCT data outlined by IEEE C57, for each type of BCT supplied. Such data shall include BCT excitation and saturation curves, secondary resistance values and thermal rating information.
- 7.8 Covers for BCT's shall be bonded to the breaker frame.

## **8.0 MECHANICAL POWER TRAIN**

- 8.1 The circuit breaker shall provide synchronous gang operation of all interrupter poles through a common mechanical power train assembly. The mechanical power train shall be fully enclosed within weatherproof, dustproof cabinetry supplied as an integral part of the circuit breaker.
- 8.2 The mechanical power train shall provide a mechanical target or semaphore to provide visual indication of the open or closed status of the interrupter assembly. The target or semaphore shall identify the open position by the text letters "OPEN" in white letters against a green background. The text letters "CLOSED" in white letters against a red background shall identify the closed position. The escutcheons and the text point shall be sized sufficiently to provide clearly discernible status indication to any station operator standing at ground elevation without requiring the operator to open any control cabinets or mechanism housings. On spring charged mechanisms the mechanism indicator shall display the word "charged" in black letters on a yellow background and the word "discharged" in black letters on a white background. Indicators shall not cloud or deteriorate in the presence of normal solar exposure for 25 years.
- 8.3 Adjustable dimensions within the mechanical power train linkage shall provide the resolution necessary to achieve proper travel and precise synchronous gang operation of the interrupter poles. All adjustments that affect synchronous operation shall be factory set and secured in a manner that will not require further alignment during field assembly of the circuit breaker.

## 9.0 OPERATING MECHANISM

- 9.1 The circuit breaker shall provide a stored-energy, trip-free, operating mechanism control for local mechanical or remote electrical operation of the mechanical power train assembly. Mechanism shall be spring close/spring trip with electric motor for recharging of spring. Any alternate designs are subject to the Owner's approval.
- 9.2 The operator's stored energy shall provide sufficient speed and torque to perform a complete synchronized group operation of the interrupters from fully closed to fully open position within three cycles (60 Hz basis)
- 9.3 The operator's stored energy shall provide sufficient speed and torque to perform a complete synchronized group operation of the interrupters from fully open to fully closed position within three cycles (60 Hz basis).
- 9.4 The operator shall provide sufficient stored energy to accommodate the fully rated interrupting capacity for an "OCO+15+CO" reclosing duty cycle.
- 9.5 The operator's stored energy shall provide sufficient speed and torque to perform a complete synchronized trip or close operation of the interrupters under one-inch ice formation without detriment to the required operating speed.
- 9.6 The operator shall provide a dc-voltage electrical shunt trip circuit to allow the remote trip operation of the interrupters from the customer's field relaying and control equipment. The shunt trip circuit shall be designed to release the operator's stored tripping energy to the mechanical power train and accomplish fully rated electrical isolation within the designated clearing time. The trip circuit shall be wired to a terminal block in the breaker control cabinet for field connection to the customer's backup relaying scheme.
- 9.7 The operator shall provide trip redundancy through a second dc-voltage shunt trip circuit equal in all aspects to the circuit required by paragraph 9.6. The second trip circuit shall be wired to a terminal block in the breaker control cabinet for field connection to the customer's backup relaying scheme. Trip circuits shall be completely independent from on another. Any breaker that employs trip circuits that have a single point of failure will not be accepted.
- 9.8 Each trip circuit shall be capable of operating normally with or without any voltage on the other circuit. Trip coils shall be electrically and magnetically

independent and all necessary control circuits including pressure switches and reset devices shall be provided.

- 9.9 (Applicable for gas breaker) Each trip circuit shall include a permissive contact representing adequate pressure within each SF<sub>6</sub> interruption chamber. Lack of adequate SF<sub>6</sub> media in any chamber shall disable each trip circuit of the breaker via the permissive contact. The arrangement of this feature shall not compromise the independence of the two trip circuits.
- 9.10 In addition to each electrical shunt trip device, the operator shall provide a manually-operated mechanical trip device allowing personnel to trip the interrupters if insufficient control voltage is available to operate the electrical shunt trip device. The manual trip device shall be designed to release the operator's stored tripping energy to the mechanical power train and accomplish fully rated electrical isolation within the designated clearing time. Manual trip of the interrupters shall set an electrical interlock (69 switch), which prevents subsequent electrical closing of the interrupters until such interlock switch has been manually reset.
- 9.11 The operator shall be designed and tested to ensure positive trip-free circuit interruption independent of the partial or fully closed state of the interrupter. If a trip signal is applied to the operator at any partially closed stage, the trip signal shall initiate full contact separation and fully rated electrical isolation of the interrupters within the designated three-cycle operating speed.
- 9.12 Closing the circuit breaker operator into a standing trip signal input (provided by customer's relaying) shall not cause damage to the circuit breaker.
- 9.13 The breaker shall provide an anti-pump "52 X-Y" electrical closing circuit with dc-voltage closing coil, mechanism latch check switch and permissive contacts representing adequate SF<sub>6</sub> interrupter pressure (if applicable). Failure of mechanism to properly latch shall cause the latch check switch to inhibit an electrical close operation. Similarly, loss of adequate interrupter medium in any interrupter chamber shall cause the SF<sub>6</sub> pressure switch to inhibit an electrical close operation (if applicable).
- 9.14 Electrical isolation shall be provided between the seal-in contact of the closing circuit at the breaker and the closing circuit of the customers control circuit such that the customer's control circuit does not make and break full close coil current.
- 9.15 Tripping current shall not exceed 12 amperes per trip coil circuit.
- 9.16 All latches, rollers, bearings etc. shall be either sealed or long-life lubricants shall be used. Lubricants should be selected and specified with the knowledge that the breaker may be operated only once per year (or less). The manufacturer's documentation shall provide the type of mechanism lubricants that are preferable

with a listing of all acceptable lubricant manufacturers and specific lubricant information.

- 9.17 Regarding breakers equipped with motor-charged spring mechanisms per ANSI requirements:
- 9.17.1 The mechanical and electrical sequence of the operating mechanism shall provide full charging of the stored energy devices before initiating a close operation of the interrupters.
  - 9.17.2 The operator shall provide an electrically-powered motor and appropriate gear drive for charging the mechanical energy storage devices (i.e., springs).
  - 9.17.3 The primary intent of the motor and gear drive is to charge the operator. The operator shall not be directly dependent upon the motor or the gear drive to articulate a tripping operation of the interrupters or to achieve rated electrical isolation on the primary circuit.
  - 9.17.4 The operator shall provide a mechanical operating crank or lever arrangement for manually driving the position of power train mechanism for maintenance purposes. The manual drive crank (or lever) shall be electrically interlocked to disable all electrical trip and spring charging circuits when the manual drive crank is inserted and in use.
- 9.18 The breaker shall be supplied with provisions for mounting a time motion velocity device and instructions for timing of the circuit breaker.
- 9.19 A means shall be provided to mechanically lock the mechanism in the open or closed position for maintenance purposes.
- 9.20 All gauges, meters, and similar devices shall be calibrated in US standards designations, (i.e. pounds per square inch).

## **10.0 STRUCTURAL FEATURES & MOUNTING**

- 10.1 Structural arrangement of the circuit breaker shall include integral assembly of all interrupter poles, bushings, mechanism cabinetry and control cabinetry onto a common mounting base.
- 10.2 The breaker shall be furnished with a freestanding mounting frame for installation onto a concrete pad. Mounting frames shall be fabricated from structural-grade carbon steel and hot-dip galvanized prior to factory assembly.

- 10.3 The breaker-mounting frame shall be designed to withstand all dynamic and static loads induced by the breaker mechanism and the specified seismic loading over the useful life of the breaker.
- 10.4 All bolted connections between the structural mounting base, cabinetry and associated subassemblies shall provide a secure means of electrically bonding these metal components. All structural mounting bases shall provide a NEMA two-hole terminal pad for attachment of a bonding conductor between the column and the substation grounding system.
- 10.5 Miscellaneous assembly hardware for field erection of the circuit breaker shall be included with the circuit breaker. All miscellaneous hardware shall be packaged for durable shipment and handling, and shall be clearly identified as to purpose and location for field assembly.
- 10.6 Anchor bolt recommendations shall be provided by the gas circuit breaker manufacturer. Anchor bolt recommendation shall be in accordance with the static and dynamic force characteristics of the specific model of gas circuit breaker as well as the external loading conditions described in Section 3 of this Specification.
- 10.7 All breaker external hardware shall be stainless steel or silicon bronze. No plated hardware will be accepted.
- 10.8 All shipping pins, bolts, or other devices requiring removal prior to operating breaker shall be painted red or yellow and labeled.

## **11.0 ENCLOSURES & CABINETS**

- 11.1 All cabinetry shall be weatherproof, dustproof enclosures suitable for continuous outdoor use and shall provide protection against rain, sleet, snow, dripping water and corrosion in accordance with NEMA 3R standards.
- 11.2 Exterior cabinet corners shall be fully covered by formed bends which overlap; seams shall meet at flat surfaces only. All exterior seams and corners must be ground smooth for tight fit.
- 11.3 Enclosures shall feature a main front door for primary access to operator control functions and may offer supplemental side or rear doors to provide serviceable access to mechanism hardware and wiring. Each door shall be attached with multi-point hinges employing stainless steel hinge pin and fastener hardware. The hinged side of each door shall be equipped with a self-engaging restraint arm to hold door open (120° minimum). Each cabinet door shall provide a latch employing either a cam mechanism or three-point mechanism for secure door closure. The latching mechanism handle shall be pistol-grip type and provide a means for padlocking against unauthorized entry into the enclosure.

- 11.4 Each door opening shall be double-flanged on all four sides for strength and prevention against inadvertent entry of dust and liquids. The door shall be sealed against the double-flanged opening using closed cell neoprene gasket material.
- 11.5 Swing panels for access to interior wiring must be able to open and be latched at 120° (minimum) to facilitate work inside. The swing panel shall be locked in the closed position in at least two points by latching handles. Bolts are not acceptable. Handles are to unlatch with 90° turn.
- 11.6 Front access doors shall be equipped with a metal document pouch for storage of instruction manuals and drawings relevant to the circuit breaker operation.
- 11.7 Louvers and door mountings shall meet NEMA 3R requirements in prevention of dust and water entry into the enclosure. Ventilation louvers shall feature a tamper-resistant design.
- 11.8 The floor of the electrical control enclosure shall be equipped with a removable conduit entry plate for field installation of incoming conduit and cable. The removable conduit plate shall include neoprene gasket and fastener bolts.
- 11.9 Cabinet interiors shall be designed for equipment mounting using techniques that do not penetrate the exterior walls of the enclosure.
- 11.10 The operator enclosure mounting height shall provide convenient access to personnel from ground elevation with a maximum door handle height of 5'-6". The bottom of the operator enclosure shall not be less than 18 inches nor greater than 36 inches above the base of the gas circuit breaker mounting elevation. All items typically accessed for monthly inspection or maintenance shall be at 5'-6" or less from breaker mounting pad elevation.
- 11.11 Mechanical power train assembly components, stored energy operator components, and electrical control wiring shall be fully contained within and supported by a single (or multiple) weatherproof tank enclosure(s).
- 11.12 The main cabinets shall have 120-volt lamps with manual on/off switch plus door switch and protective guard. The electrical control enclosure shall provide an ac service outlet in the form of a 120-volt, 20-ampere GFCI duplex receptacle complete with circuit breaker.
- 11.13 Each operating mechanism and control enclosure shall be provided with thermostatically controlled space heaters to prevent condensation within the enclosure. The heaters shall be rated 240 volts but shall be designed to maintain the enclosure temperature above the dew point when operated at 120 volts. Heaters shall be placed as to avoid damage to wiring, devices or painted surfaces. Heaters shall be placed to avoid drying of the operating mechanism. Each compartment shall have at least one continuously operated heater and one

thermostatically operated heater. All heaters subject to contact shall have suitable guards or shields that are thermally isolated or non-conducting. Surface temperature of the guards shall not exceed 140°F in continuous operation.

11.14 All viewing windows shall be non-glare safety glass or Lexan.

## 12.0 ELECTRICAL CONTROL FEATURES

12.1 The Owner's control voltages will be as follows:

Circuit	Input Voltage
Shunt Trip Coil No. 1	48 vdc
Shunt Trip Coil No. 2	48 vdc
Closing Coil	48 vdc
Spring-Charging Motor	48 vdc

12.2 The Owner will provide all protective relays (Devices 50 / 51 / 67 / 81, etc.) and automatic reclosing (79) in a separate external relay control panel that will be field wired to the breaker's close and trip circuitry. Therefore, no protective relaying or automatic reclosing relays are required in the circuit breaker. However, the breaker's trip coil and close coil circuit wiring shall accommodate field integration and termination of the Owner's remote trip and close controls as may be provided from the external relay/control panel. The breaker control circuitry shall provide factory-wired terminal blocks for field connection of the Owner's relay system outputs and inputs to the breaker's trip and close circuitry.

12.3 The Owner's protective relay panel will include a control switch (52CS) for electrical trip and close operation of the breaker from the indoor relay enclosure.

12.4 The mechanism (close circuit only) shall provide a "Local/Remote" selector switch installed to inhibit breaker operation from the Owner's remote close device(s). The local/remote selector switch shall only be wired into the close circuit and shall not, under any circumstances inhibit any trip operation from any remote trip devices.

- In the REMOTE position, the customer's external breaker close controls are enabled and the local pushbutton close control is blocked
- In the LOCAL position, the customer's external breaker close controls are blocked and the local close pushbutton control is enabled.
- The selector switch shall have a second set of contacts, factory wired to a terminal block that can be used by the Owner for status indication.

- 12.5 The electrical closing circuitry of the control shall provide field terminals for the addition of a permissive (normally-closed) interlocking contact from the customer's field relaying system. External relay operations that open this electrical interlock shall prevent the circuit breaker from being electrically closed remotely or locally until this electrical interlock has been restored.
- 12.6 The control circuitry shall include a local alarm annunciator circuit to latch and maintain separate alarm lamps for the following conditions:
- 12.6.1 Detection of insufficient SF<sub>6</sub> gas pressure (where applicable) for safe breaker operation.
- 12.6.2 Detection of insufficient pneumatic pressure (where applicable) for proper operation of the pneumatic mechanism.
- 12.7 The operator control panel shall provide one green and one red indicator lamp to locally indicate the open and closed positions of the interrupters. The indicator lamps shall be integrally wired with the trip coil to provide local confirmation of the continuity of the trip coil circuit. The lamps shall be cluster head LED type with transparent lens and T-2 base.
- 12.8 The indicator lamp circuits shall accommodate field integration and termination of remote indicator lamps by the Owner as may be located on an external relay and control panel or switchboard.
- 12.9 The operator control shall be equipped with a non-resettable numerical operations counter to record all trip operations. The counter shall provide a minimum resolution of five digits. Counter shall be mechanically linked to trip mechanism. Counter shall be located in mechanism housing as to be conveniently read from ground level (or platform) without opening door of cabinet.
- 12.10 The operator control shall provide a bank of ten separate Form A and ten separate Form B auxiliary contact switches mechanically linked to the output of the operator control. Auxiliary switches shall be of the rotary type. Flexible cables or chain linkage type connections will not be accepted. These switches shall be for customer use and shall be in addition to those needed for breaker operation. All spare auxiliary contacts and unused contacts or control devices shall be wired to terminal blocks in the control cabinet. Contacts shall be rated for 10 amps at the Owner's designated control DC voltage.
- 12.11 The breaker control system shall include an SEL-2505 Remote I/O module for local collection and reporting of all circuit breaker alarm and status inputs. The purpose of the SEL-2505 is to convert the status of these inputs into data for transmission over optic fiber to the customer's substation IED server. The breaker manufacturer shall furnish and install the SEL-2505 and completely wire

all designated inputs and power supply. Details regarding the SEL-2505 are noted in Section 17.0.

### **13.0 CONTROL DEVICES, TERMINAL BLOCKS AND WIRING**

- 13.1 All internal conductors used for interconnection of control and service circuits shall be adequately sized to meet anticipated circuit loadings within tolerances of allowable voltage drop and withstand mechanical stresses of the application.
- 13.2 All field termination points shall be wired to multi-pole phenolic barrier-type terminal blocks provided with brass-nickel-plated screws and terminal pads. Terminal blocks may be in 4-, 6-, 8- or 12-pole configurations as required by the drawings and as appropriate to the field I/O wiring arrangement. All screw terminations shall include non-ferrous lockwashers.
- 13.3 Wire terminations shall be limited to a maximum of 2 terminal lugs on any terminal point on any block or device in the enclosure.
- 13.4 All devices and instruments mounted in the enclosure shall be labeled according to designations illustrated on the manufacturer's wiring diagrams. Labels shall be placed in a conspicuous location, preferably on the device or on the mounting panel adjacent to the device. Nameplates shall be engraved plastic, phenolic type (tape, paper, composition, etc. type will not be accepted).
- 13.5 Wire terminations and individual termination points on terminal blocks shall be clearly marked for circuit identification (device codes, etc.). Nameplates shall be engraved plastic, phenolic type (tape, paper, composition, etc. type will not be accepted).
- 13.6 Terminal blocks shall have an engraved phenolic type (tape type labels are not acceptable) white marker strip having the wire identities (or black marker strip with white wire identities, same-end designation) as shown on the manufacturer's certified drawings and shall be supplied for the following:
  - (a) Control circuits
  - (b) Current transformer leads
  - (c) Motor leads
  - (d) Heater leads
  - (e) Other equipment controls, instruments, meters, and relays requiring external connections.
- 13.7 If terminal blocks are located within 6" of corners, top or bottom, they shall be offset on a 45° angle so as to facilitate easier termination by the customer.
- 13.8 The terminal block arrangement and location shall be such that incoming and outgoing cables can be supported.

- 13.9 Adjacent rows of terminal blocks shall be separated at least 6" from sides, top, or bottom of cabinet for all wiring terminations to be made by the customer. Wiring which will be done at the factory may be made in a space that is not less than 3 inches in width.
- 13.10 General control and service wiring shall be terminated on barrier blocks rated 600 volts ac, 30 amperes, accepting wire ranging from 10 AWG to 16 AWG, and equivalent to Marathon 1600 Series.
- 13.11 Customer-supplied dc service voltage input shall be terminated on a phenolic barrier-type 2-pole power distribution splicer/stud block. Each pole terminal shall accept a wire range of 2-14 AWG stranded copper conductor. Power blocks shall be rated 600 volts, 115 amperes per pole.
- 13.12 Fuse holders: Each AC and DC circuit shall be routed through thermoplastic or phenolic barrier-type fuse holders or equivalent ac circuit breakers. All circuits are to be clearly labeled at the fuse holder with name and amp rating. Nameplates shall be engraved plastic, phenolic type (tape, paper, composition, etc. type will not be accepted). Fuse holders shall be equivalent to Marathon RF30 series fuse blocks. Fuse holders shall be 1-, 2- or 3-pole as appropriate for the designated input voltage. AC service neutrals shall not be fused. Manufacturer shall supply 2-pole ganged knife switch (copper or stainless steel) on the source side of all fuse holders. In addition to fuses, slugs shall be provided for all fuse holders in tripping circuit.
- 13.13 Fuses: Fuses shall be one-time non-renewable, class H or K with Melamine impregnated glass cloth tube and silver link. Control circuits shall be fused separately from motor circuits. Alarm auxiliary circuits shall be fused separately from annunciator.
- 13.14 For easy removal by customer, terminal blocks are to be secured to a permanently mounted bracket with tapped holes or to a welded nut with which block mounting screws are threaded.
- 13.15 One 4-pole, 100 ampere, terminal block suitable for use with full-ring tongue lugs shall be furnished for each set of purchaser's auxiliary power leads.
- 13.16 One terminal block shall be furnished for purchaser's single-phase auxiliary power leads.
- 13.17 One terminal block shall be furnished for each set of purchaser's close and trip DC power leads.
- 13.18 A minimum of 15 percent spare terminal points (but not less than 12 points) shall be furnished in the control cabinet and mechanism housing. These terminal points shall be furnished with all screws and locking devices.

- 13.19 All circuit connections shall be wired point-to-point between devices with continuous conductor. Splices and taps in wiring are unacceptable techniques.
- 13.20 All wire terminations shall bear a “from / to” label collar on the wire insulation immediately behind the terminal lug to identify the terminal point at the opposite end of the wire. For example, a wire terminated between points TB4-2 and AB-9 shall have "AB-9" identified at the lug terminating at TB4-2 to identify the origin of the wire. The end of the wire terminating at AB-9 would bear the designation "TB4-2" for similar identification. All labels shall be heat-shrink type manufactured by Kroy or approved equal.
- 13.21 All power wiring shall not be less than 12 AWG stranded tinned copper wire. The primary insulation jacket of all wiring shall be 600-volt, 90°C or higher temperature, flame retardant, and moisture-, heat-, and oil-resistant. Seven-strand wire is not acceptable.
- 13.22 Control wiring shall be 45- or 65-strand conductor and not smaller in size than 12 AWG tinned copper wire, with the exception that wiring to alarm auxiliary relays and indicating lights may be smaller in size.
- 13.23 All current transformer leads shall be 105-strand flexible stranded conductor in size 10 AWG tinned copper or larger.
- 13.23.1 All current transformer leads shall be wired to terminal blocks in the control cabinet.
- 13.23.2 Each CT shall have its own terminal block.
- 13.23.3 When junction boxes are required in wiring between current transformer and control cabinet, terminal blocks shall be used for wiring connections.
- 13.24 All taps from multi-ratio current transformers shall be brought to shorting blocks in the operating mechanism housing.
- 13.24.1 The current transformer terminal connections are to retain a logical physical orientation.
- 13.24.2 Individual sets of current transformer terminations shall not be mixed with other sets of terminations. (i.e. 1X-3X-5X and 2X-4X-6X C.T.'s grouped together).
- 13.25 Wire shall be type SIS or approved equivalent.
- 13.26 All screws are to be non-metric blade types.

- 13.27 Wiring connections between fixed and hinged sections shall be minimum 65-strand wire.
- 13.28 All terminal connections for conductor sizes 10 AWG in size and smaller shall be made with non-insulated, full ring tongue, crimp type lugs with inspection holes. Wires shall be visible in inspection hole. Spade-type terminals, slip-on connectors, or wire nuts are not acceptable. Lugs shall be manufactured by Burndy or pre-approved equal.
- 13.29 All terminal connections for conductors sizes 2 AWG through 9 AWG shall be made with non-insulated lugs manufactured by Burndy or pre-approved equivalent.
- 13.30 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 pre-approved equivalent.
- 13.31 Grommets shall be provided for all openings in metal barriers used for wiring.
- 13.32 Non-insulated exposed conductor or terminal lug shall not extend beyond the sides of the terminal block or its insulating barriers.
- 13.33 In any location where accidental short circuiting of certain wires can result in malfunction of equipment such as closing or tripping of the circuit breaker, these wires shall not be terminated on adjacent terminal block points.
- 13.34 All alarm contacts for external usage shall be wired to designated alarm terminal blocks.
- 13.35 All manufacturer's connections to the interconnecting terminal blocks shall be made to one side only, leaving space on the other side for the purchaser's connections.

## 14.0 GROUNDING CONNECTIONS

- 14.1 Two (2) brazed and tapped ½"-13 UNC two-hole or four-hole ½" thick solid copper or 304 grade non-magnetic stainless steel (with grade identification stamp) grounding pads shall be provided for each breaker. These pads are to be located on diagonally opposite corners of the structural frame of the high voltage compartment to provide a convenient connection of ground lead with routing along breaker leg. Any joints in the frame should be bridged by a copper conductor or bus equal to 2/0 AWG minimum. Support legs shall have 9/16" holes on 18" centers for clamps used for ground wire routing. All breaker tanks shall be similarly bonded to the breaker frame

- 14.2 Enclosures for breaker controls shall be furnished with an external screw compression type connector suitable for attachment of bonding conductors ranging from 10 AWG solid to 2 AWG solid copper. The compression connector shall be factory connected to the ground bus located within the electrical control enclosure.
- 14.3 Enclosures shall have factory-installed bonding jumpers installed between the cabinet and the mounting frame. Minimum acceptable size is 2AWG, 19-strand (min.).

## **15.0 NAMEPLATES**

- 15.1 The breaker shall include weatherproof stainless steel nameplates with etched black-filled engraving to identify all applicable characteristics of the breaker ratings, design parameters, operational characteristics and auxiliary equipment. Nameplates shall be securely affixed to the exterior surface of the breaker cabinetry or located on the interior of enclosure doors.
- 15.2 A nameplate shall be provided identifying all breaker ratings and operational characteristics as prescribed by ANSI C37.06.
- 15.3 A nameplate shall be provided identifying current transformer ANSI ratings, taps, connection charts and other relevant data as prescribed by ANSI C37.06.
- 15.4 All other relays, switches, contactors, starters and devices shall be identified by nameplates. All nameplates shall be black-faced laminated plastic with white core. Text shall be 3/16" for one or two lines with 1/8" text for three lines.
- 15.5 Instruction and warning labels shall be provided and strategically located to identify hazardous mechanical parts and electrical connections within the breaker in accordance with ANSI C37.06.

## **16.0 PIPING AND CONDUIT**

- 16.1 The manufacturer shall furnish all gas, air and electric pipe and conduit as necessary for a functional system.
- 16.2 Rigid conduit threads shall be zinc-treated for corrosion and sealed against moisture after installation.
- 16.3 All conduit and piping shall be suitable for climbing supports where exposed to possible use as such.
- 16.4 No EMT will be permitted.

## 17.0 AUXILIARY EQUIPMENT AND ACCESSORIES

- 17.1 Auxiliary relays shall be provided for alarming for loss of voltage on AC and DC circuits, for low mechanism working pressure, for low SF<sub>6</sub> pressure (where applicable), excessive compressor/pump run time, and for blocking the tripping or closing of the circuit breaker as applicable to breakers being supplied.
- 17.2 Auxiliary alarm relays for AC circuits should have adjustable time delay and be set to 90 seconds.
- 17.3 All alarm contacts shall be suitable for 125 volts DC (Owner supplied control voltage may be different), with separate wiring from each device to terminal blocks in control cabinet for customer's external usage. An alarm contact for each function shall be available for usage in the circuit breaker annunciator circuit.
- 17.3.1 Normally-Closed alarm relay contacts should be used where appropriate to provide fail-safe alarm operation.
- 17.4 Auxiliary relays, furnished under 17.1 and 17.2 that perform either a trip or close, start or stop function, shall not be mounted on a hinged panel door.
- 17.5 Two normally-open contacts from the breaker closing relay (52X) and one normally-closed contact of the anti-pump relay (52Y) shall be wired to terminal block points for use by the customer, employing two wires per contact.
- 17.5.1 Contact interrupting rating for inductive circuit shall be 1.0 amperes at 125 volts DC (Owner supplied control voltage may be different).
- 17.5.2 The normally open 52X contacts shall remain closed for a minimum of 10 cycles during a close operation.
- 17.5.3 The 52X closing relay must be furnished. No exceptions are allowed.
- 17.5.4 The 52Y relay coil shall be continuously rated at the mechanism control voltage.
- 17.6 All relays shall have dust covers.
- 17.7 Pressure operated switches and gauges shall have isolating valves to facilitate calibration.
- 17.8 Unless otherwise approved, all circuit breakers shall be equipped with rupture disks. Rupture disks shall have protective covers.
- 17.9 All alarm and status contacts shall be routed via terminal blocks into the input points of an SEL-2505 Remote I/O module to be furnished with and installed in

the breaker control cabinet. The purpose of the SEL-2505 is to collect and report alarm status via optic fiber to the customer's SCADA system in the substation. The SEL-2505 shall be configured for 48 vdc power supply and input contact wetting with capacity for up to eight (8) digital inputs and eight (8) digital outputs. Communications ports shall be configured for one pair of Type ST multimode optic fiber connectors. The Remote I/O module shall conform to SEL part number 2505362XX.

17.9.1 At a minimum, inputs to the SEL-2505 shall include:

- Loss of AC service alarm (heater and motor circuits separately)
- Loss of DC service alarms (Close, trip1, and trip 2 ckts separately)
- Low mechanism working pressure (if applicable)
- Low SF<sub>6</sub> gas interrupter pressure (if applicable)
- Low pressure lockout alarm (if applicable)
- 52a contact status
- 52b contact status
- Remote/local control switch status

17.10 Each alarm listed in 17.9.1 shall be derived from a device (relay) that has two sets of Form C contacts. One set of contacts shall be wired to the SEL-2505 I/O device as listed above; the other set of contacts shall be wired to terminal points that are available to the Customer for hard wiring to annunciators or similar devices.

## 18.0 TEST & TEST DATA

- 18.1 The circuit breaker shall be completely assembled, wired and tested as a three-phase device.
- 18.2 Design tests shall be conducted on the breaker unless design tests have been conducted on a duplicate circuit breaker of previous manufacture.
- 18.3 Production tests shall be performed on each circuit breaker and associated bushing current transformers, bushings and relays as required by ANSI/IEEE C37.09-latest revision and a production test report furnished to purchaser. The production test report shall be certified to be correct and to be for the circuit breaker identified.
- 18.3.1 The circuit breaker shall be identified by serial number.
- 18.3.2 Actual bushings to be shipped with breaker shall be used for testing.
- 18.4 Operational checks and tests shall be performed on the circuit breaker as detailed below. Results of each test shall be fully documented in the final report provided with breaker.

- 18.4.1 All closing, tripping and relay coils shall be checked by resistance measurement. Show function, part #, operating volts, specified resistance and measured resistance.
  - 18.4.2 Current transformers shall be ratio tested. Two points on the excitation curve shall be checked to ensure the unit meets its relaying classification.
  - 18.4.3 Mechanical operation and timing tests per C37.09.
  - 18.4.4 Manual trip and lockout operation.
  - 18.4.5 Anti-pump operation.
  - 18.4.6 Circuit breaker pole contact resistance per C37.09.
  - 18.4.7 Low-frequency withstand voltage tests on major insulation components per C37.09.
  - 18.4.8 Control wiring continuity, hipot, and insulation resistance checks.
  - 18.4.9 Tank gas/air leakage test.
- 18.5 If the circuit breaker or any of its auxiliaries or accessories fails to pass the tests specified, additional tests shall be made to locate the failure. After rework or repair of the failure, the specified tests shall be repeated to insure that the repaired circuit breaker, auxiliary or accessories will meet the specification in all respects. Rework or repair and retesting shall be done at seller's expense.
- 18.6 Seller shall keep a permanent record of all failures detected during tests, of rework or repair required, and of test data taken after rework or repairs have been completed.
- 18.7 Rework or repairs shall be made in accordance with an approved procedure signed by that party responsible to give in-process disposition of such rework or repairs.
- 18.8 TEST DATA
- 18.8.1 Set of test data sheets containing the equipment information on the tests required shall be transmitted no later than the shipping date. A copy of a complete set of applicable test data is to be shipped inside the pocket of the control cabinet. Test data is to be identified with the serial number and owner purchase order number.
  - 18.8.2 Manufacturer shall ship with breaker nine copies of documentation defining measurements (with allowable limits) to be performed during field installation of the breaker, as well as list of actual factory measurements checked during installation. Specifically, manufacture shall furnish:
    - 18.8.2.1 Power factor of bushing, when applicable, as individual units and as installed in equipment.

- 18.8.2.2 Typical excitation, ratio correction factor and phase angle curves for current transformers.
- 18.8.3 Contact resistance readings and maximum allowable resistance for proper operation.
- 18.8.4 Breaker timing and travel curves. These curves/data shall be provided in test data electronic format. Specify the type of test equipment used.
- 18.8.5 All final test data shall be furnished in electronic format and hard copy.

## **19.0 DOCUMENTATION**

### **19.1 ENGINEER'S DRAWINGS**

The Engineer may provide drawings to the Seller to assist the Seller with development of the concept design of the product, and to assist the Seller with formulating a proposal for manufacture and delivery of the product. The Engineer's drawings and intellectual content represented thereupon remain the property of the Engineer. The Seller shall not use the Engineer's drawings for any project outside the scope defined by these Technical Specifications without the written consent of the Engineer.

### **19.2 BID DOCUMENTATION**

The following breaker application data shall be provided by the bidder at the time proposals for the circuit breaker(s) are submitted. Proposals failing to provide this information may be considered unresponsive.

- 19.2.1 An outline drawing of proposed circuit breaker identifying all salient dimensions related to installation clearances. This data shall include:
  - 19.2.1.1 Elevation of the structural mounting base depicting height and arrangement of mounting base and centerline spacing between frame legs of mounting base.
  - 19.2.1.2 Dimensions for mounting frame anchor bolt spacing.
  - 19.2.1.3 Centerline separation between each bushing (phase-to-phase) and spacing between line and load side bushings.
  - 19.2.1.4 Elevations of line and load side primary circuit terminal pads and spacing between all terminal pads.
  - 19.2.1.5 Elevation from mounting pad surface elevation to lowest live part or part considered above zero (ground) potential.

- 19.2.1.6 Cross-sectional dimensions of overall assembly, including interrupters, mounting base, mechanism housings, control cabinetry and cabinet door swing-outs.
- 19.2.1.7 Elevations for cabinet heights and centerlines for location of control cabinet and mechanism housings.
- 19.2.2 Maximum continuous loading limits for primary circuit terminal pads, expressed in pounds, for all three axes of conductor attachment.
- 19.2.3 Peak momentary loading limits for primary circuit terminal pads, expressed in pounds, for all three axes of conductor attachment.
- 19.2.4 Foundation loadings, including:
  - 19.2.4.1 Bending moment, M, expressed in foot-pounds, occurring about the vertical axis of the frame column base;
  - 19.2.4.2 Shear load, S, expressed in pounds, occurring through the horizontal axis of the frame column base; and
  - 19.2.4.3 Static and dynamic components of thrust load and total thrust load, each expressed in pounds, occurring through the vertical axis of the frame column base.
- 19.2.5 Dimensions of the recommended anchor bolts to be used with the circuit breaker, including bolt diameter, shank length, hook length and threaded depth.
- 19.2.6 Data in accordance with forms provided within Appendix A of these Specifications, including:
  - Breaker Data Sheet No. 1: General Ratings and Characteristics
  - Breaker Data Sheet No. 2: Characteristics for Motor-Charged Spring Operator

The bidder may use the forms provided therein or substitute a different format so long as all prescribed data is supplied at time of bid opening.

### 19.3 SUBMITTAL OF APPROVAL DOCUMENTS

- 19.3.1 Before proceeding with parts orders and system assembly, the Seller shall submit, for approval, sufficient drawings to demonstrate that all parts conform to the requirements and intent of these Specifications. The drawings shall include three copies each of schematics, wiring diagrams and physical diagrams illustrating equipment arrangement.

Submittal shall also include a bill of materials outlining all major components of the system configuration.

- 19.3.2 The Engineer will review all documentation submitted by the Seller and return one set of drawings with commentary related to the manufacture of the relay panel. The Engineer will classify each drawing as either “APPROVED,” “APPROVED AS REVISED” or “REJECTED, REVISE AND RESUBMIT” based upon his review. The Engineer will perform the review in a prompt and timely manner, and within two weeks following receipt of the approval drawings.
- 19.3.3 The Seller shall proceed with manufacture of the product in accordance with the review and commentary supplied by the Engineer. The Engineer’s review and commentary shall not relieve the Seller from responsibility to comply with all aspects of the Technical Specifications.
- 19.3.4 The Seller shall accept full responsibility for all materials ordered and all services performed prior to the approval of the Engineer. Such products and services may be subject to rejection by the Engineer or the Owner.
- 19.3.5 Seller shall provide drawings and data as follows:
  - 19.3.5.1 Outline drawing showing overall dimensions and weight of the breaker including location and size of the control cabinet, compressor, bushings, operating mechanism, current transformer, conduit connections, and permissible loads which may be applied to bushing terminal connections, etc.
  - 19.3.5.2 Foundation information with:
    - 19.3.5.2.1 Anchor bolt locations
    - 19.3.5.2.2 All forces on the foundation under normal operating conditions.
    - 19.3.5.2.3 Equipment centerline of gravity
    - 19.3.5.2.4 Equipment mounting bolt holes for anchor bolts (Holes to be minimum 0.25" diameter larger than bolt diameter.)
  - 19.3.5.3 Schematic and detail wiring diagrams of control and current transformer circuits with table of current transformer ratio connections. Schematic for the breaker opening and closing circuits shall be shown for all three phases, complete with interlocking circuits. Wiring diagrams shall be point-to-point drawings. “From” / “To” tables or charts are not acceptable.
    - 19.3.5.3.1 Schematic drawings shall include a legend which shows the manufacturer, type, model, coil

voltage and current data, contact rating data of trip coils, close coil, auxiliary relays and control devices employed in the breaker control and indication schemes. In addition, the following information shall be shown:

- a. Continuous voltage rating on relay coils (utilization voltage on other breaker coils), resistance, manufacturer's parts number for all circuit breaker coils (52X, 52Y, CC, TC, etc.).
- b. Current requirements for trip operation, close operating motor inrush and steady state currents.
- c. Fuse types and ampere ratings.
- d. Interconnections between terminal blocks on different drawings, interconnecting wires, and connections shall be referenced and identified as illustrated in the example below:

Terminal Block Mounted  
On Mech. Panel  
See DWG. # \_\_\_\_\_

Terminal Block Mounted  
On Relay Panel  
See DWG. # \_\_\_\_\_

- 19.3.5.4 Current transformer standard application data in accordance with ANSI Standard C57.13, including excitation current and core loss curves and thermal factor. Also to be included is the resistance of the secondary windings and leads on the excitation current curve drawing.
- 19.3.5.5 Control panel outline and gas pressure manifold valve assembly.
- 19.3.5.6 Bushing outline and details.
- 19.3.5.7 Nameplate drawings. Information to be included on these nameplates includes, but is not limited to the following:
  - a. Manufacturer

- b. Manufacturer type (**complete** type/description required)
- c. Date of manufacture (Month and Year)
- d. Mechanism type
- e. Rated maximum operating voltage
- f. Rated continuous current (and any overload applicable)
- g. Rated short circuit current (in kA)
- h. Frequency
- i. Motor rating (voltage, current)
- j. Tripping control voltage range
- k. Closing control voltage range
- l. Trip current
- m. Close current
- n. K factor
- o. Interrupting time
- p. Pounds of gas per pole (if applicable)
- q. Weight, complete
- r. Reference to Instruction Book
- s. C.T. primary current rating
- t. C.T. quantity and location
- u. C.T. accuracy class
- v. C.T. thermal rating factors
- w. SF<sub>6</sub> operating pressure (if applicable): Normal, Minimum pressure to interrupt full rated load and fault currents, PSI.

19.3.5.8 SF<sub>6</sub> equipment schematic diagrams to clearly indicate gas flow, pressures, valves, controls and other pertinent data on the breaker gas system shall be provided; also, a graphic representation of the alarm set and reset points for the SF<sub>6</sub> gas system (if applicable).

19.3.5.9 Breaker timing charts for each circuit breaker.

19.3.5.10 Breaker interrupting current vs. operations curve. The number of operations shall be provided for rated fault interrupting duty and rated load current operations.

19.3.5.11 Maintenance and lubricating schedule for interrupters, control devices, accessories, and operating mechanism.

19.3.6 All drawings, data, instruction books, etc. required to be furnished by the manufacturer shall be in English and all dimensions and measurements shall be given in the English system. If the SI (International System) is used, the equivalent English unit is to accompany the SI unit.

## 19.4 FINAL DOCUMENTATION

The Seller shall provide final documentation as follows:

- 19.4.1 Five (5) print copies of the bill of materials.
- 19.4.2 Five (5) copies of all technical manuals regarding components provided by the Seller. All manufacturer literature addressing function, programming, application, operation and maintenance for any such device shall be provided. Manual content shall be descriptively oriented to instruct user personnel in all facets of equipment functionality and features.
- 19.4.3 A listing of addresses, phone numbers and contact personnel for the return authorization of any system component for inspection or repair by the manufacturer's approved repair facility, regardless of whether component failure is covered or excluded by the warranty period.
- 19.4.4 The Seller shall provide an equipment installation and maintenance training DVD for the circuit breaker.
- 19.4.5 The Seller shall grant Owner the right to use or furnish to other Sellers for subsequent work the drawings made by Seller including design drawings, shop drawing details, erection drawings and bills of material, for the purposes of project integration, maintenance and similar activities that do not infringe on product design rights of the manufacturer.
- 19.4.6 Final drawings are to be provided as quickly as possible, but no later than thirty (30) days prior to shipment.
- 19.4.7 Unless otherwise specified on the purchase order, the vendor shall furnish six (6) sets of final drawings. These drawings shall be full size or reduced to no smaller than "C" size. These drawings shall be included in the instruction books as complete folded sets of final drawings. In addition, one set of drawings shall be shipped with the circuit breaker in the control cabinet.
- 19.4.8 One Compact Disk (CD) (or DVD) of the entire instruction book shall be made containing:
  - 19.3.8.10.1 Complete set of drawings in the AutoCAD format.
  - 19.3.8.10.2 Text in a format that can be viewed using Adobe Acrobat.
  - 19.3.8.10.3 Copy of the complete test report.
- 19.4.9 One set of certified test reports is required for each circuit breaker.
- 19.4.10 Recommended renewal and spare parts list.

19.4.11 Complete list of parts with item and part number.

## 20.0 WARRANTY

- 20.1 The Seller's obligation to provide materials and perform services in accordance with the Technical Specifications is absolute, and the Seller warrants and guarantees to the Owner that all materials and services will be free from defects for a period of 5 years from the date of delivery.
- 20.2 The Owner shall be entitled to the benefits of all warranties provided on all materials and services supplied by the Seller regardless of manufacturer or origin.
- 20.2.1 All hardware and software supplied as components of the system configuration shall be warranted by the Seller for a minimum of five years, commencing from the date of on-site acceptance by the Owner.
- 20.2.2 Any maintenance services normally provided by a component supplier under subcontract to the Seller within the warranty period shall be made available directly to the Owner by the Seller as if such maintenance services were directly titled to the Owner.
- 20.3 Materials supplied by the Seller but not manufactured by the Seller shall be guaranteed against defects in accordance with these warranty requirements, except where the warranty provided by the manufacturer of origin exceeds the specified requirements, then the longer term of warranty shall apply.
- 20.4 If there are apparent defects in the materials supplied by the Seller the Seller shall, without cost to the Owner, correct the defect or replace the materials with appropriate materials. The cost to the manufacturer shall include any in/out transportation costs, the cost of disassembly and reassembly, of the breaker, removal of adjacent structures, extra rigging and any other materials, equipment and labor necessary to keep customers in service.
- 20.5 If the Seller fails to promptly correct defects to the satisfaction of the Owner, the Owner may elect to replace or correct defective materials and remedy all expenses of replacement and correction with the cost of same to be borne by the manufacturer. The costs will include any costs associated with keeping customers in service such as mobile installation, line switching, maintenance support, etc.
- 20.6 If, at any time, the Owner or the Engineer notifies the Seller in writing that any services provided by the Seller fail to meet performance standards set forth by the Technical Specifications and prudent judgment, the Seller shall promptly provide service of quality acceptable to the Owner and the Engineer.
- 20.7 If the Seller fails to promptly remedy faulty performance to acceptable standards, the Owner may elect to obtain acceptable services elsewhere at the expense of the Seller.

## 21.0 SHIPMENT

- 21.1 Circuit breaker may be disassembled only as necessary for shipment; otherwise it shall be shipped as complete as possible to expedite assembly and maintain integrity of the insulation and interrupting media. The circuit breaker and all accessories including current transformers shall be shipped in a condition suitable to withstand shipment followed by outdoor storage of up to twelve (12) months without losing the electrical and mechanical integrity demonstrated by factory tests. All shipping, pins, bolts devices that require removal prior to operating the mechanism shall be painted red or yellow and shall be tagged indicating required removal.
- 21.2 Parts shall be securely packaged with each package and each item clearly identified with the customer's purchase order number, breaker identification, and the function of the part. All parts shall be shipped at the same time as the circuit breaker in order to minimize storage and prevent losses. Any package requiring special handling or indoor storage shall be suitably packaged and clearly labeled in this respect.
- 21.3 The Seller shall furnish and ship with the circuit breaker receipt, handling and storage instructions that must be followed to protect warranties and/or guarantees.
- 21.4 All system components shall be delivered F.O.B. to designated job site at the Seller's cost and risk of delivery.
- 21.5 Vehicular transport of system components shall be via open top truck for ease of handling and unloading at the project site.
- 21.6 The Seller shall provide the Owner with 30 days tentative notice of the anticipated shipping date and shall provide the Owner with 48 hours notification prior to anticipated delivery time.
- 21.7 Unless directed otherwise by the Owner, the components shall be shipped to:

**Town of Smithfield  
230 Hospital Road  
Smithfield, NC 27577**

- 21.8 Unless directed otherwise by the Owner, all correspondence regarding production schedule, shipping and delivery should be directed to:

**Ted Credle, P.E.  
Director of Public Utilities  
Town of Smithfield**

**230 Hospital Road  
Smithfield, NC 27577  
919-934-2116 x-1162  
ted.credle@smithfield-nc.com**

**with copy to Electrical Consulting Engineers  
Attention: Tony Pearce (tpearce@ecepower.com)  
(919) 632-7426**

- 21.9 The Owner reserves the right to alter the designated delivery site and to accelerate or postpone delivery dates by written notice. If the Seller can show documented proof of additional costs incurred for such changes, the Seller may make claim for adjustments in Contract price for the changes in delivery.
- 21.10 Ownership of the products furnished under the Contract Work shall transfer to the Owner once the products have been delivered to the designated delivery site, contingent upon the Owner's acceptance of the products. The Owner reserves the right to reject any component found not in compliance with the Technical Specifications or the terms and conditions of the Contract and decline receipt of delivery.
- 21.11 No component shall be shipped prior to being subjected to quality acceptance tests at the Seller's manufacturing facilities. The Owner shall be given a minimum of two week notice of the factory test schedule.

## **22.0 INSTALLATION AND START UP SUPPORT (quoted as an option)**

The ability of the Seller to provide responsive field service to the Owner is considered an essential element of the system value. Bidders must offer a formal program of field support to the Owner encompassing installation, instruction, and maintenance services. Installation and start-up support shall include the availability of the following services. The manufacturer or his authorized field service agent shall furnish all tools and test equipment.

Service Shall Include:

- 22.1 Performing any and all SF<sub>6</sub> gas or air filling procedures on interrupters as may be required in field assembly.
- 22.2 Supervising and testing the assembly of any pneumatic, hydraulic, or similar energy storage systems for proper performance and against leaks (if applicable).
- 22.3 Performing all field measurements and adjustments in accordance with manufacturer's specifications to assure synchronized 3-pole interrupter travel within specified operating time.

- 22.4 Performing a measurement of contact resistance on each interrupter pole, using an externally powered low-resistance micro-ohmmeter designed for contact measurements.
- 22.5 Performing a measurement of coil impedance and continuity on all closing and tripping coils.
- 22.6 Performing turns ratio tests and polarity tests on the bushing current transformers provided with the circuit breaker.
- 22.7 Contingent upon application of the Owner's control voltage, inspect and test all trip, close, and auxiliary electrical control circuits for proper functionality. The Owner's permissive and preventive field interfaces to remote relay and control systems may be bypassed during this test.
- 22.8 Checking that bonds to ground have been properly attached to key connection points on circuit breaker frame, housing, and control enclosures.
- 22.9 Provide instruction to Owner staff with respect to breaker operation and required routine maintenance procedures.

## **23.0 MAINTENANCE SUPPORT**

- 23.1 The Seller shall provide on-going maintenance support for the field service and repair of the circuit breaker provided. The Seller must be capable of providing on-site assembly and repair services for all circuit breaker components that are either repairable or replaceable in the field.
- 23.2 If field maintenance is provided by the Seller through subcontracted services, the subcontractor must possess a complete "systems" knowledge of the complete breaker assembly. This level of service shall be required so as to provide authoritative diagnostics and repairs to install and restore breaker functionality while on site unless the extent of damage warrants in-factory repairs.
- 23.3 Each Bidder shall provide, in the Proposal, the address of the field support representative located nearest to the Owner. The Bidder must also state the amount of advance notice (response time) required from the Owner to have a field service engineer or technician on site.

## 24.0 INSTALLATION, MAINTENANCE TOOLS AND DEVICES

Any special tools or devices required for installation and/or maintenance shall be assumed to be in the base price unless listed as separate adders and shall include but not be limited to:

- 24.1 Special-purpose wrenches, alignment brackets, lifting devices
- 24.2 Tools for manually opening and closing the breaker during testing.
- 24.3 Equipment for gas filling as may be required for routine addition of SF<sub>6</sub>.
- 24.4 Equipment installation and maintenance training video.

**TOWN OF SMITHFIELD  
SMITHFIELD, NORTH CAROLINA**

**Appendix A**

**BREAKER DATA SHEETS**

**TO BE COMPLETED AND SUBMITTED BY BIDDER WITH PROPOSAL**

**BREAKER DATA SHEET NO. 1**  
**GENERAL RATINGS & CHARACTERISTICS**  
**(Data to be provided by Bidder with submittal of bid)**

Breaker Manufacturer:	
Manufacturer's Address:	
Breaker Model No.:	
Rated Maximum Voltage, kV RMS:	
Rated Voltage Range Factor, K:	
Rated Low Frequency Withstand, kV RMS:	
Rated Full-Wave Impulse, kV crest:	
Maximum Out-of-Phase Voltage Withstand:	
Continuous Current Rating, Amperes:	
Close & Latch Rating, kA:	
Short-time Rating, Amperes:	
Rated Short Circuit Current, kA:	
Maximum Symmetrical Interrupting, kA:	
Maximum Asymmetrical Interrupting, kA:	
Rated Opening Time, Cycles:	
Rated Closing Time, Cycles:	
Minimum Reclosing Time Allowable:	
SF <sub>6</sub> Nominal Gas Pressure (psi):	
SF <sub>6</sub> Pressure Operating Range (psi):	
Minimum Allowable Pressure for Rated Interrupting Amperes (psi):	
Field-fill gas volume per chamber (pounds):	

**BREAKER DATA SHEET NO. 2  
CHARACTERISTICS FOR  
MOTOR-CHARGED SPRING OPERATORS  
(Data to be provided by Bidder with submittal of bid)**

<b>Charged Spring System:</b>	
Number of Close - Open Operations provided by system at full charge and no service voltage to charging motor:	
Nominal spring recharge time, seconds:	
Maximum time required (sec.) to charge spring for complete one operation cycle (OCO):	
Charging motor supply voltage (vdc):	
Charging motor max. run amperes:	
Charging motor max. starting amperes:	
<b>Mechanism:</b>	
Shunt Trip Coil Operating Range, vdc:	
Max. Shunt Trip Coil Current, amperes:	
Shunt Trip Coil Impedance, ohms:	
Closing Coil Operating Range, vdc:	
Max. Closing Coil Current, amperes:	
Closing Coil Impedance, ohms:	
Auxiliary Heater watts:	
Auxiliary Heater volts:	
120 V AC Demand*	
240 V AC Demand*	
48 V DC Demand*	

\* These should be trip demand, close demand and maximum demand not total connected load. Values should be shown on schematic diagrams.

\* **Furnish all information required in Section 19.2 of the Technical Specifications.**

**Town of Smithfield  
Smithfield, North Carolina**

**115 kV Outdoor Circuit Breaker**

**BID SCHEDULE**

<u>DESCRIPTION</u>	<u>QTY</u>	<u>PRICE (EACH)</u>	<u>EXTENDED PRICE</u>
<b>Outdoor 115 kV Circuit Breaker; Motor-Charged Spring Operator Mechanism;</b> Complete with all components in accordance with the Technical Specifications; Delivered F.O.B. to the project site or Owner's warehouse.	2	\$ _____	\$ _____
Adder: Installation and Startup Services per specifications. Assume separate trips for each breaker.	2	\$ _____	\$ _____
Adder: Installation and Startup Services per specifications. Assume single trip for both breakers.	Lot	N/A	\$ _____
Adder/Deduct for composite bushings. Unit price for 6 bushings.	2 sets	\$ _____	\$ _____

**DELIVERY SCHEDULE**  
**(Consecutive Calendar Days ARO)**

Submittal of Shop/Approval Drawings \_\_\_\_\_

Shipment of Equipment \_\_\_\_\_

Bidder shall attach a recommended spare parts list with price quotes. Also attach completed Appendix A and information required in Section 19.2 of the Technical Specifications.

Manufacturing location: \_\_\_\_\_

