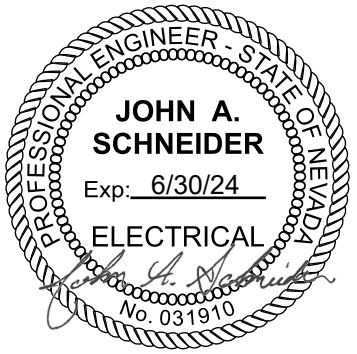
Digitally signed by
Schneider, John A.
Date: 2024.01.11
15:24:42-06'00'



SECTION 33 75 19

230 KV POWER CIRCUIT BREAKER

PART 1 - GENERAL

1.1 DEFINITION OF TERMS

A. "Bidder", "Seller", or "Contractor" shall be considered synonymous terms and shall mean the person, firm or corporation with whom Owner may enter into contract for execution of work specified.

B. "Owner" shall mean:

Southern Nevada Water Authority
100 City Parkway, Suite 700
Las Vegas, NV 89106
(702) 862-3786

Colorado River Commission of Nevada
Attn: Bob Reese
555 E Washington Avenue
Las Vegas, NV 89101
(702) 486-2670
breese@crc.nv.gov

C. "Engineer" shall mean:

HDR Engineering, Inc.
Attn: John Schneider
Project Manager
3231 Greensboro Drive, Suite 200
Bismarck, ND 58503
Phone: (701) 557-9711
john.schneider@hdrinc.com

D. "Work" shall mean work to be done in the course of construction and furnishing materials and equipment under the Equipment Contract, unless some other meaning is indicated by the context.

1.2 COMPONENTS OF SPECIFICATIONS

A. Detailed Specifications
1. Part 1 - General
2. Part 2 - Products

B. Numbered addenda if appended to the foregoing.

1.3 INTENT OF SPECIFICATIONS

A. To set forth requirements of performance, type of equipment desired, standards of materials and construction, tests to be made, and guarantees to be met.

B. To require Seller to furnish all materials and equipment and perform all work and services described in the contract documents, unless otherwise specifically indicated.

C. To require Seller to provide complete and operable equipment in spite of omission of specific reference to any minor component part.

D. To require Seller to provide new materials and equipment.

1.4 INTERPRETATION OF SPECIFICATIONS

A. Report any errors or omissions in specifications to the Engineer as soon as detected. The Engineer will answer questions and interpret intended meaning of specification. His interpretation shall be accepted as final.

1.5 METHOD OF BIDDING

A. Equivalent products:
   1. Whenever specifications or plans call for item of material or equipment by manufacturer's name and type, "or equal", it is intended that products of equal quality and performance by other manufacturers may be substituted, subject to the approval of the Engineer.
   2. Furnish drawings or other data as required to indicate all modifications resulting from use of such substitute items. Furnish general arrangement drawings, full descriptive data, and other information required to demonstrate to Engineer that material or equipment proposed is, in fact, equal to that specified. Burden of proof of equality shall in all cases remain with Seller. Final approval of the substitution shall be made by the Engineer.
   3. Abide by Engineer's decisions when proposed substitutions of material or equipment are deemed to be unacceptable.
   4. Owner may consider such factors as over-all project arrangement, over-all project cost, and similar factors in determining acceptability of proposed substitutions.
   5. Approval of substitutions shall not relieve Seller of responsibility for providing workmanship, material, and equipment equal to that specified.

B. Form of bid price submittal:
   1. Unit price for all items to be furnished and delivered under this contract.
   2. Bid price shall cover complete work described in specifications, including costs incidental thereto, unless specifically indicated otherwise.
   3. List separately the price of services of Service Technician, as defined in the Summary of Proposal.

1.6 DATA TO ACCOMPANY BIDS

A. A complete Equipment Contract and Summary of Proposal, as bound in the front of this specification, shall be properly completed and submitted to the Engineer, along with all other material listed below. All items submitted shall be sent to the Engineer no later than the time and date specified.
   1. Any exceptions taken by the Seller to the Specifications, Equipment Contract and/or Summary of Proposal at time of bid shall be clearly and simply stated or summarized, formatted, in a specially prepared letter of transmittal attached to and made a part of the Summary of Proposal.

Note: Manufacturer's "standard conditions of sale" catalog pages are not acceptable for purposes of stating exceptions to the specifications.

2. Seller shall complete one copy of the "Summary of Proposal" for each alternative bid or proposal submitted. Additional copies may be prepared by photocopying the blank "Summary of Proposal" pages. Seller shall clearly identify each summary by alternate number.

B. Seller's proposal shall also contain, as a minimum, one copy of the following:
   1. Manufacturer's specifications, guarantees, and descriptive data on equipment proposed.
   2. Itemized list of special tools and spare parts which Seller proposes to furnish.
   3. Outline drawings showing general arrangement, approximate dimensions, space requirements and clearance, and approximate weights of proposed equipment.
   4. Standard and specified accessories and instruments to be furnished separately shall be listed in detail. List shall clearly define those items to be shipped separately. It is understood that all items not so listed shall be shipped, mounted and connected. Use Summary of Proposal for listing.
   5. Complete copy of the warranty the Seller will offer.

1.7 EQUIPMENT GUARANTEE

A. Without limiting any other provision of this specification regarding guarantees, guarantee the equipment as follows:
   1. Seller shall guarantee to the Owner that the complete power circuit breaker, together with all parts included in the original purchase, is free of defect in workmanship and materials and is capable of continuous and satisfactory performance when operated in accordance with the instructions provided by the Seller at the specified rating and capacity.
   2. Guarantee shall extend for a minimum of one year from the date of commercial operation. It shall cover all defects and malfunctions of the equipment and accessories. Guarantee shall cover all out-in freight by common carrier in full and the costs of removal from the site and reinstallation after repair. Seller shall not be liable for special, indirect or consequential damages, nor costs of moving structures or associated equipment.

1.8 DELIVERY AND SHIPMENT

A. Bid shall include delivery F.O.B. jobsite, freight prepaid, with final destination delivery date as specified by the Seller in the Summary of Proposal.

   Project Locction: Las Vegas, NV (36.308883°,-114.989844°)

B. The Seller shall notify the Engineer when equipment is ready for shipment. A minimum of seven (7) working days advance notice of delivery is required in order to arrange for offloading the delivery truck. Such notice shall include projected routing and estimated time in shipment. Seller shall not release power circuit breakers for shipment until release is authorized by the Engineer.
   1. All equipment in this contract with a common delivery destination shall be made in a common shipment. The Seller shall be responsible for all incidental costs incurred by the Owner due to separate shipments of such equipment.

2. Immediately after shipment, Seller shall notify the Engineer of transportation carrier and all transfers and references to permit follow-up on status of shipment and delivery.
3. The Seller shall investigate all limitations in regard to shipping the equipment F.O.B. destination, including seasonal or weather-related load restrictions. Power circuit breakers shall be shipped as completely assembled as transportation limits allow.
4. Equipment damaged in shipment will be refused on delivery and it will be the Seller's responsibility to arrange for prompt repair or replacement to the standards of new equipment. The Seller will not be relieved of the responsibility of delivering undamaged equipment even if the damage is internal or otherwise goes undetected and the nature of the damage remains unknown until the equipment is energized and tested.

C. Prior to shipment, all gauge and indicator glass shall be thoroughly cleaned and covered with non-adhesive shipping protectors.

D. Power circuit breakers shall be shipped as complete as practical. Gas interrupters shall be pre-charged prior to shipment, with any supplemental gas furnished as part of one single shipment.

E. Delivery shall not be made prior to earliest acceptable delivery specified in the Summary of Proposal. Should delivery be made prior to earliest acceptable delivery date, the Owner reserves the right to withhold initial payment without any additional cost until 30 days after the earliest acceptable delivery date. In addition, the supplier shall be responsible for all incidental costs incurred by the Owner due to early delivery.

1.9 DRAWINGS AND INSTRUCTIONAL MATERIAL

A. Shop Drawings for Approval
1. "Shop Drawings" refers to all the detailed installation drawings prepared by the Seller and/or his suppliers required to construct the material as defined in the specifications, and shall include all fabrication drawings, working drawings, design calculations, foundation loadings, material schedules, detailed layouts, and assembly information.
2. The Seller agrees that submittals and shop drawings processed by the Engineer are not change orders; that the purpose of submittals and shop drawings by the Seller is to demonstrate to the Engineer that the Seller understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install, and by detailing the fabrication and installation methods he intends to use. The Seller alone accepts all responsibility for assuring that all materials furnished under these specifications meet in full all requirements of the contract documents. The Engineer's review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Seller from compliance with the project plans and specifications, nor departures therefrom. The Seller remains responsible for details and accuracy for confirming and correlating all quantities and dimensions, for selecting fabrication processes and for techniques of assembly.
3. Submit the following shop drawings to the Engineer in the manner specified hereinafter. Make initial submittal of information requested on or before the date specified in the Summary of Proposal:

a. Certified outline assembly and installation drawings as appropriate for each item.
b. Certified arrangement drawing for anchor bolts.
c. Complete nameplate data for each item.
d. Schematic diagrams of all control and alarm circuits.
e. Complete connection diagram of items, including current transformers and linear couplers.
f. Bushing current transformer data, including excitation and ratio correction factor curves.
g. Such other similar information as the Engineer may request.

B. Engineer's Action
1. Engineer will review shop drawings and indicate action taken according to the following classifications:
a. No Exceptions Taken: Indicates that the shop drawing has been reviewed and appears to be in general agreement with the requirements. Seller may make further distribution of shop drawings and proceed with fabrication and/or installation of the work detailed on the drawing.
b. Make Corrections Noted: Design revisions, deletions, additions, and comments shown on these drawings shall be incorporated into the design before proceeding with fabrication or drawing distribution.
c. Amend and Resubmit: Indicates that the shop drawing, or part thereof, does not appear to be in general agreement with the requirements. Engineer's comments are noted on the shop drawing and/or separate letter. Seller shall recheck and make any necessary revisions and resubmit for Engineer's review.
d. Rejected: Indicates that the shop drawings do not conform to requirements. Reasons for rejection are noted on the shop drawing and/or separate letter.

C. Shop Drawing Submittal and Distribution
a. Initial Submittal (REVIEW): Submit one (1) electronic copy in PDF and AutoCAD 2007 format of each shop drawing to the Engineer; direct mailing to the Engineer’s email address given in Section 1.1, C. One (1) copy of the shop drawings indicating the Engineer’s action will be returned to the Seller with one (1) week from the date of receipt.
b. Resubmittal: If drawing is returned to the Seller with Engineer's comments and action noted "RESUBMIT", the drawing should be rechecked and revised as necessary and resubmitted in manner described in "1 - Initial Submittal".
c. Final Distribution (CERTIFIED): Within the time schedule listed in the Summary of Proposal, Seller shall submit to the Engineer, and one (1) electronic copy in PDF and AutoCAD format of all final drawings covered in Section 1.9, B above. AutoCAD drawings shall be emailed along with all related dependent files such as x-refs, font files, and plot styles, to the Engineer's email address given in Section 1.1, C.

D. Instruction Manuals, Test Reports, and Parts Lists
1. Seller shall furnish complete instruction manuals covering installation, operation and maintenance for all equipment. Manuals shall include the following items:

a. All shop drawings listed in Section 1.9, B. (Reduce as required to fit in manuals.)
b. Specific equipment instruction books.
c. Renewable parts lists for all replaceable parts and assemblies.
d. Test report for all shop tests required under Section 1.11.

2. Submit one (1) electronic PDF copy to Engineer for distribution and one (1) printed paper copy with power circuit breaker delivery (located inside control cabinet). Paper copy shall be bound in vinyl and properly labeled to indicate the facilities covered. Engineer's address is given in Section 1.1, C.

E. Shop Drawing and Instructional Material Transmittal Form
1. Seller may use his own form of transmittal letter for distribution of shop drawings, clearly marked "For Approval" or "Certified" as applicable.
2. Submit one (1) electronic PDF copy of transmittal form with each set of drawings or instructional materials.

F. Seller's Responsibility
1. Prior to submittal, check shop drawings for errors, correctness of details, and conformance with the specifications.
2. Notify Engineer of any inconsistencies or questions regarding approval revisions or comments on the drawings.
3. Review of shop drawings by Engineer does not relieve the Seller of responsibility for errors, correctness of details, or conformance with the specifications.
4. Fabrication and shipment of materials or equipment prior to Owner's release of drawings, data, and information mentioned hereinbefore, shall be at Seller's risk.

1.10 CODES AND STANDARDS

A. Perform work in accordance with best present-day installation and manufacturing practices.

B. Unless specifically noted to contrary, conform with and test in accordance with applicable sections of latest revisions of following codes and standards:
1. American National Standards Institute (ANSI).
2. National Electrical Manufacturer's Association (NEMA).
3. American Society for Testing Materials (ASTM).
4. International Electrotechnical Commission (IEC) Standards.
5. Institute of Electrical and Electronic Engineers (IEEE).
6. National Electrical Code (NEC)
7. National Electric Safety Code (NESC)

C. Conflicts between referenced codes and standards: Code or standard establishing more stringent requirements shall be followed.

1.11 SHOP TESTS

A. Perform standard tests on power circuit breakers in accordance with the latest version of applicable ANSI C37 standards and NEMA Publication SG-4.

B. Leak Rate Requirements: A quantitative leak rate test must be performed on the breaker with a criteria of 1% or less per year on entire breaker. Any expense to the company to maintain the leak rate of 1% for a period of 12 months must be

reimbursed in total by the breaker manufacturer. In addition to performance of actual leak rate test, manufacturer shall also furnish supporting data indicating in-service leak performance for equipment proposed.

The breaker tanks and associated castings shall be warranted against cracks and leaks due to defects in workmanship or materials that cause annual leak rates in excess of 1% for a period of five years and shall be replaced at the manufacturer's expense (labor and materials).

C. Provide Engineer with one (1) certified electronic PDF copy of all power circuit breaker test data, including oscillograms when performed.

1.12 INSTALLATION

A. The equipment will be received, unloaded at job site, assembled and connected by Others.

1.13 FIELD SERVICE TECHNICIAN

A. Field service is not required but rates shall be included in the Seller's proposal. Provide a competent Field Service Technician who shall:
   1. Advise on assembly of equipment.
   2. Perform visual inspection and check internal contact mechanism.
   3. Perform mechanical and electrical tests as required to insure integrity of service.
   4. Check connections to equipment and adjust control and indicating devices after equipment has been installed and connected.
   5. Fully instruct operating personnel in construction, assembly, operation, and maintenance of equipment.

B. Field Service Technician shall submit report to the Engineer, listing all test results and mechanical clearances. All required test equipment shall be furnished by Field Service Technician.

C. Service Technician shall make no less than one trip to the project jobsite(s) to perform work listed above.

D. If any of the Service Technician's time spent at project site, or if any of his trips to project site are required to make corrections to equipment supplied under this specification resulting from defective material or workmanship used in the manufacture of equipment, such time and trips will be at the Seller's expense.

1.14 FIELD TESTS

A. Owner will conduct tests and inspection as he deems necessary to determine that equipment functions properly after installation. Any special test equipment will be furnished by others.

B. If equipment fails to function properly because of defects, Seller will make necessary corrections and, upon completion thereof, demonstrate to Owner that these defects have been corrected.

1.15 DEFECTIVE EQUIPMENT

A. Should equipment fail to conform to specifications or to operate satisfactorily, Owner will have right to operate equipment until defects are corrected and guarantees met.

B. Owner will have right to operate rejected equipment until it is replaced without cost for depreciation, use, or wear.

C. Equipment may be removed from operation for examination, adjustment, alteration, or change, only at time approved by the Owner.

D. Shipment of replacement equipment or devices, if required, shall be expedited with the highest priority.

1.16 BID EVALUATION

A. In estimating the lowest cost to the Owner as one of the factors in deciding the award of the contract, the Owner will consider, in addition to the prices quoted in the Summary of Proposal, the following:
   1. Any exceptions taken and noted in the Summary of Proposal.
   2. Proposed delivery.
   3. Proposed warranty.
   4. Estimated cost for field assembly based on Engineer's estimate of hours at $200/crew hour.
   5. Estimated cost of maintenance and operation, as determined from information furnished by the Seller and by survey of other utilities with experience in the operation of equipment proposed by the Seller.
   6. If escalation is proposed by the Bidder, the maximum escalated price will be used in comparison of bids. Escalation will be computed on past 12 months of B.L.S. statistics.
   7. Field Service Technician as estimated by bidder in Summary of Proposal. Note: Bidder shall provide all field service items specified in Section 1.13 in the estimated time.

B. Until final award of the contract is made, the Owner reserves the right to accept or reject any and all bids, waive any informalities or accept any bid or bids which in the opinion of the Engineer will serve the best interest of the Owner. The Owner also reserves the right to accept or reject any or all alternates in the same manner.

C. Optional accessories will only be accepted from the bidder who contracts to supply the power circuit breakers.

1.17 FAILURE TO MEET GUARANTEED DELIVERY DATE

A. Since delivery of power circuit breakers specified herein is critical to the scheduling of the Owner's projects, the Seller shall make every reasonable effort to meet the guaranteed delivery date specified in the Summary of Proposal.

B. The Owner agrees to indemnify the Seller for circumstances resulting in late delivery of power circuit breakers where such circumstances are beyond the control of the Seller. Circumstances beyond the control of the Seller are defined as: acts of God, acts of government, transportation to final destination, failure of equipment under test, material shortages due to failure of others to make timely

delivery, and any other circumstances reasonably beyond the control of the Seller.

C. Upon any actual or projected departure from the manufacturing schedule which, in the opinion of the Seller, may result in delay in shipment, the Seller shall immediately notify the Engineer of the following:
   1. Explanation of delay or potential delay.
   2. Means by which delay could be minimized.
   3. Projected new shipment date.
   4. Additional details as requested by the Engineer.

D. Should the Seller fail to make a reasonable effort to meet the guaranteed delivery date where this failure is evidenced by: failure to inform the Engineer of changes in the manufacturing schedule, failure to allow sufficient time for delivery of materials and equipment necessary for manufacturing, or lack of cooperation in effective measures by which delays could be minimized, the Owner may charge the Seller an amount not in excess of $200.00 per day for each day that the factory shipping date falls beyond the guaranteed delivery date specified in the Summary of Proposal.

E. The Engineer reserves the right to inspect the progress of work at the Seller's facilities at any time subsequent to notice of such intent.

1.18 FINAL ACCEPTANCE AND PAYMENT

A. Owner will not accept equipment as final until installation is complete and equipment is ascertained to be in conformance with specifications and guarantees.

B. Final payment will be made thirty (30) days after receipt of all equipment, drawings, instruction books and test reports as required by these specifications and in accordance with the contract.

C. Should equipment be received prior to earliest acceptable delivery date, as specified in Summary of Proposal, the Owner reserves the right to withhold payment, without any additional cost, until thirty (30) days after the specified earliest acceptable delivery date. In addition, Seller shall be responsible for all incidental costs incurred by the Owner due to early delivery.

D. Payment does not constitute final acceptance for warranty purposes.

PART 2 - PRODUCTS

2.1 230 KV POWER CIRCUIT BREAKER GENERAL

A. Quantity to be furnished:
   1. Two (2) 230 kV Power Circuit Breakers to be used for power tranformer protection. All power circuit breakers with same ratings provided under this specification shall be of identical construction including all ratings, componenets, wiring, physical size, etc.

B. Service Conditions:
   1. Outdoor, continuous duty.

2. Altitude: Power circuit breaker shall be suitable for operating at an altitude of less than 3,300 feet above sea level. For altitudes above 3,300 feet, apply Altitude Correction Factors to the voltage and continuous current ratings in accordance with ANSI C37.04, Table 1.
3. Ambient Conditions: Ambient temperature of cooling air shall not exceed 50°C; average temperature shall not exceed 40°C for any 24 hour period. Expected minimum temperature is 0°C.
4. Auxiliary AC power available: 120/240 Volt, single-phase.
5. Auxiliary DC power available: 125 Volt DC
6. Seismic Loading: In accordance with the ASCE values.
   a. SDS: 0.522
   b. SD1: 0.284
   c. FPGA: 1.34
7. PCB terminal connections shall be constructed to withstand the following mechanical loading:
8. The resultant of the simultaneous forces in (a), (b) and (c):
   a. The more severe of a wind load of 90 MPH or an earthquake shock of 0.2 G (static).
   b. Any vector sum of a line pull of 300 lb in line with an axis drawn through the phase terminals plus 150 lb at right angles to an axis drawn through the phase terminals.
   c. Additional loading imposed by the interruption of rated short circuit current or the magnetic forces resulting within the length of the power circuit breaker from an adjacent phase unit of the power circuit breaker.

C. The frame shall be such that the lowest live part on the breaker or lowest point for connection to the breaker shall be at an elevation in accordance with the National Electric Safety Code.

D. The power circuit breaker shall not be limited to a specified number of operations within a time period as long as critical gas pressure and critical stored operating energy is maintained within normal ranges. The power circuit breaker operating mechanism shall not be thermally limited within the ambient operating temperature range of the breaker.

E. The following specifications apply to base bid power circuit breakers and any alternate power circuit breakers unless specifically stated otherwise.

2.2 ELECTRICAL CHARACTERISTICS

A. 230 kV Power Circuit Breaker Ratings:
1. Construction ..... Dead Tank
2. Insulating medium ..... SF6 Gas
3. Number of phases 3
4. Maximum voltage ..... 242 kV (min.)
5. Rated voltage range factor (k) 1.0
6. BIL ..... 900 kV

   Note: Bushings shall meet the BIL <u>after</u> applying any altitude correction factors per Section 2-1.B.2.

7. Continuous Current ..... 2,000 A

   Note: All power circuit breakers shall meet the continuous current rating <u>after</u> applying any altitude correction factors per Section 2-1.B.2.

8. Short-circuit current rating (rms symmetrical at max kV).....40 kA
9. Short-time current rating (1 sec.).....40 kA
10. Closing and latching capability .....104 kA
11. Interrupting time .....3 Cycles (max.)
12. Frequency ..... 60 Hz
13. Closing control voltage ..... 125 VDC
14. Tripping control voltage ..... 125 VDC
15. Control and auxiliary power protection.....Separate knife switches with separate fuses for DC trip, DC close, and AC.
16. Number of Trip Coils .....Two (2)
17. Motor voltage ..... 125 VDC/120 VAC
18. Auxiliary heater voltage .....120/240 VAC

B. Switching Performance
1. Power circuit breaker shall be suitable for reclosing duty cycle, as specified by ANSI C37.04.
2. Power circuit breaker line charging switching rating shall be in accordance with ANSI C37.04.
3. The recovery voltage during interruption of line charging current shall be a minimum of 2.4 times maximum phase-to-ground voltage at 0.5 cycle and thereafter per ANSI C37.09.
4. The power circuit breaker shall be capable of out-of-step interruption in accordance with ANSI C37.09.

2.3 STANDARD FEATURES

A. Power circuit breakers shall have wet glazed porcelain bushings designed and rated in accordance with IEEE C37.017. Bushing color shall be ANSI No. 70 light grey. Dead tank SF6 power circuit breakers shall have SF6 gas insulated bushings.

B. One mechanical tripped-closed position indicator for mechanically interlocked mechanisms. Non-mechanically interlocked power circuit breakers shall be provided with one indicator for each pole or operating mechanism.

C. External emergency manual trip device which shall electrically operate the breaker. Trip device shall be interlocked with SF6 gas pressure contacts to prevent opening the breaker without sufficient gas interrupting medium. Trip device shall also block against electrical closure of the breaker.

D. Gas power circuit breaker standard equipment:
1. Provide three (3) temperature compensated gas density gauges for power circuit breakers with individually pressurized poles. Only one (1) temperature compensated gas density gauge is required for single-tank power circuit breakers or individually pressurized pole breakers with common piping. The face of density gauge shall have color codes to indicate normal, fill, and lockout. Temperature sensor shall be shielded to prevent direct sunlight from influencing readings.
2. The SF6 system shall be supplied with separate shut off valves to each interrupter. All SF6 devices shall be piped to a common manifold to allow for filling or testing from a single connection point without affecting the

SF6 pressure in all of the interrupters. There shall also be a main shut off valve for the SF6 system.

3. Provide temperature compensated low pressure alarm and cutout switches for each separately pressurized interrupter module. For single-tank and three-tank systems with common piping, only one (1) alarm and one (1) cutout switch will be required. Low pressure alarm should be set to operate, due to either leakage or "critically low" gas pressure, at a higher pressure than cutout switch, actual pressure settings to be per manufacturer's recommendations. Cutout switches shall be provided with a sufficient number of contacts to block tripping of all three phases of the power circuit breaker plus two additional contacts for customers use as cutout alarm.
4. Complete mounting stand for power circuit breaker and any required oil filled current transformers.
5. Breakers shall be shipped with partial internal SF6 gas pressure to eliminate the need for evacuation of the pole unit for installation.

E. A spring-spring operating mechanism mounted and enclosed in a weatherproof enclosure for opening and closing the contacts. Operating mechanism shall be trip free with latch check switch and anti-pumping device. Features and performance shall be in conformance with NEMA Standard SG-4, Part 3, where applicable. Other features shall include the following:

1. Closing spring shall both close the breaker and tension the opening spring.
2. With the tensioning motor inoperative, the number of available close operations shall not be less than one with the breaker closed and closing spring tensioned upon last close operation, i.e., breaker shall be capable of an open-close-open cycle.
3. Tensioning motor shall be rated for operation at specified AC motor voltage and DC control voltage. Control shall include a throw-over circuit that will automatically switch to the DC source if the AC motor voltage is lost. Include 3 minute delayed alarm upon loss of VAC.
4. The time required to tension the springs to operating level shall not exceed 15 seconds.
5. Closing mechanism shall be manually operable from outside of the tank.
6. Alarm contact indicating that the spring is not fully charged. Alarm shall include a 3 minute delay.

F. Standard (NEMA) two bolt ground terminal pads on opposite corners of frame(s).

G. Operations counter visible from outside the mechanism enclosure.

H. Manufacturer's standard screened strip heater(s) mounted in mechanism and control enclosures for anti-condensation purposes. Heaters shall be rated for operation at voltage listed in 2-2.A.20 above.

I. Special tools and devices required to install or to dismantle and reassemble breaker, including maintenance closing device for manual operation.

J. Terminal boards for control wiring shall be rated 600 V, 30 A, molded block type with insulating barriers between terminals. Terminals shall be strap screw type connections for ring lugs. Blocks shall have a removable marking strip and cover. Approximately 10 percent spare terminals shall be provided on each block for terminating spare conductor and control cables. The arrangement and location shall be such that incoming and outgoing cables can be supported.

Adjacent rows of terminal blocks shall be separated at least six (6) inches edge-to-edge, and at least six (6) inches from sides, top, or bottom of cabinet, for all wiring which will be made in the field. Wiring which will be done at the factory may be made in a space which is not less than three (3) inches. Blocks used for interpanel wiring shall be readily accessible. Heavy-duty terminal blocks with barriers shall be furnished and installed for external power supply cables if required.

2.4 REQUIRED ACCESSORIES

A. Six (6) bushing terminal connectors, stud to 4-hole NEMA pad, tinned bronze, suitable for either copper or aluminum, Anderson Type HDSF, or approved equal.

B. Two (2) NEMA standard grounding clamps per stand for use with 4/0 to 350 MCM copper conductor. Grounding clamps shall be Sefcor Type GTT2-14-N-T or approved equal.

C. Manufacturer sized standard control cabinet strip heater for anti-condensation which shall be on continuously. Each additional strip heater will have a control thermostat with an adjustable control range which includes 0°F to 45°F for operation during severe weather conditions shall be furnished. Heater(s) shall be rated for operation at the voltage listed in Section 2.2, A.20 and screened to protect maintenance personnel from physical contact. Accessory heaters shall have over-current protection devices separate from those for standard heaters. AC heater circuits must be supplied with alarm circuits with a 3 minute time delay on loss of AC. Provide heaters in mechanism and control compartments as required.

D. Minimum of 14 "a" and 14 "b" spare auxiliary switch contacts available for customer's use. In addition, Breakers shall be supplied with two (2) adjustable delayed “b” contacts. These contacts shall be adjustable from 3 to 120 cycles and shall be for customer use only. Manufacturer shall provide additional contacts, as required, for standard breaker control and alarm functions. Auxiliary switches shall be mounted in a dust tight enclosure to prevent contact exposure to foreign particles. Enclosure shall be removable for access to each switch contact. Auxiliary contacts shall be field convertible to either normally open or normally closed.

E. Mechanism cabinet shall be illuminated by LED light strip. Light shall be push-button controlled, activated by opening cabinet door.

F. 120 VAC, NEMA 5-20R convenience receptacle, ground fault interrupter type.

G. Control switch (52CS) for electrically operating power circuit breaker. Switch shall be GE Type SB-1 or Electroswitch Series 24, with pistol handle and spring return.

H. A copper bar, 12" long, 1" wide, and 1/4" thick, shall be mounted near the bottom of the control cabinet. Where the control cabinet is not mounted directly on the frame of the power circuit breaker, the ground bar shall be mounted on insulated supports. Where the control cabinet is mounted directly on the frame of the power circuit breaker, the ground bar shall be grounded on the cabinet. The ground bar shall be drilled and tapped for #10/32 screws to ground control cable shields and spare conductors.

I. Provide all necessary hoses, regulators, SF6 gas, or other devices normally required to perform gas filling operations for SF6 breakers.

J. Provide phase discordance protection for all power circuit breakers with non-mechanically interlocked poles. Protection shall utilize auxiliary switch contacts from power circuit breaker poles to detect failure to close any power circuit breaker. Provide an auxiliary tripping relay to initiate re-trip upon detection of phase discordance conditions. Relay shall be rated to operate at DC control voltage listed in Section 2.2. Provide a minimum of two spare contacts from auxiliary relay for customer's use.

K. Current Transformers

1. Dead Tank Breakers: Two (2) relaying accuracy multi-ratio bushing current transformers on each bushing (total of twelve (12) bushing current transformers per breaker), with short-circuiting terminal boards in mechanism cabinet. All leads shall be wired to the shorting terminal boards such that ratios can be changed without having to de-energize the breaker.
   a. Bushing current transformers shall be rated 1200:5 multi-ratio, C800 accuracy class with thermal rating factor of 2.0.
   b. Bushing current transformers shall conform to IEEE C37.110 and C57.13.

2.5 REQUIRED SPARE PARTS

A. One complete set of gaskets.

B. One trip coil and one close coil.

C. All spare parts shall be shipped with the power circuit breaker to the destination as quoted in the Summary of Proposal, Section A. Provide Engineer with a signed receipt acknowledging delivery of all spare parts to Owner.

2.6 OPTIONAL ACCESSORIES/SPARE PARTS

A. Provide a manufacturer's list of recommended spare parts and costs for these parts. Include the cost of one (1) spare bushing. This section will not be used in the bid evaluation.

2.7 PAINT AND FINISH

A. Preparation for and application of paint to exterior parts and accessories shall meet or exceed requirements of ANSI C37.12. Color shall be ANSI #70 light grey (Munsell 5BG 7/0.4). Provide two quarts of touch-up paint for each breaker along with a coating system repair procedure.

B. All masking materials shall be removed from the equipment prior to shipment. Protective shipping covers for gauges, etc., shall be provided in accordance with previous sections.

2.8 STANDARDS

A. The breaker shall be designed, constructed, and tested in accordance with the latest revision of the applicable IEEE, ANSI, NEMA and RUS standards, except

where specific requirements of these specifications conflict with these standards. In such cases, thesespecifications shall take precedence.

B. It is assumed that the equipment provided by the manufacturer will be in strict compliance with these specifications unless specific exception is taken and an explanation provided.

APPENDIX
SUMMARY OF PROPOSAL – ITEM NO. 1
230 kV POWER CIRCUIT BREAKER

(Requires Completion by Bidder)
* Denotes guaranteed value

A. Price and Delivery

1. Base Bid:

   Total price to furnish and deliver F.O.B. to jobsite, two (2) 230 kV power circuit breakers and accessories as described in Part 2 of these specifications. $ _____

2. Can Seller meet the specified delivery date based upon award of contract within ten (10) working days after bid opening? _____ * (yes/no)

   If not, Seller shall enter the earliest guaranteed delivery date of equipment to its final destination. _____ * (mm/dd/yy)

B. Field Service Technician

1. If required, what is the estimated number of working days required by Service Technician for installation of all power circuit breakers. _____ *

2. Rate per working day, including expenses. $ _____ *

3. Cost of round trip to jobsite including expenses. $ _____ *

4. Is the cost of one round trip for the Field Technician (including expenses) for the estimated time and rate as stated above included in the total bid price? Refer to Section 1-13. _____ (yes, no)

5. Explanatory notes regarding field service (Bidders' discretion)

   _____

   _____

   _____

C. Drawings

Will Seller meet delivery dates as listed below

for drawings based upon award of contract within ten (10) working days after bid opening?

1. Drawings for review (4 weeks ARO) _____* (yes, no)

2. Certified Drawings (8 weeks ARO) _____* (yes, no)

3. If Seller cannot meet drawing delivery dates listed above, show the dates below which can be met.

   Drawings for Review: _____* (mm/dd/yy)

   Certified Drawings: _____* (mm/dd/yy)

D. 230 kV Breaker Data

1. Manufacturer _____

2. Location of Factory _____

3. Type (SF6 gas, vacuum, etc.) _____

4. Bushing Manufacturer _____

5. Do bushings meet specified kV BIL rating after applying all applicable derating factors? _____ (yes, no)

6. Does breaker have provisions for manual closing should auxiliary power service be interrupted? _____ (yes, no)

   If no, indicate price of providing closing capability. $_____

7. List all items which require field assembly:

   a. _____

   b. _____

   c. _____

   d. _____

e. _____

f. _____

Seller Company: _____

Address: _____

By: Name: _____

Title: _____

Date: _____

END OF SECTION