



INVITATION FOR BIDS
OFFICE OF PROCUREMENT & CONTRACTS

1. INSTRUCTIONS FOR BIDDERS

- a. Sealed bids will be received in the Office of Procurement & Contracts, Mississippi State University, for the purchase of the items listed herein.
- b. All bids must be received in the Office of Procurement & Contracts on or before the bid opening time and date listed herein. Delivery of bids must be during normal working hours, 8:00 a.m. to 5:00 p.m. CST, except on weekends and holidays when no delivery is possible.
- c. Bidders shall submit their bids either electronically or in a sealed envelope.
 - i. Sealed bids should include the bid number on the face of the envelope as well as the bidders' name and address. Bids should be mailed to: 245 Barr Avenue, 610 McArthur Hall, Mississippi State, MS 39762.
 - ii. At this time we only accept non-ITS bids electronically. For electronic submission of bids, go to: <https://portal.magic.ms.gov> and use the RFX number on the next page as your reference number.
- d. All questions regarding this bid should be directed to the Office of Procurement & Contracts at 662-325-2550.

2. TERMS AND CONDITIONS

- a. All bids should be bid "FOB Destination"
- b. Bidders must comply with all rules, regulations, and statutes relating to purchasing in the State of Mississippi, in addition to the requirements on this form. General Bid Terms and Conditions can be found here:
https://www.procurement.msstate.edu/procurement/bids/Bid_General_Terms_May_2019_V2.pdf
- c. Any contract resulting from this Invitation for Bid shall be in substantial compliance with Mississippi State University's Standard Contract Addendum:
<https://www.procurement.msstate.edu/contracts/standardaddendum.pdf>

Bid Number/RFX Number: 23-82/RFX#3160005970

Opening Date: July 5, 2023 at 2:00 p.m.

Description: Electric Distribution Materials (Material Only)

Vendor Name: _____

Vendor Address: _____

Telephone Number: _____

Days the Offer is Firm: _____

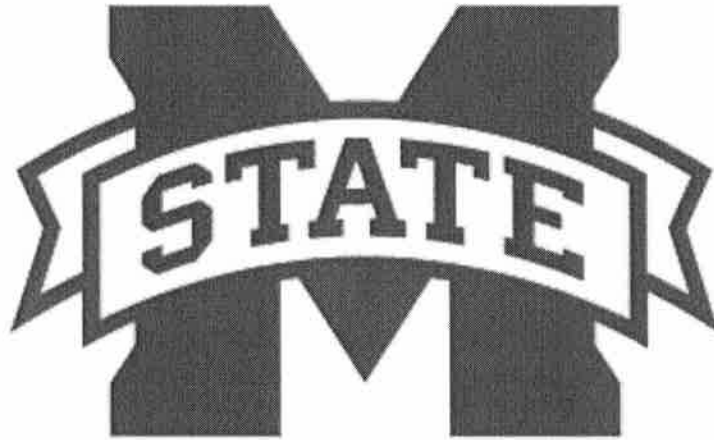
Authorized Signature: _____

Name: _____

Title: _____

See following pages for specifications and bid pricing form.

**Specifications & Materialman's Proposal
for
Electric Distribution Materials
(Material Only)
for
PDC #305-535
West Feeder Upgrade Phase 3 Materials**



June 2, 2023

Prepared for:

City of Starkville
110 West Main Street
Starkville, MS 39759

Prepared by:

Atwell & Gent, P.A.
Consulting Engineers
309 University Drive
Starkville, MS 39759



A&G Job No.: 601E3083

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MISSISSIPPI STATE UNIVERSITY

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INSTRUCTION TO BIDDERS

ELECTRIC DISTRIBUTION MATERIALS (MATERIAL ONLY)
FOR PDC #305-535 WEST FEEDER UPGRADE PHASE 3
MISSISSIPPI STATE UNIVERSITY

Bids that are sent by mail shall be clearly marked "Bid Enclosed" or "Bid Envelope Enclosed" as appropriate. The sealed envelope containing the bid shall have the following information shown on the envelope:

BID ENCLOSED

ITEM: ELECTRIC DISTRIBUTION MATERIALS (MATERIAL ONLY)
FOR PDC #305-535 WEST FEEDER UPGRADE PHASE 3
MISSISSIPPI STATE UNIVERSITY

OWNER: MISSISSIPPI STATE UNIVERSITY
MISSISSIPPI STATE, MISSISSIPPI

BIDDER: BIDDER'S ADDRESS

BID DUE: REFER TO ADVERTISEMENT FOR BIDS

Bids that are sent by parcel delivery service or hand-delivered should be addressed to:

Mr. Don Buffum, Director
Office of Procurements & Contracts
Mississippi State University
Barr Avenue, 610 McArthur Hall
Mississippi State, Mississippi 39762

Bids that are sent by mail should be addressed to:

Mr. Don Buffum, Director
Office of Procurements & Contracts
Mississippi State University
P.O. Box 5307
Mississippi State, Mississippi 39762

The Engineer for this project is:

Atwell & Gent, P.A.
P.O. Box 2558
Starkville, Mississippi 39760-2558
Telephone (662) 324-5658

The Engineer will represent the Owner in all matters pertaining to this project, including but not limited to, answering technical questions of prospective bidders and recommendations of lowest and best bid, acceptance of shop drawings and similar documents, and approval of invoices prior to payment by the Owner.

Submit all questions about the specifications to the Engineer, in writing. Replies will be issued to all prospective Bidders of Record. Neither the Engineer nor the Owner will be responsible for oral clarifications.

BID PREPARATION:

Bidders shall complete all blank spaces on both the Materialman's Proposal Form and the Detailed Bid Form for each item of equipment being bid in accordance with these specifications and terms and conditions. Bidder should insert the unit price in the blank under the Unit Price heading and multiply this unit price by the number shown in the Number Required heading and enter the product of this multiplication in the blank under the heading Total Price for each bid item on the Detailed Bid Form. The bidder shall sum the Total Bid Price for each Bid Item and enter this sum in the Total Bid Price.

Bidder shall insert the delivery time in weeks after receipt of an order for each item of equipment bid in the blank provided on the Detailed Bid Form. Bidder shall also indicate equipment being bid by the manufacturer's name and catalog number in the blanks provided on the Proposal Form.

Bidder shall supply all information requested in the blanks provided on the Materialman's Proposal Form and Detailed Bid Form for the electric distribution equipment being bid. Bidders taking exceptions to any part of the specifications, conditions, or payment terms specified herein shall show such exception on the Materialman's Proposal Form in the space provided. If exceptions are not shown on the Materialman's Proposal Form, Bidder shall supply equipment specified herein under the terms and conditions specified herein.

Pad-mounted transformer prices shall be FIRM for delivery to the Owner as specified herein or firm with commodity price modifiers. Bidder shall indicate whether the pad-mounted transformer price is a firm price or a firm price with commodity modifiers. If Bidder submits a bid with commodity modifiers, a complete description of the method of calculating the final price of the transformer shall accompany the bid.

Proposals that are incomplete, modified, excepted, or in any way changed from the proposal that the OWNER is requesting in this request for proposals may be rejected by the OWNER.

Bidder shall submit Materialman's Proposal Form and the Detailed Bid Form as a part of their bid.

BID AWARD:

Group #1: Bid Items No. 1 and No. 2 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 1 and No. 2 inclusive.

Group #2: Bid Items No. 3 and No. 4 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 3 and No. 4 inclusive.

Group #3: Bid Items No. 5 and No. 6 will be awarded to the bidder with lowest and best responsive bid for Bid Items No. 5 and No. 6 inclusive.

Group #4: Bid Items No. 7 through No. 16 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 7 through No. 16 inclusive.

Group #5: Bid Item No. 17 will be awarded to the bidder with lowest and best responsive bid for Bid Item No. 17.

Group #6: Bid Items No. 18 through No. 22 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 18 through No. 22 inclusive.

Group #7: Bid Items No. 23 and No. 24 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 23 and No. 24 inclusive.

Group #8: Bid Items No. 25 and No. 26 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 25 and No. 26 inclusive.

Group #9: Bid Item No. 27 will be awarded to the bidder with lowest and best responsive bid for Bid Item No. 27.

Group #10: Bid Items No. 28 through No. 31 will be awarded on an aggregate-low basis to the bidder with lowest and best responsive bid for Bid Items No. 28 through No. 31 inclusive.

Group #11: Bid Item No. 32 will be awarded to the bidder with lowest and best responsive bid for Bid Item No. 32.

Note: It is not necessary to bid all bid items; however, it is necessary to bid all bid items within any specific group (e.g., bid all items in Group #3).

Failure to bid on all items within a group may cause bid to be disregarded. Unusually long delivery promises may cause bid to be disregarded.

MATERIALMAN'S PROPOSAL

ELECTRIC DISTRIBUTION MATERIALS (MATERIAL ONLY)
FOR PDC #305-535 WEST FEEDER UPGRADE PHASE 3
MISSISSIPPI STATE UNIVERSITY

To: Mr. Don Buffum, Director
Office of Procurements & Contracts
Mississippi State University
Barr Avenue, 610 McArthur Hall
Mississippi State, Mississippi 39762

The undersigned (hereinafter called the MATERIALMAN) acknowledges by his signature that he has received and examined the documents entitled "Specifications and Materialman's Proposal for **ELECTRIC DISTRIBUTION MATERIALS (MATERIAL ONLY)** for the Mississippi State University (hereinafter called the OWNER), dated June 2, 2023, and has included the provisions of the Specifications in his Proposal. The Materialman further acknowledges that he has received the following addenda.

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

The Materialman hereby proposes to sell and deliver to the OWNER, upon the terms and conditions herein stated, the equipment specified in the attached specification for the following sums shown below:

TOTAL BID FOR BID ITEMS #1 AND #2 (GROUP #1) INCLUSIVE	_____
TOTAL BID FOR BID ITEMS #3 AND #4 (GROUP #2) INCLUSIVE	_____
TOTAL BID FOR BID ITEMS #5 AND #6 (GROUP #3) INCLUSIVE	_____
TOTAL BID FOR BID ITEMS #7 THROUGH #16 (GROUP #4) INCLUSIVE	_____
TOTAL BID FOR BID ITEM #17 (GROUP #5)	_____
TOTAL BID FOR BID ITEMS #18 THROUGH #22 (GROUP #6) INCLUSIVE	_____
TOTAL BID FOR BID ITEMS #23 AND #24 (GROUP #7) INCLUSIVE	_____
TOTAL BID FOR BID ITEMS #25 AND #26 (GROUP #8) INCLUSIVE	_____
TOTAL BID FOR BID ITEM #27 (GROUP #9)	_____
TOTAL BID FOR BID ITEMS #28 THROUGH #31 (GROUP #10) INCLUSIVE	_____
TOTAL BID FOR BID ITEM #32 (GROUP #11)	_____

Note: Refer to Instructions to Bidders. **It is not necessary to bid all bid items; however, it is necessary to bid all bid items within any specific group (e.g., bid all items in Group #6).**

Bid Form

The Detailed Bid Form complete with item description and required quantities for each Bid Item is included with this RFQ in Appendix A.

Bill of Materials

The Bill of Materials complete with item description and catalog numbers for each Bid Item is included with this RFQ in Appendix B.

Technical Specifications

Technical specifications for select Bid Items are included with this RFQ in Appendix C through Appendix E.

Other Considerations

- A. The total prices set forth above shall be firm if accepted by the OWNER within thirty (30) days and shall include delivery to Mississippi State University; Starkville, Mississippi 39759, ready for OWNER's use. The OWNER will unload electric distribution materials at OWNER's Electric Department Warehouse.
- B. The prices set forth herein do not include any sums which are, or which may be payable by MATERIALMAN on account of taxes imposed by any taxing authority upon the sale, purchase, or use of the equipment. If any such tax is applicable to the sale, purchase, or use of the equipment, the amount thereof shall be added to the purchase price and paid by the OWNER.
- C. Title of the equipment shall pass to the Owner upon:
 - 1. Delivery to location specified.
 - 2. Satisfactory inspection for in-transit damage.
 - 3. Acceptance by the Owner.

D. Exceptions: _____

- E. It is understood by the undersigned that the OWNER retains the privilege of accepting or rejecting all or any part of this proposal and to waive any informalities or technicalities therein. Counterproposals or qualified bids shall be subject to rejection at the discretion of the OWNER.

It is also understood by the undersigned that the OWNER reserves the right to conduct investigations to evaluate the proposals received and to award the bid for this equipment to the lowest Bidder, who in the OWNER's evaluation will provide the equipment which will be in the best interest of the OWNER.

MATERIALMAN:

BY: _____

TITLE: _____

COMPANY: _____

ADDRESS: _____

TELEPHONE NO.: _____

EMAIL: _____

DATE SIGNED: _____

APPENDIX A
DETAILED BID FORM

APPENDIX B
BILL OF MATERIALS

APPENDIX C

SPECIFICATIONS FOR PRECAST CONCRETE MEDIUM-VOLTAGE ELECTRICAL VAULT

1.1 SCOPE

A. Section Includes:

1. Bid Items
2. References.
3. Submittals.
4. Quality Assurance.
5. Precast Concrete Medium-Voltage Electrical Vault.

1.2 BID ITEMS

A. Bid Item #1: Precast Concrete Electrical Vault.

1.3 REFERENCES

A. American Association of State Highway and Transportation (AASHTO):

1. AASHTO M306 - Standard Specification for Drainage, Sewer, Utility, and Related Castings.

B. American Concrete Institute (ACI):

1. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ASTM International:

1. ASTM A536 - Standard Specification for Ductile Iron Castings.
2. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
4. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
5. ASTM C1037 - Standard Practice for Inspection of Underground Precast Concrete Utility Structures.

D. Institute of Electrical and Electronics Engineers (IEEE):

1. IEEE C2 - National Electrical Safety Code.

1.4 SUBMITTALS

A. Submit catalog data on all equipment items specified in this section to be utilized on this Project.

- B. Sufficient information, clearly presented, shall be included to determine compliance with Drawings and Specifications.
- C. The specific item proposed, and its area of application shall be marked on the catalog cuts.
- D. Shop Drawings: Indicate dimensions, connection and support points, weight, specified ratings, and materials.
- E. Product Data: Submit electrical characteristics and connection requirements, standard model design tests, and options.
- F. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

1.5 QUALITY ASSURANCE

- A. Conform to IEEE C2, NFPA 70, and NECA 605.
- B. Design and Certification: All vaults shall be designed and certified to meet design requirements by a Professional Engineer registered in the State of Mississippi.

1.6 PRECAST ELECTRICAL VAULTS

- A. Manufacturers: Oldcastle, Lee's Custom Precast; or as accepted.
- B. Substitutions: Section 26 00 00.
- C. Design Requirements: Design structures, risers, and vault lids for minimum loads in accordance with ASTM C857 and ASTM C890.
 - 1. Live Load: Comply with heavy traffic loading, ASTM C856, AASHTO Load Designation HS-20.
 - 2. Dead Loads: Actual weight of materials producing static load.
- D. Product Description: Non-corrosive steel reinforced precast concrete vaults designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.
- E. Quality Assurance: Electrical vaults shall be precast concrete manufactured in a plant especially designed for that purpose. Inspect vaults in accordance with ASTM C1037.
- F. Shape: As indicated on Drawings.
- G. Nominal Inside Dimensions: As indicated on Drawings or as accepted. Alternate interior dimensions will be considered where:
 - 1. Alternate vault provides equivalent interior area (e.g., length times width) or greater.
- H. Inside Depth: As indicated on Drawings.
- I. Wall Thickness: 6" minimum or greater where required to meet Design Requirements.

J. Materials:

1. All cement shall conform to ASTM C150, Type I, IA, III, or IIIA. All fine and coarse aggregates shall conform to ASTM C33.
2. Steel reinforcing design shall conform to ASTM C857 Specifications for Structural Design for Underground Precast Concrete Utility Structures and shall be utilize Grade 60 bars conforming to the requirements of ASTM A615.
3. Batching, mixing, and placing of concrete shall conform to ACI 304. Concrete shall develop a minimum compressive strength of 4,500 psi at twenty-eight (28) days.
4. Units shall consist of assembled sections. Assembled sections shall have mating edges with tongue and groove joints. Joints shall be designed to firmly interlock adjoining components and provide waterproof junctions. Joints shall be sealed watertight using preformed plastic strip. Sealing material shall be installed in strict accordance with the sealant manufacturer's printed instructions. Apply two coats of vault manufacturer's standard asphalt or epoxy waterproofing material in compliance with the waterproofing manufacturer's recommendations. Coating shall completely cover all exterior surfaces of the vault.
5. Tolerances:
 - a. Vaults shall be designed and constructed so that the inside dimensions, as indicated on the Drawings, are maintained under the specified loading conditions.
 - b. Wall embedments shall be located within ¼ inch of the position as indicated on the Drawings.

K. Embedments: Embedments shall be galvanized steel or non-corrosive fiberglass or plastic. Embedments shall be designed to accept 1/2"-13 x 1-1/4" stainless steel bolts. Provide embedment's for support of cable junction point, cable supports, and grounding supports, as indicated on the Drawings.

L. Base Section: Include 3" deep x 12" round sump with cast sleeve, and two (2) 1" ground rod openings.

M. Top Section: Include vault cover and vault access doors.

N. Nameplate: Identified structure with manufacturer's name embedded in, or otherwise permanently attached to an interior wall face.

O. Duct Entry Provisions: Concrete knockouts shall be provided in each vault wall for conduit entry and exit. Concrete knockouts shall be designed to be easily removed by striking the center of the knockout with a hammer or similar means. The location and size of concrete knockouts in each wall of the vault is shown on detail drawing VLT-1. Concrete block outs (holes through the side of the vault) or conduit Term-A -Ducts will not be accepted.

P. Lifting Devices: Lifting devices shall be cast into vault base, riser extensions, and cover for use during unloading and installation operations. Lifting devices shall be designed and installed to allow unloading and lifting operations with either a 4-way chain or sling. Lifting devices in vault cover shall be furnished with cover plate.

Q. Cable Pulling Irons:

1. Manufacturers: Bowco Industries, or as accepted.
2. Substitutions: Section 26 00 00.
3. Product Description: Cable Pulling iron, 7/8-inch diameter, hot-dipped galvanized. Locate as shown on Drawings.

R. Cable Supports:

1. Manufacturers: Underground Devices "Saddle Rack", or as accepted.
2. Substitutions: Section 26 00 00.
3. Product Description: Heavy-duty nonmetallic type, length as required.

S. Sump Covers: ASTM A48/A48M, Class 30B gray cast iron.

T. Vault Cover and Access Doors

1. Design Requirements: Design vault cover and vault for minimum loads in accordance with ASTM C856, AASHTO Load Designation HS-20.
2. Vault Cover Description: The vault cover shall have opening sections above the switchgear to allow operation of the gear from grade level. The entire cover shall be removable for installation and removal of the switchgear, and installation and repair of the cables. Cover shall be constructed from non-corrosive steel reinforced concrete and shall be broom finished in a natural concrete gray color. The entire vault cover shall be removable by machine. The vault cover shall include hinged vault access doors for access to the operating mechanisms of the switchgear.
3. Vault Access Doors Description:
 - a. Manufacturers: Halliday Type "H2W", or as accepted.
 - b. Substitutions: Section 26 00 00.
 - c. Description: Vault access doors shall be torsion spring assisted, have irregular/rough surfaces, and be constructed of aluminum. Hinged or removable cover sections shall include locking devices to prevent access by unauthorized persons.
 - d. Identification: Access door shall be identified "High-Voltage".

APPENDIX C
ELECTRICAL VAULT DETAIL DRAWING

APPENDIX D

SPECIFICATIONS FOR PAD MOUNTED MEDIUM-VOLTAGE SWITCHGEAR

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pad-Mounted Medium-Voltage Switchgear.
2. Switchgear Box Pad.

1.2 BID ITEMS

- A. Bid Items #23 & #24: Pad Mounted Switchgear.

1.3 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C57.12.29 - Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments.
2. ANSI C37.72 - Manually Operated, Dead Front Pad-Mounted Switchgear with Load Interrupting Switches and Separable Connectors for Alternating Current Systems.
3. C37.112 -IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays.

B. Institute of Electrical and Electronics Engineers:

1. IEEE 48 - Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV Through 765 kV.
2. IEEE 386 - Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600 V.
3. IEEE C2 - National Electrical Safety Code.
4. ANSI C37.85 - ANSI American National Standard Safety Requirements for X-Radiation Limits for AC High-Voltage Power Switchgear.
5. IEEE C57.13 - Standard Requirements for Instrument Transformers.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Electrical Manufacturers Association:

1. NEMA 260 - Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.

E. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.

1.4 MATERIALS

- A. All materials, equipment and appurtenances furnished shall be new.

1.5 SUBMITTALS

- A. Submit shop drawings and product data on all equipment items specified in this section to be utilized on this Project.
 - 1. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings, and materials.
 - 2. Product Data: Submit electrical characteristics and connection requirements, standard model design tests, and options.

PART 2 PRODUCTS

2.1 PAD-MOUNTED MEDIUM-VOLTAGE SWITCHGEAR

- A. Manufacturers:

- 1. S & C Electric "Vista" or as accepted.
 - 2. Substitutions: Only switchgear meeting the Critical Requirements detailed in this Section will be considered.

- B. Critical Requirements:

- 1. Product Description: ANSI C37.72 pad mounted switchgear, 15 kV, 600 ampere, SF6 insulated, deadfront construction, suitable for installation where accessible by general public switch and load interrupter ways configured as detailed below.
 - a. One (1) S&C Electric Vista "532".
 - b. One (1) S&C Electric Vista "431".
 - 2. Service Conditions:
 - a. Maximum Ambient Temperature: 104°F.
 - b. Maximum Interior Design Temperature: 85°F.
 - c. Maximum Relative Humidity: 95%.
 - d. Altitude: Sea level.
 - e. Environment: Outdoor.
 - 3. Ratings:
 - a. System Voltage: 13.2 kV nominal, three phase, 60 Hz.
 - b. Maximum Design Voltage: 15.5 kV.
 - c. Insulation Type and Level: SF6 insulated, 95 kV BIL.
 - d. Main Bus and Switch Ampacity: 600 amperes, continuous.
 - e. Short Circuit Rating: 12,500 rms symmetrical amperes at rated nominal voltage.

4. Construction:

- a. Single-sided Construction. All cable terminations shall be located on one side of the switchgear unit.
- b. Cable Grounding: All ways, both load interrupter switch and fault interrupter, shall be three-position type (closed- open- ground).
- c. Cabinet Height: Switchgear cabinet shall be low profile and in no case shall its overall height exceed 54".
- d. Finish Color: The exterior of the unit shall be painted Carboline F235 Dark Bronze (or as accepted).

5. Controls: Provide microprocessor-based overcurrent control for switchgear unit. Control shall incorporate ANSI C37.112 relay curves. Switchgear shall be capable of being programmed using a laptop computer. The control shall at a minimum feature the following time-current characteristic (TCC) curves:

- a. Standard "E" speed curves.
- b. Standard "K" speed curves.
- c. IEEE C37.112-1996 "U" relay curves. Time dial settings shall be available in 0.1 increments from 0.0 to 10.0.

Controls provided shall be manufacturer's most advanced model available.

6. Potential Indication with Test Feature: Provide LCD display to indicate presence of voltage on each phase, and solar panel to supply power for testing of complete voltage-indication circuit and phasing circuit. One potential indicator shall be provided for each bus-terminal, load interrupter switch, and fault-interrupter way.

C. Construction:

1. Switching: Three-pole load interrupter switches and three-pole fault interrupter switches configured as follows:

- a. One (1) five-way switchgear unit with three (3) three-pole load interrupter switches and two (2) three-pole fault interrupter switches.
- b. One (1) four-way switchgear unit with three (3) three-pole load interrupter switches and one (1) three-pole fault interrupter switch.

2. Switchgear Tank: Mild steel.

3. Pad Mount Enclosure: Mild steel conforming to requirements of ANSI C37.72 and C57.12.29.

4. Finish Color: The exterior of the unit shall be painted Carboline F235 Dark Bronze (or as accepted).

5. Load Interrupter Switches:

- a. Three-position (closed-open-ground) type. The load interrupter switches shall provide three-pole live switching of 600-ampere three phase circuits.
- b. Load interrupter switches shall provide a visible gap when open.
- c. Operating shafts shall be pad lockable in any position. The operating shaft shall be capable of being locked to prevent operation to the ground position.

- d. The load interrupter switches shall be furnished with a manual handle to charge the switch operating mechanism or to actuate the operating mechanism. Operating mechanism shall be capable of providing quick-make, quick break operation in either switching direction. The operating mechanism shall be designed to prevent inadvertent operation from the closed position directly to the ground position and vice versa.
 - e. Load interrupter switch terminals shall be equipped with bushings designed to ANSI/IEEE 386 Standards. Refer to "Schedule" for exact primary bushing configurations and ampacity requirements.
6. Fault Interrupter Switches:
- a. Three-phase resettable fault interrupters shall be provided in the switchgear for live switching of tap circuits and for fault interruption of tap circuits. Fault interrupters shall be vacuum or arc spinning contact type.
 - b. The fault interrupters shall be operated by a spring operating mechanism that is recharged with a manually operated handle. The operating mechanism shall operate independently of the speed of the manual handle. Trip indicators shall be provided on the fault interrupters that indicate the contact position is open. This indicator shall be fully visible through viewing windows in the switchgear tank.
 - c. Fault interrupters shall provide three-pole fault interruption and three-pole load switching.
 - d. The fault interrupters shall be non-reclosing, manual reset devices. An electronic assembly shall sense load and fault current on each phase of the load tap circuits. The electronic control shall be powered from current transformers mounted inside of the SF6 insulated switchgear tank. No external power source shall be required for overcurrent protection.
 - e. Fault interrupter switch terminals shall be equipped with bushings designed to ANSI/IEEE 386 Standards. Refer to "Schedule" for exact primary bushing configurations and ampacity requirements.
7. Grounding Lugs: Furnished with one ground pad installed on switchgear unit and one ground pad installed on pad mount enclosure. Ground pads shall be NEMA two-hole type.
8. Labeling: Furnish safety labels in accordance with NEMA 260.
9. Accessories:
- a. Mounting Provisions for Fault Indicator: Provide mounting provisions for fault indicators installed on each phase of load interrupter switches. Provide viewing windows for fault LED indicating lights for each phase of all load interrupter switches (e.g., three (3) per load interrupter switch).
 - b. Potential Indication with Test Feature: Provide LCD display to indicate presence of voltage on each phase, and solar panel to supply power for testing of complete voltage-indication circuit and phasing circuit. One potential indicator shall be provided for each bus-terminal, load interrupter switch, and fault-interrupter way.
10. Controls: Provide standard microprocessor-based overcurrent control for switchgear unit. Control shall incorporate ANSI C37.112 relay curves. Switchgear shall be capable of being programmed using a laptop computer. The control shall at a minimum feature the following time-current characteristic (TCC) curves:

- a. Standard "E" speed curves.
- b. Standard "K" speed curves.
- c. IEEE C37.112-1996 "U" relay curves.

Controls provided shall be manufacturer's most advanced model available. Switchgear shall be furnished with all required Windows-compatible software and programming cables, adapters, and all other components required to field program control from standard laptop computer.

11. Demonstration and Field Training: Manufacturer shall include four hours of on-site training by a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain medium-voltage switchgear units and controls.

2.2 SWITCHGEAR SCHEDULE

A. Medium-Voltage Switchgear Schedule: See below.

MEDIUM VOLTAGE SWITCHGEAR SCHEDULE

SWITCHGEAR NO.	SWITCHGEAR RATING AND TYPE	NOMINAL OPERATING VOLTAGE	MODEL NO.	BUSHING TYPE/TERMINATION SCHEDULE				
				WAY 1	WAY 2	WAY 3	WAY 4	WAY 5
PMS-152	600A, 15 kV, 5-WAY PAD MOUNTED SWITCHGEAR UNIT	13.2 kV	S&C ELECTRIC VISTA "532"	600A DB	600A DB	600A DB	200A LB	200A LB
PMS-153	600A, 15 kV, 4-WAY PAD MOUNTED SWITCHGEAR UNIT	13.2 kV	S&C ELECTRIC VISTA "431"	600A DB	600A DB	600A DB	200A LB	

APPENDIX E

SPECIFICATIONS FOR SINGLE-PHASE PAD MOUNTED TRANSFORMERS

PART 1 GENERAL

1.1 SCOPE

A. Section Includes:

1. Liquid Filled Transformers.
2. Service Conditions.
3. Ratings.
4. Transformer Efficiencies and Losses.
5. Accessories.
6. Noise.
7. Fabrication.
8. Factory Finishing.
9. Quality Control.
10. Transformer Pad Foundations.

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C37.47 - American National Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses.
2. ANSI C57.12.25 - Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage: 34500GrdY/19920 Volts and Below; Low Voltage: 240/120 Volts; 167 kVA and Smaller.
3. ANSI C57.12.28 - Pad-Mounted Equipment - Enclosure Integrity.
4. ANSI C57.12.90 - Test Code for Liquid-Immersed Distribution, Power and Regulation Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers.
5. ANSI C57.91 - Guide for Loading Mineral Oil Transformers.

B. Department of Energy (DOE):

1. 10 CFR Part 431 - Department of Energy - Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule.

C. Factory Mutual Engineering and Research (FM):

1. FM P7825 - Approval Guide.

- D. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. IEEE 386 - Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600 V.
 - 2. IEEE C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 - 3. IEEE C57.106 - Guide for Acceptance and Maintenance of Insulating Oil in Equipment.
- E. International Electrical Testing Association (NETA):
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- F. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA TR1 - Transformers, Regulators and Reactors.
 - 2. NEMA 260 - Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.
- G. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code.

1.3 MATERIALS

- A. All materials, equipment and appurtenances furnished shall be new.

1.4 SUBMITTALS

- A. Submit shop drawings and product data on all equipment items specified in this section to be utilized on this Project.
 - 1. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings, and materials.
 - 2. Product Data: Submit electrical characteristics and connection requirements, standard model design tests, and options.

PART 2 PRODUCTS

2.1 LIQUID-FILLED TRANSFORMERS

- A. Manufacturers: Ermco, ABB/Hitachi, Cooper Power Systems/Eaton, Howard Industries.
- B. Substitutions: Not Permitted.
- C. Product Description: ANSI C57.12.34, single phase, loop feed, pad-mounted, self-cooled transformer unit. Transformers shall be new and shall be manufactured in the United States of America.
- D. Cooling and Temperature Rise: IEEE C57.12.00, Class ONAN, 65 degrees C, self-cooled.

E. Insulating Liquid: Non-PCB mineral oil.

2.2 SERVICE CONDITIONS

A. Service Conditions:

1. Maximum Ambient Temperature: 104°F.
2. Maximum Interior Design Temperature: 85°F.
3. Maximum Relative Humidity: 95%.
4. Altitude: Sea level.

2.3 RATINGS

- A. Capacity: Two (2) 25 kVA single phase pad mounted transformers.
- B. Primary Voltage: 13,200GrdY/7,620 V.
- C. Taps: Standard primary taps, 2 FCAN and 2FCBN. Taps shall be suitable for de-energized operation only.
- D. Secondary Voltage: 240/120 V.
- E. Impedance: ANSI C57.12.00 standard impedance.
- F. Basic Impulse Level: 95 kV primary, 30 kV secondary.

2.4 TRANSFORMER EFFICIENCIES AND LOSSES

- A. Efficiencies and Losses: 10 CFR Part 431. Transformers shall comply with the latest DOE Energy Conservation Standards and Test Procedures, with the allowed tolerances as defined in the DOE Test Procedures.

2.5 ACCESSORIES

- A. Primary Terminations: Bushing wells with non-corrosive clamping rings conforming to IEEE 386. Furnish two (2) 200-Ampere, load break, 15 kV class bushings for loop feed operation.
- B. Primary Overcurrent Protection: Conforming to ANSI C37.47.
 1. Bayonet-type, liquid-immersed, dual sensing expulsion fuses mounted externally in a lockable enclosed compartment on the high-voltage end of the transformer tank. Manufacturer: Cooper Power Systems.
 2. Fuse sizes shall be indicated by a label or by nameplate on the interior of the low voltage compartment.
- C. Secondary Bushings: Porcelain low-voltage bushings with 5/8"-11 UNC 1-1/2" copper stud.
- D. Grounding Lugs: Furnished with one ground pad installed in the transformer compartment. Ground pads shall be NEMA two-hole type unpainted stainless steel.

- E. Pressure Relief: Furnish transformer with pressure relief device in accordance with ANSI C57.12.26.
- F. Nameplate: Furnish stainless steel or anodized aluminum instruction nameplates in accordance with ANSI C57.12.00. Nameplate shall indicate transformer ratings, proper connection and fusing information and total gallons of oil. Nameplate shall also indicate that the PCB content of said transformer is less than one (1) part per million or at time of manufacture gas chromatograph analysis certified non-detectable PCB. Nameplates shall be installed on the tank wall inside the low-voltage compartment and on the inside of the low-voltage door.
- G. Labeling: Furnish safety labels in accordance with NEMA 260. Rating of transformer in kVA shall be indicated on the front of transformer tank.

2.6 NOISE

- A. Transformer sound levels shall not exceed the values specified in the latest revision of NEMA Publication TR-1.

2.7 FABRICATION

- A. Mild steel tank and termination cabinet, conforming to requirements of ANSI C57.12.28.
- B. The high and low voltage compartments shall be side by side in a single air-filled compartment. Access to the compartment shall be by means of a hinged, lift up cover. When viewed from the front, the low-voltage compartment shall be on the right. The cover shall be secured by a single, recessed penta-head bolt, with additional provisions for a padlock having a 1/2" diameter shackle.
- C. A recessed, captive, penta-head or hex-head bolt that meets the dimensions per ANSI C57.12.28 shall secure access cover. Provide provisions for locking with hasp type lock.
- D. The enclosure integrity of the tank and cabinet shall meet the requirements for tamper resistance set forth in ANSI C57.12.28 including but not limited to the pry test, pull test, and wire probe test.

2.8 FACTORY FINISHING

- A. Finish: The coating system shall meet or exceed ANSI C57.12.28 coating system requirements for Pad-Mounted equipment, including the following performance tests:
 - 1. Salt spray test per ASTM B117 / D1654.
 - 2. Cross hatch adhesion test ASTM D3359.
 - 3. Humidity test per ASTM D4585 / D3363.
 - 4. Impact test per ASTM D2794 / B1117.
 - 5. Ultraviolet accelerated weathering (QUV) test per ASTM G154 / D523.
 - 6. Abrasion resistance Taber abraser test per ASTM D4060 / B1117.

- B. Finish Color: The exterior of the unit shall be painted Carboline F235 Dark Bronze (or as accepted).

2.9 QUALITY CONTROL:

- A. All units shall be tested for the following:
1. No-Load (85°C or 20°C) losses at rated current.
 2. Total (85°C) losses at rated current.
 3. Percent Impedance (85°C) at rated current.
 4. Excitation current (100% voltage) test.
 5. Winding resistance measurement tests.
 6. Ratio tests using all tap settings.
 7. Polarity and phase relation tests.
 8. Induced potential tests.
 9. Full wave and reduced wave impulse test.