



**BID REQUEST NO.:** 17 8014 KS C  
**TITLE:** Medium Voltage Switchgear  
**ISSUE DATE:** 1-04-17

**STRATEGIC SOURCING SPECIALIST:** Kevin Summers  
**PHONE NO:** (573) 884-8797  
**E-MAIL:** SummersK@umsystem.edu

**RETURN BID NO LATER THAN: 1-18-17 AT 2:00 PM CENTRAL TIME**

**MAILING INSTRUCTIONS:** Print or type **Bid Request No.** and **Return Due Date** on the lower left hand corner of the envelope or package. Delivered sealed bids must be in UM Supply Chain Office by the return date and time.  
**Faxed or e-mailed bid responses will not be considered.**

**RETURN BID TO: UM System Supply Chain**  
**2910 Lemone Industrial Blvd**  
**Columbia, MO 65201**

You are invited to submit bids on the items or services specified. All bids must be made on this form and shall be subject to the terms and conditions on the reverse side hereof for furnishing items or services of the description listed below. All deliveries shall be made **FOB DESTINATION** with freight charges fully included and prepaid. The seller pays and bears the freight charges.

In compliance with this bid request and subject to all of the terms and conditions thereon, bidder offers and agrees to furnish or deliver the items or perform the services upon which prices are quoted herein, such items or services to be provided within the number of days indicated after receipt by bidder of University Purchase Order. Only cash discounts having a period of thirty (30) days or more will be taken into account in determining the lowest bid. Discount time is compiled from day of delivery and acceptance of items or services or receipt of correct invoice, whichever is later.

The bidder further agrees that the language of this bid document shall govern in the event of a conflict with his/her bid. The bidder further agrees that upon receipt of an authorized purchase order from the University of Missouri or when a Notice of Award is signed and issued by an authorized official of the University of Missouri, a binding contract shall exist between the bidder and The Curators of the University of Missouri.

**SIGNATURE REQUIRED**

DOING BUSINESS AS (DBA) NAME
MAILING ADDRESS
CITY, STATE, ZIP CODE

LEGAL NAME OF ENTITY/INDIVIDUAL FILED WITH IRS FOR THIS TAX ID NO.
IRS FORM 1099 MAILING ADDRESS
CITY, STATE, ZIP CODE

CONTACT PERSON		EMAIL ADDRESS	
PHONE NUMBER		FAX NUMBER	
TAXPAYER ID NUMBER (TIN)	TAXPAYER ID (TIN) TYPE (CHECK ONE) ___ FEIN ___ SSN		VENDOR NUMBER (IF KNOWN)
VENDOR TAX FILING TYPE WITH IRS (CHECK ONE) (NOTE: LLC IS NOT A VALID TAX FILING TYPE.) ___ Corporation ___ Individual ___ State/Local Government ___ Partnership ___ Sole Proprietor ___ Other _____			
AUTHORIZED SIGNATURE		DATE	
PRINTED NAME		TITLE	

## BID REQUEST AND BID CONDITIONS

This Bid Request and Bid is made upon and subject to the following conditions, all of which are accepted by bidder. Upon acceptance by University, this Bid Request and Bid and the University Purchase Order issued thereon shall constitute the contract for furnishing the items described in the bid in strict conformity with the contract instruments.

1. No oral explanation in regard to the meaning of the specifications will be made, and no oral interpretation will be given before the award of the contract. If any person contemplating submitting a bid for this contract is in doubt as to the true meaning of any part of the specifications or any other proposed contract documents, he may submit to the University a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made by addendum duly issued or delivered to each person receiving a set of such documents. The University will not be responsible for any other explanation or interpretations of the proposed documents.
2. The University reserves the right to reject any and all bids and to waive any informality in bids.
3. Whenever the name of a manufacturer or vendor is mentioned on the face hereon and words "or equal" do not follow, it shall be deemed that the words "or equal" shall follow such designation unless the context specifies "no substitution". University assumes that items bid as equal are equal. University reserves the right to return at the bidder's expense all items that are furnished which are not acceptable as equals to items specified by the Bid Request and Specifications, and vendor agrees to replace such items with satisfactory items at the original bid price.
4. All items bid shall be new unless otherwise specified by the University.
5. Bidder agrees to unconditionally guarantee all items bid upon against defects in material and workmanship for a period of one year from the date of acceptance by the University unless otherwise specified.
6. Unless it is so noted on the bid it will be deemed that the article furnished is that designated. If the vendor proposes to furnish an item of a different manufacturer or vendor other than the one specified on the face hereof, the manufacturer or vendor of the substituted items shall be noted and complete descriptive literature describing the items to be substituted must accompany the bid.
7. Materials and services furnished the University are not subject to either Federal Excise Taxes or the Missouri Sales Tax. Exemption certificates will be furnished on request.
8. Prices quoted are to be firm and final and prices shall be stated in units of quantity specified with packing and drayage charges included.
9. Shipments shall be marked as directed on the Purchase Order.
10. C.O.D. shipments will not be accepted. All shipping charges must be PREPAID. No packing or drayage charges will be allowed.
11. The University will not be responsible for articles or services furnished without a Purchase Order.
12. Risk of loss or damage to the goods prior to the time of their receipt and acceptance by the University is upon the vendor.
13. All invoices and correspondence shall show the Purchase Order Number. All invoices must be rendered in duplicate and contain full descriptive information on items or service furnished. Separate invoices shall be rendered for each order and forwarded to the University.
14. Vendor agrees to defend, protect and save the University harmless from all claims and actions arising out of patent infringement.
15. University reserves the right to cancel all or any part of orders if shipment is not made as promised. Vendor shall notify the University if shipment cannot be made as promised. Time of proposed delivery must be stated in definite terms in the space provided.
16. The bidder hereby guarantees that no article listed herein is adulterated or misbranded within the meaning of the Federal Food, Drug and Cosmetic Act or an article which may not, under the provisions of Federal Law, be introduced into interstate commerce.
17. Samples, when required, are to be furnished prior to the date specified for receipt of bids.
18. In case of any doubt or difference of opinion as to the items to be furnished hereunder or the quality thereof, the decision of the UM Chief Procurement Officer shall be final and binding upon both parties.
19. The University reserves the right to award an order to the lowest aggregate bidder for all items or on an item basis, or a group of like items, whichever is found to be in the best interest of the University. If a split award is not acceptable to a bidder, it must be stated in the bid response.
20. In awarding the contract, the University may take into consideration the skill, facilities, capacity, experience, ability, responsibility, previous work, the financial standing of the bidder or bidders; the amount of other work being carried on by the bidder; the quality, efficiency, and construction of the equipment proposed to be furnished; the period of time within which the equipment is to be furnished and delivered; and the necessity of prompt delivery of the items herein described. The inability of any bidder to meet the requirement mentioned above may be cause for rejection of his bid.
21. In the event that time and materials are a portion of this bid, the University reserves the right to audit vendor's records concerning this bid.
22. All items or services to be furnished hereunder shall meet all applicable State and Federal requirements of the Occupational Safety and Health Standard. All alleged violations and deviations from said State and Federal regulations or standards of the items of services to be furnished hereunder, must be set forth on the Bid Form at the time of submission of the bid. Or if at any later date the items or services contained herein shall not meet all applicable state and federal requirements after the bidder is awarded the contract hereunder the bidder must notify the Campus Purchasing Manager, immediately by certified mail, return receipt requested.
23. The University serves from time to time as contractor for the United States Government. Accordingly, the provider of goods and/or services shall comply with federal laws, rules, and regulations applicable to subcontractors of government contracts including those relating to equal employment opportunity and affirmative action in the employment of minorities (Executive Order 11246), women (Executive Order 11375), persons with disabilities (29 USC 706 and Executive Order 11758), and certain veterans (38 USC 4212 formerly [2012]) contracting with business concerns with small disadvantaged business concerns (Publication L. 95-507). Contract clauses required by the Government in such circumstances are incorporated herein by reference.
24. The Curators of the University of Missouri have adopted a policy which is binding upon all employees and departments of the University, and which by contract shall be binding upon independent contractors and subcontractors with the University, whereby all other things being equal, and when the same can be secured without additional cost over foreign products, or products of other states, a preference shall be granted in all construction, repair and purchase contracts, to all products, commodities, materials, supplies and articles mined, grown, produced and manufactured in marketable quantity in the State of Missouri and to all firms, corporations or individuals doing business as Missouri, firms, corporations, or individuals. By virtue of the foregoing policy, preferences will be given to materials, products, supplies, or provisions, and all other articles produced, manufactured, mined or grown within the State of Missouri, and to all firms, corporations or individuals doing business as Missouri firms, corporations or individuals. Each bidder submitting a proposal agrees to comply with and be bound by the foregoing policy.

**Part 1 General**

- 1.1 The switchgear shall be in accordance with the attached one-line diagram, and shall conform to the following specification. Switchgear shall be S&C Vista Model 624 Padmounted Style, Catalog# 93624R1-P6-T4-L2-M3-O or approved equal. Switchgear shall be compatible with owners existing S&C Vista switchgear.
- 1.2 The switchgear shall consist of a gas-tight tank containing SF6 gas, load-interrupter switches and resettable fault interrupters with visible open gaps and integral visible grounds, motor operators and controls (as specified), a low-voltage enclosure (as specified), and a microprocessor-based overcurrent control. Load-interrupter switch terminals shall be equipped with bushings rated 600 amperes continuous, and fault-interrupter terminals shall be equipped with bushings rated 600 amperes continuous to provide for elbow connection. Manual operating mechanisms and viewing windows shall be located on the opposite side of the tank from the bushings and bushing wells so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.
- 1.3 Each three-phase load-interrupter and each three-phase fault-interrupter will be reference to as a “way”.
- 1.4 The ratings for the integrated switchgear shall be as designated below.

Frequency:	60 Hz
Short-Circuit Rating, RMS Symmetrical:	12,500 Amperes
kV, Maximum:	15.5kV
kV, BIL :	95kV
Main Bus Continuous, Amperes:	600
Three-Pole Load-Interrupter Switches:	
Continuous, Amperes	600
Load Dropping, Amperes	600
Fault-Closing, Duty-Cycle	
Three-Time, Amperes RMS Symmetrical	12,500
Three-Time, Amperes, Peak	32,500
10-Time, Amperes RMS Symmetrical	12,500
10-Time, Amperes, Peak	32,500
Fault Interrupters	
Continuous, Amperes	600
Load Dropping, Amperes	600
Fault Interrupting, Duty-Cycle	
Three-Time, Amperes RMS Symmetrical	12,500
Ten-Time, Amperes RMS Symmetrical	12,500
Fault-Closing, Duty-Cycle	
Three-Time, Amperes RMS Symmetrical	12,500

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Three-Time, Amperes, Peak.	32,000
10-Time, Amperes RMS Symmetrical	12,500
10-Time, Amperes, Peak	32,500

### 1.5 Certification of Ratings

- 1.5.1 The manufacturer of the switchgear shall be completely and solely responsible for the performance of the load-interrupter switch and fault interrupter as well as the complete integrated assembly as rated.
- 1.5.2 The manufacturer shall furnish, upon request, certification of ratings of the load-interrupter switch, fault interrupter, and the integrated switchgear assembly consisting of switches and fault interrupters in combination with the gas-tight tank.

### 1.6 Compliance with Standards and Codes

The switchgear shall conform to or exceed the applicable requirements of the following standards and codes:

- 1.6.1 The applicable portions of ANSI C57.12.28, covering enclosure integrity for padmounted equipment.
- 1.6.2 The applicable portions of ANSI C37.71, ANSI C37.72, ANSI C37.73, IEC 56, and IEC 265-1 (Class A), which specify test procedures and sequences for the load-interrupter switches, fault interrupters, and the complete switchgear assembly.
- 1.6.3 The applicable portions of IEC 298, Appendix AA covering arc resistance, through 12.5 kA for 15 cycles.

1.7 Switchgear shall be certified as arc resistant per IEC 298 Appendix AA

## **Part 2 Construction**

### 2.1 SF6 - Gas Insulation

- 2.1.1 The SF6 gas shall conform to ASTM D2472.
- 2.1.2 The switchgear shall be filled with SF6 gas to a pressure of 7 psig at 68°F.
- 2.1.3 The gas-tight tank shall be evacuated prior to filling with SF6 gas to minimize moisture in the tank.
- 2.1.4 The switchgear shall withstand system voltage at a gas pressure of 0 psig at 68° F.

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- 2.1.5 A gas-fill valve shall be provided.
- 2.1.6 A temperature-compensated pressure gauge shall be provided that is color coded to show the operating range. The gauge shall be mounted inside the gas-tight tank (visible through a large viewing window) to provide consistent pressure readings regardless of the altitude at the installation site.

### 2.2 Gas-Tight Tank

- 2.2.1 The tank shall be submersible and able to withstand up to 10 feet of water over the base.
- 2.2.2 The tank shall be of welded construction and shall be made of 7-gauge mild steel.
- 2.2.3 A means of lifting the tank shall be provided.

### 2.3 Gas-Tight Tank Finish

- 2.3.1 To remove oils and dirt, to form a chemically and anodically neutral conversion coating to improve the finish-to-metal bond, and to retard underfilm propagation of corrosion, mild-steel surfaces shall undergo a thorough pretreatment process of cleaning, rinsing, phosphatizing, sealing, drying, and cooling, before any protective coatings are applied. By utilizing this process, the mild-steel surfaces of the gas-tight tank shall receive a highly consistent thorough treatment, eliminating fluctuations in reaction time, reaction temperature, and chemical concentrations.
- 2.3.2 A representative test specimen coated by the manufacturer's finishing system shall satisfactorily pass the following tests:
  - (a) 1500 hours of pretreatment, protective coatings shall be applied that shall help resist corrosion and protect the mild-steel surfaces of the gas-tight tank. To establish the capability to resist corrosion and protect the mild steel, exposure to salt-spray testing per ASTM B 117 with:
    - (i) Underfilm corrosion not to extend more than 1/32" from the scribe as evaluated per ASTM D 1645, Procedure A, Method 2 (scraping).
    - (ii) Loss of adhesion from bare metal not to extend more than 1/8" from the scribe.

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(b) 1000 hours of humidity testing per ASTM D 4585 using the Cleveland Condensing Type Humidity Cabinet with no blistering as evaluated per ASTM D 714.

(c) Crosshatch adhesion testing per ASTM D 3359 Method B with no loss of finish. Certified test abstracts substantiating the above capabilities shall be furnished upon request.

2.3.3 The finish shall be inspected for scuffs and scratches. Blemishes shall be touched up by hand to restore the protective integrity of the finish.

2.3.4 The finish shall be indoor light gray, satisfying the requirements of ANSI Standard Z55.1 for No. 61.

### 2.4 Viewing Windows

2.4.1 Each load-interrupter switch shall be provided with a large viewing window at least 6 inches by 12 inches to allow visual verification of the switch-blade position (open, closed, and grounded) while shining a flashlight on the blades.

2.4.2 Each fault interrupter shall be provided with a large viewing window at least 6 inches by 12 inches to allow visual verification of the disconnect-blade position (open, closed, and grounded) while shining a flashlight on the blades.

2.4.3 Viewing windows shall be located on the opposite side of the gear from the bushings and bushing wells so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

### 2.5 High-Voltage Bus

2.5.1 Bus and interconnections shall withstand the stresses associated with short-circuit currents up through the maximum rating of the switchgear.

2.5.2 Before installation of aluminum bus, all electrical contact surfaces shall first be prepared by machine abrading to remove any oxide film. Immediately after this operation, the electrical contact surfaces shall be coated with a uniform coating of an oxide inhibitor and sealant.

### 2.6 Provisions for Grounding

2.6.1 **One ground-connection pad per way shall be provided on the gas-tight tank of the switchgear.**

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2.6.2 The ground-connection pad shall be constructed of stainless steel and welded to the gas-tight tank, and shall have a short-circuit rating equal to that of the switchgear.

2.6.3 One enclosure ground pad shall be provided.

### 2.7 Terminations

2.7.1 Terminals for load-interrupter switches and fault interrupters shall have 600-ampere bushings for non-load break, bolted elbow connection.

2.7.2 Bushings and bushing wells shall be located on one side of the gear to reduce the required operating clearance.

2.7.3 Bushings rated 600 amperes continuous shall be provided *Without* a threaded stud.

### 2.8 Bushings and Bushing Wells

2.8.1 Bushings and bushing wells shall conform to ANSI/IEEE Standard 386 (ANSI Standard C119.2).

2.8.2 Bushings and bushing wells shall include a semiconductive coating.

2.8.3 Bushings and bushing wells shall be mounted in such a way that the semiconductive coating is solidly grounded to the gas-tight tank.

## Part 3 Basic Components

### 3.1 Load-Interrupter Switches

3.1.1 The three-phase, gang-operated load-interrupter switches shall have a three-time and ten-time duty-cycle fault-closing rating as specified under section 1.4. Certified test abstracts establishing such ratings shall be furnished upon request.

3.1.2 The switch shall be provided with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment. The switch blade ends must be highly visible to easily indicate the switch position (closed/open/grounded) during low lighting conditions.

3.1.3 The ground position shall have a three-time and ten-time duty-cycle fault-closing rating as specified in section 1.4.

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- 3.1.4 The switch shall be provided with an open position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to establish a visible gap.
- 3.1.5 The open gaps of the switch shall be sized to allow cable testing through a feedthru bushing or the back of the elbow.

### 3.2 Fault Interrupters

- 3.2.1 Fault interrupters shall have a three-time and ten-time duty-cycle fault-closing and fault interrupting rating as specified under section 1.4. Certified test abstracts establishing such ratings shall be furnished upon request.
- 3.2.2 The fault interrupter shall be provided with a disconnect with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment. The switch blade ends must be highly visible to easily indicate the switch position (closed/open/grounded) during low lighting conditions.
- 3.2.3 The ground position shall have a three-time and ten-time duty-cycle fault-closing rating as specified in section 1.4.
- 3.2.4 The disconnect shall be provided with an open position that is readily visible through the viewing window, eliminating the need for cable handling and exposure to high voltage to establish a visible gap.
- 3.2.5 The fault interrupter, including its three-position disconnect, shall be a single integrated design so that operation between the closed and open positions or the open and grounded positions is accomplished with a single, intuitive movement.
- 3.2.6 The open gaps of the disconnect shall be sized to allow Hi-Pot testing through the bushing.
- 3.2.7 An internal indicator shall be provided for each fault interrupter to show when it is in the tripped condition. The indicator shall be clearly visible through the viewing window.



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### 3.3 Operating Mechanisms

- 3.3.1 Load-interrupter switches and fault interrupters shall be operated by means of a quick-make, quick-break mechanism.
- 3.3.2 The manual handle shall charge the operating mechanism for opening, closing, and grounding of the switches and fault interrupters.
- 3.3.3 A single, integrated operating mechanism shall fully operate each fault interrupter or load interrupter switch in a continuous movement, so that additional operations are not required to establish open or ground positions.
- 3.3.4 Operating mechanisms shall be equipped with an operation selector to prevent inadvertent operation from the closed position directly to the grounded position, or from the grounded position directly to the closed position. The operation selector shall require physical movement to the proper position to permit the next operation.
- 3.3.5 Operating shafts shall be padlockable in any position to prevent operation.
- 3.3.6 The operation selector shall be padlockable to prevent operation to the grounded position.
- 3.3.7 The operating mechanism shall indicate switch position which shall be clearly visible from the normal operating position.

### 3.4 Overcurrent Control

- 3.4.1 A microprocessor-based overcurrent control shall be provided to initiate fault interruption.
- 3.4.2 The control shall be mounted in an enclosure and shall be removable in the field without taking the gear out of service.
- 3.4.3 Control settings shall be field programmable using a personal computer connected via a data port to the control. The data port shall be accessible from the exterior of the enclosure. Neither external power nor energization of the gear shall be required to set or alter control settings.
- 3.4.4 Power and sensing for the control shall be supplied by integral current transformers.
- 3.4.5 The minimum total clearing time (from initiation of the fault to total clearing) for fault interruption shall be 40 milliseconds (2.4 cycles) at 60 hertz.

- 3.4.6 The control shall provide time-current characteristic (TCC) curves including standard E-speed, K-speed, coordinating-speed tap, coordinating-speed main curves, and relay curves per IEEE C37.112-1996. Coordinating-speed tap curves shall optimize coordination with load-side weak-link/backup current-limiting fuse combinations, and coordinating-speed main curves shall optimize coordination with tap-interrupter curves and upstream feeder breakers.
- 3.4.7 The standard E-speed curve shall have phase-overcurrent settings ranging from 25E through 400E. The coordinating-speed tap curve shall have phase-overcurrent and independent ground-overcurrent settings ranging from 50 amperes through 400 amperes. The coordinating-speed main curve shall have phase-overcurrent and independent ground-overcurrent settings ranging from 100 amperes through 800 amperes.
- 3.4.8 The time-overcurrent relay curves conform to IEEE C37.112-1996 IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays for the following curves:
- U.S. Moderately Inverse Curve U1, U.S. Inverse Curve U2, U.S. Very Inverse Curve U3, U.S. Extremely Inverse Curve U4, U.S. Short-Time Inverse Curve U5, I.E.C. Class A Curve (Standard Inverse) C1, I.E.C. Class B Curve (Very Inverse) C2, I.E.C. Class C Curve (Extremely Inverse) C3, I.E.C. Long-Time Inverse Curve C4, and I.E.C. Short-Time Inverse Curve C5.
- 3.4.9 The control shall have instantaneous-trip (1 kA through 8 kA) and definite-time delay (32 ms through 96 ms) settings to allow tailoring of the coordinating-speed tap and coordinating-speed main curves to the application.
- 3.4.10 Event records shall be easily extractable from the control using a personal computer connected to the data port.
- 3.4.11 The control shall store sufficient energy to operate the motor operators for the interrupter switches without impacting the accuracy or coordination under fault conditions.

3.5 Voltage indication with provisions for low-voltage phasing

- 3.5.1 Voltage indication with provisions for low-voltage phasing for each load-interrupter switch and fault interrupter, shall be provided by means of capacitive taps on the bushings. There shall be no need for cable handling and exposure to high voltage to test the cables for voltage and phasing. This feature shall include a flashing LCD display to indicate the presence of voltage for each phase, and a solar panel to supply power for testing of the complete voltage-indication circuit and phasing circuit.
- 3.5.2 The voltage-indication feature shall be mounted on the opposite side of the gear from the bushings and bushing wells so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

**Part 4 Switchgear Style**

4.1 Pad-Mounted Style

- 4.1.1 The gas-tight tank shall be made of 7-gauge mild-steel as specified in sections 2.2 and 2.3.
- 4.1.2 Enclosure
  - (a) The switchgear shall be provided with a pad-mounted enclosure suitable for installation of the gear on a concrete pad.
  - (b) The pad-mounted enclosure shall be separable from the switchgear to allow clear access to the bushings and bushing wells for cable termination.
  - (c) The basic material shall be 14-gauge hot-rolled, pickled, and oiled steel sheet.
  - (d) The enclosure shall be provided with removable front and back panels, and hinged lift-up roof sections for access to the operating and termination compartments. Each roof section shall have a retainer to hold it in the open position.
  - (e) Lift-up roof sections shall overlap the panels and shall have provisions for padlocking that incorporate a means to protect the padlock shackle from tampering.
  - (f) Penta-head bolts shall be used to limit all entry to enclosure.

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- (g) The base shall consist of continuous 90-degree flanges, turned inward and welded at the corners, for bolting to the concrete pad.
- (h) Panel openings shall have 90-degree flanges, facing outward, that shall provide strength and rigidity as well as deep overlapping between panels and panel openings to guard against water entry.
- (i) For bushings rated 600 amperes continuous, the termination compartment shall be of an adequate depth to accommodate encapsulated surge arresters mounted on 600-ampere elbows having 200-ampere interfaces.
- (j) An instruction manual holder shall be provided.
- (k) Non-removable lifting tabs shall be provided.

4.1.3 Enclosure Finish

- (a) All exterior welded seams shall be filled and sanded smooth for neat appearance.
- (b) To remove oils and dirt, to form a chemically and anodically neutral conversion coating to improve the finish-to-metal bond, and to retard underfilm propagation of corrosion, all surfaces shall undergo a thorough pretreatment process comprised of a fully automated system of cleaning, rinsing, phosphatizing, sealing, drying, and cooling, before any protective coatings are applied. By utilizing an automated pretreatment process, the enclosure shall receive a highly consistent thorough treatment, eliminating fluctuations in reaction time, reaction temperature, and chemical concentrations.
- (c) After pretreatment, protective coatings shall be applied that shall help resist corrosion and protect the steel enclosure. To establish the capability to resist corrosion and protect the enclosure, representative test specimens coated by the manufacturer's finishing system shall satisfactorily pass the following tests:
  - (i) 4000 hours of exposure to salt-spray testing per ASTM B 117 with:
    - (1) Underfilm corrosion not to extend more than 1/32" from the scribe as evaluated per ASTM D 1645, Procedure A, Method 2 (scraping); and
    - (2) Loss of adhesion from bare metal not to extend more than 1/8" from the scribe.

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- (ii) 1000 hours of humidity testing per ASTM D 4585 using the Cleveland Condensing Type Humidity Cabinet with no blistering as evaluated per ASTM D 714.
  - (iii) 500 hours of accelerated weathering testing per ASTM G 53 using lamp UVB-313 with no chalking as evaluated per ASTM D 659, and no more than 10% reduction of gloss as evaluated per ASTM D 523.
  - (iv) Crosshatch adhesion testing per ASTM D 3359 Method B with no loss of finish.
  - (v) 160-inch-pound impact adhesion testing per ASTM D 2794 with no chipping or cracking.
  - (vi) Oil resistance testing consisting of a 72-hour immersion bath in mineral oil with no shift in color, no streaking, no blistering, and no loss of hardness.
  - (vii) 3000 cycles of abrasion testing per ASTM 4060 with no penetration to the substrate. Certified test abstracts substantiating the above capabilities shall be furnished upon request.
- (d) The finish shall be inspected for scuffs and scratches. Blemishes shall be touched up by hand to restore the protective integrity of the finish.
- (e) The finish shall be olive green, Munsell 7GY3.29/1.5. One can of touch-up paint shall be provided for each unit provided.

**Part 5 Labeling**

5.1 Hazard-Alerting Signs

- 5.1.1 The exterior of the pad-mounted enclosure (if furnished) shall be provided with “Warning—Keep Out—Hazardous Voltage Inside—Can Shock, Burn, or Cause Death” signs.
- 5.1.2 Switchgear shall be provided with a “Danger—Hazardous Voltage—Failure to Follow These Instructions Will Likely Cause Shock, Burns, or Death” sign. The text shall further indicate that operating personnel must know and obey the employer’s work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.

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- 5.1.3 Switchgear shall be provided with a “Danger—Keep Away—Hazardous Voltage—Will Shock, Burn, or Cause Death” sign.

### 5.2 Nameplates, Ratings Labels, and Connection Diagrams

- 5.2.1 Switchgear shall be provided with a nameplate indicating the manufacturer’s name, catalog number, model number, date of manufacture, and serial number.
- 5.2.2 Switchgear shall be provided with a ratings label indicating the following:  
  
voltage rating; main bus continuous rating; short-circuit rating; fault-interrupter ratings including interrupting and duty-cycle fault-closing; and load-interrupter switch ratings including duty-cycle fault-closing and short-time.
- 5.2.3 The pad-mounted enclosure shall be provided with a connection diagram showing load-interrupter switches, fault interrupters with integral disconnects, and bus along with the manufacturer’s model number.

## Part 6 Testing Requirements

- 6.1 A certified third party independent test report shall be submitted if requested. This report shall include, but is not limited to, Short Time Current, Momentary and 1 Second. Unit shall be tested in accordance with the appropriate sections on ANSI C37.34-1971, “American National Test Code for High-Voltage Air Switches”.

## Part 7 Shipping

- 9.1 Shipping shall be F.O.B. University of Missouri-Columbia, Energy Management. Receiving by the University shall be during normal business hours Monday – Friday, 8:00am to 3:00pm. Notice shall be given 48 hours prior to arrival to allow arrangements to be made for receiving. **Notice shall be given to Energy Management Electric Distribution Supervisor by calling (573) 882-3094 at least 48 hours prior to arrival on site.**

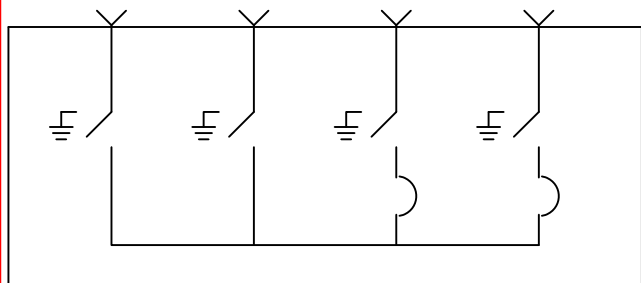
University of Missouri Request for Bid # 17 8014 KS C

**Pricing**

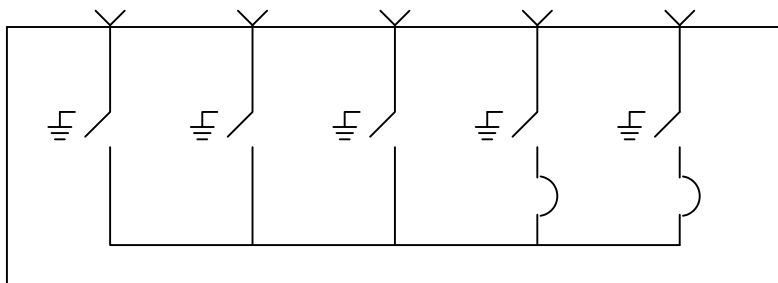
Medium Voltage Switchgear  
(per attached specifications)

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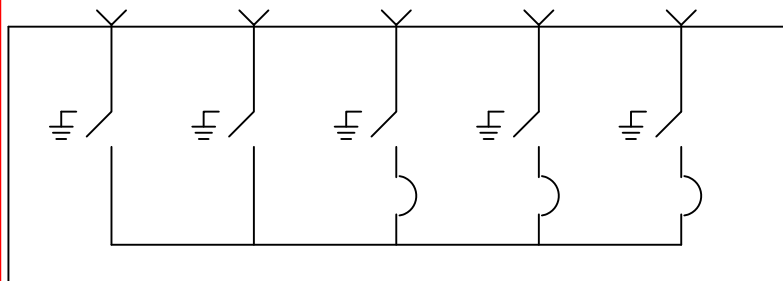
Bidder may attach an itemized quotation showing complete equipment description.



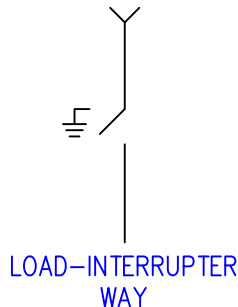
4-WAY  
(422)



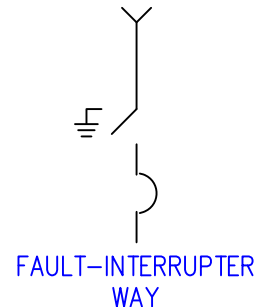
5-WAY  
(532)



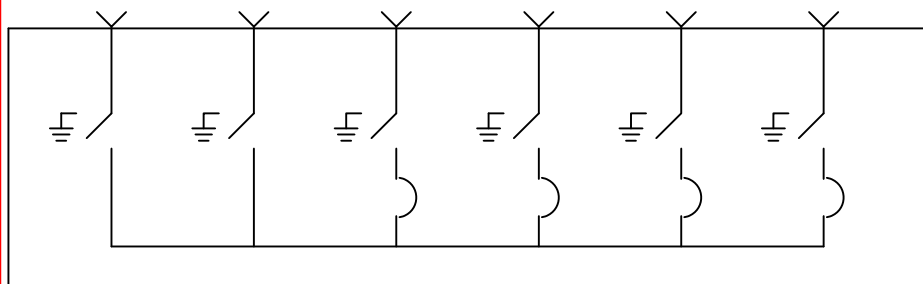
5-WAY  
(523)



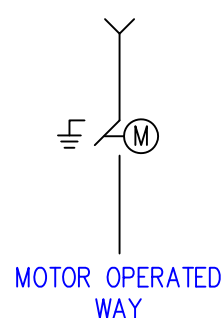
LOAD-INTERRUPTER  
WAY



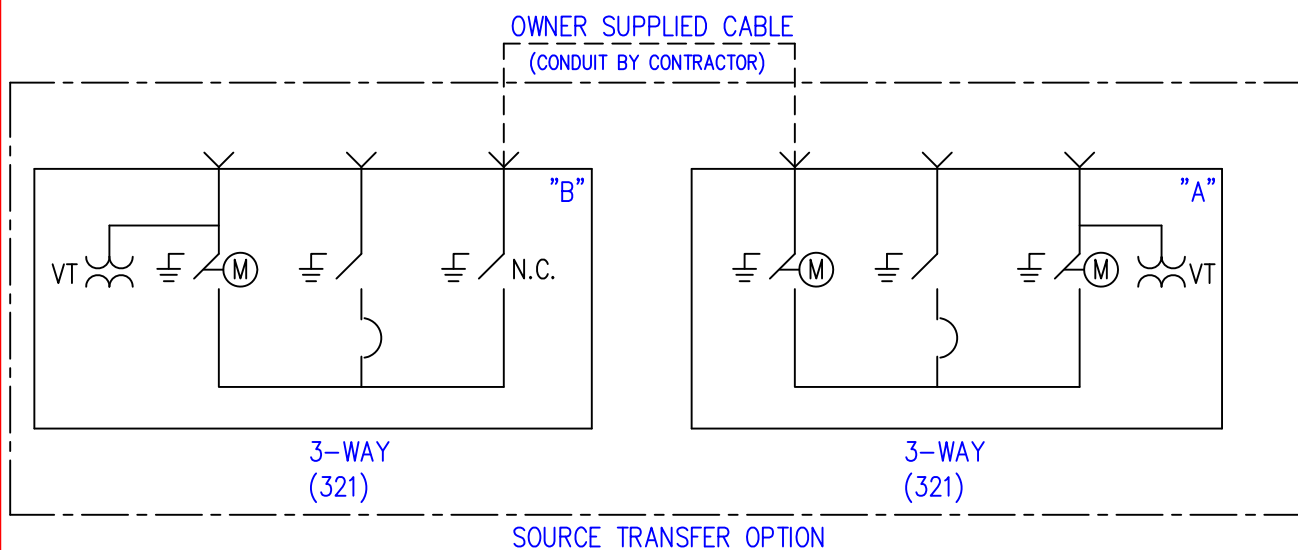
FAULT-INTERRUPTER  
WAY



6-WAY  
(624)



MOTOR OPERATED  
WAY



SOURCE TRANSFER OPTION

REV	DATE
E	10/8/13
B	6/13/06
C	7/20/06
D	1/23/12
DRAWN BY: JS	
REVISED BY: ZK	

# Construction Standard Switchgear One-Line Diagrams



UNIVERSITY OF MISSOURI-COLUMBIA  
Campus Facilities  
Energy Management

DRAWING  
NOT TO SCALE  
DATE: 5/17/06