CITY OF AUSTIN ELECTRIC UTILITY DEPARTMENT

PURCHASE SPECIFICATION

FOR

SWITCHGEAR,DISTRIBUTION,URD PADMOUNT,3PH,600A,15KV,DEADFRONT,SF6 INSULATED,DOUBLE-TANK,AUTOMATIC-TRANSFER,REMOTE SUPERVISORY

DATE	PREPARED BY	ISSUANCE/REVISION	APPROVAL
6/1/99	BOB BOYKIN	ISSUANCE	
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11/25/2024	BRANTLEY GOSEY	REVISION	
04/01/25	BRANTLEY GOSEY	REVISION	

REASON FOR REVISION	*AFFECTED PARAGRAPHS*
Issuance	
2/1/23: Change radio from Utilinet Integrated Wangate (IWR), Series IV to Sierra Wireless RV55 (Part Number 1104303).	3.7.6
11/25/24: update to specify SEL 451	3.4, 3.6, 3.7, 3.8, 3.9, 4.1, 4.8, 4.10
04/01/25: removal of remote control and clarifications for LI and VFI	3.3.2, 3.3.3, 3.4.3, 3.4.4, 3.7.2.2, 3.7.9.2, 3.9.2, 3.9.8.1, 3.10.3.2, 4.1.9, 4.1.13,

This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein. Retain for future reference.

1.0 SCOPE

1.1 The City of Austin Electric Utility, hereinafter referred to as Austin Energy (AE), requires a qualified Manufacturer to provide an arc-resistant, 600 Ampere, 15 kV, 95 kV BIL, outdoor, fully-enclosed, padmounted, SF_6 insulated, dual tank, load interrupting switchgear with an automatic source transfer switch to provide switching and fault interrupting for an underground distribution system with a solidly-grounded neutral.

1.2 The Manufacturer of this switchgear shall have a minimum 5 years of experience in the manufacture of vacuum and SF_6 switchgears at 15 kV.

2.0 APPLICABLE SPECIFICATIONS

2.1 The padmounted gear shall conform to or exceed the applicable requirements of ANSI, IEEE, IEC, NEMA, AWS, NESC, and NEC including, but not limited to, the following standards and codes, latest revision:

2.1.1 IEEE C37.60 – Standard Requirements for Overhead, Padmounted, Dry Vault and Submersible Automatic Circuit Reclosers and Fault Interrupters for Alternating Current systems up to 38 kV

2.1.2 IEEE 37.71 – Standard for the three-phase, manually operated, subsurface and vault load-interrupting switches for Alternating Current systems

2.1.3 IEEE C37.72 – Standard for Manually Operated, Dead-Front Padmounted Switchgear with Load Interrupting Switches and Separable Connectors for Alternating Current Systems

2.1.4 IEEE C37.73 – Standard Requirements for Padmounted Fused Switchgear

2.1.5 IEEE C37.74 - Standard Requirements for Subsurface, Vault, and Padmounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems up to 38 kV

2.1.6 IEEE C37.112 – Standard Inverse-Time Characteristic Equations for Overcurrent Relays

2.1.7 IEEE C57.12.28 – Standard for Pad-Mounted Equipment – Enclosure Integrity

2.1.8 IEEE 386 – Standard for separable insulated connector systems for power distribution systems above 600V

2.1.9 ANSI Z535 – Standard for Design, Evaluation, and Use of Safety Signs, Colors, and Symbols

2.1.10 AWS D1.1 – Steel Structural Welding Code

3.0 FUNCTIONAL REQUIREMENTS

3.1 Design

3.1.1 Dry Type, Deadfront switching design

3.1.2 General

3.1.2.1 Rated Voltage Class:	15 kV
3.1.2.2 Rated Continuous Current:	600 A
3.1.2.3 Rated Load Break:	600 A
3.1.2.4 Impulse Level (BIL):	95 kV
3.1.2.5 Rated Frequency:	60 Hz
3.1.2.6 One Minute AC Withstand:	35 kV
3.1.2.7 RMS Symmetrical Amperes	12,500 A
3.1.2.8 Three-time Duty-Cycle Fault Closing	12,500 A

3.1.3 Three Pole Load Interrupter Switches

3.1.3.1 Continuous Amperes	600 A
3.1.3.2 Load Dropping Amperes	600 A

3.1.4 Fault Interrupters

3.1.4.1 Continuous Amperes	600 A
3.1.4.2 Load Dropping Amperes	600 A

3.1.5 Fault Closing Duty Cycle

3.1.5.1 Amperes RMS symmetrical	12,500 A

3.2 The switch shall be a four-way configuration (See Attachment 1). Two ways shall be three-phase ganged vacuum interrupting ways for line side switching. Two ways shall be three-phase ganged vacuum interrupters for load side switching and fault interrupting.

3.3 Load Break/Interrupter Switch Operation

3.3.1 Load-break/interrupter switches and/or fault interrupters shall be operated by means of a quick-make, quick-break mechanism.

3.3.2 Load and Fault interrupters are two separate and independent units. The Load Interrupter is manually operated, and the Fault Interrupter is electrically operated via a Magnetic Actuator.

3.3.3 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 operations selector shall require physical movement to the proper position to permit the next operation.

3.3.4 The operation selector shall be padlockable to prevent operation to the grounded position.

3.3.5 The operation mechanism shall indicate switch position which shall be clearly visible from the normal operating position.

3.3.6 Operating shafts shall be padlockable in any position to prevent operation.

3.4 Interrupters

3.4.1 600A, 3-pole group operated fault interrupter switches shall be in accordance with IEEE C37.60. Load Interrupters are per the current standard C37.74.

The switches shall safely withstand the effect of closing, carrying and interrupting all possible currents up to the assigned maximum short circuit rating, in accordance with NEC.

3.4.2 Load Interrupter switches shall be enclosed in an inner 305 grade stainless steel or mild steel tank and shall be furnished with bushings rated 600A continuous to permit connection of elbows external to the switch compartment.

3.4.3 Load Interrupter switches shall utilize a quick-make quick-break mechanism installed by the switch manufacturer. The quick-make quick-break mechanism shall be integrally mounted on the switch frame, and shall swiftly and positively open and close the interrupter switch independent of the switch-operating-hub speed.

3.4.4 Interrupter switch contacts shall be backed up by stainless-steel springs to provide constant high contact pressure.

3.4.5 Load Interrupter switches shall be provided with a double blade per phase for circuit closing, including fault closing, continuous current carrying, and circuit interrupting. Spring-loaded auxiliary blades shall not be permitted. Interrupter switch blade supports shall be permanently molded in place in a unified insulated shaft constructed of the same cycloaliphatic epoxy resin as the insulators.

3.4.6 Circuit interruption shall be accomplished by use of an load interrupter which is positively and inherently sequenced with the blade position. It shall not be possible for the blade and interrupter to get out of sequence. Arc shall be interrupted and extinguished in the SF6 gas insulating medium, and there is no exhaust.

3.4.7 The fault interrupting ways shall incorporate a fuse-less, resettable, electronically controlled, overcurrent protection system to sense load and fault current on each phase and neutral of the switch. The protection system shall utilize a SEL 451 relay or AE Standards Engineering approved equal part number to be updated to account for connection to radio.

3.4.8 The switch and electronic controls shall function in a temperature range of - 30° to 50° C and be enclosed in a NEMA 12 enclosure.

3.4.9 Each fault interrupter way shall have a load rated open/close bypass switch.

3.4.11 Vacuum fault interrupter to be electrically operated unit in both the close and open positions and uses a magnetic actuator to operate. Unit shall use magnetic actuator to close, and during the close operation an opening spring is charged. For the open/trip operation the magnetic actuator releases the open spring so the unit can open/trip. The unit will be powered by Power Transformers (PT's) that are mounted inside the Switch Tank. The magnetic actuator allows for automatic operation (open & closed) without motor operators and provides higher reliability (one moving part, located inside tank protected from ambient environment, no settings, no adjustments, no wear).

3.5 Cable Guides

3.5.1 Cable guides shall be provided, to assist in cable training and provide additional protection against damage from excessive cable or foundation movement. The switch side shall have cable guides that accommodate #2 AWG through 1000 kcmil cable.

3.6 Automatic Source Transfer Switch

Automatic Operation

Preferred source selection, Source 1 or Source 2

Retransfer selection:

- Retransfer on, the control will always return to the preferred source that is selected when it becomes healthy.
- Retransfer off, will continue to feed from the source it is feeding from until that source become unhealthy, regardless of the preferred source selection.
- Closed transition, the sources are paralleled momentarily to ensure the load does not see any loss of voltage during this event.
- Open transition, the load will see a loss of voltage for a few cycles during this event.

NON-BYPASS Operation

The transfer timer by-pass is in the non-by-pass position. In this position the transfer timers are used, and transfer time is dependent upon the following settings:

- Loss of Voltage (Less than 102V) = 1 second delay
- Low Voltage (Greater than 102V and less than 111V) = 1 minute delay, this follows the closed transfer logic
- High Voltage (Greater than 129V and less than 132V) = 5-minute delay
- Excessive High Voltage (Greater than 132V) = 1 second delay, this also follows the closed transfer logic
- Voltage Imbalance (Greater than 132V) = 1 second delay, this also follows the closed transfer logic

Timer delay durations

- Switching Mode: 60 seconds
- Manual to Automatic: 60 seconds
- Alternate to Preferred Retransfer: 300 seconds.
- Manual close: 60 seconds
- Double Source Loss (Open) < 111V or > 129V: 1 second
- Restore After Double Source Loss (Close): 60 seconds.
- Hold Manual Button to Enter Manual Mode: 2 seconds.

SEL-451 Overcurrent protection - Fault interruption

- Phase and neutral protection

Voltage protection:

- Loss of Voltage (Less than 102V)
- Low Voltage (Greater than 102V and less than 111V)
- High Voltage (Greater than 129V and less than 132V)
- Excessive High Voltage (Greater than 132V)
- Voltage Imbalance (Greater than 132V)

BY-PASS Operation

All time delays mentioned in NON-BP mode will be bypassed. All transfers will be open transfer in this mode, except if 4% imbalance in NON-BP occurs with voltages in the >111V and <130V range, closed transfer will execute after 10 sec delay. Retransfers will follow the retransfer mode selection.

Counters

- Source 1 - counts each Source 1 Open operation.
- Source 2 - counts each Source 2 Open operation.

Indicating LED's

- Source 1 Voltage Good
- Source 2 Voltage Good
- Source 1 Open
- Source 2 Open
- Manual Mode
- Malfunction
- Auto Mode
- Source 1 Preferred
- Source 2 Preferred
- Supervisory Mode
- Retransfer On
- Retransfer Off
- Closed Retransfer
- Open Retransfer
- Source 1 Phase Rotation
- Source 2 Phase Rotation

Manual Operation

The control will not respond to automatic commands. All automatic operations are disabled. The control will however respond to supervisory commands if supervisory is enabled. Additionally, while in manual the control will respond to an overcurrent event. The manual button must be pressed and held for (2) seconds to enter into manual mode.

Switching Mode

To allow closed or open transition switching from closed source to available alternate source. Operation is as follows:

- Press manual mode button and hold for 2 seconds.
- Select switching mode button to enter switching mode.
- Press operate switching.
- After 60 second delay the interrupter will transfer to the opposite source following a closed transition or open transition operation depending on transition selection. Note, transition selection is done via the "Local Control" menu on the SEL HMI.
- Switching mode can be canceled while the 60 second timer is timing by pressing either manual or cancel switching buttons.
- Press cancel switching button to exit switching mode.

Control Power Redundant Power

The ATS will be provided with a Schweitzer Redundant Power Module p/n RPM#J4C8, which will provide backup control power to the SEL-451 in the event both Sources are lost for a period of 60 seconds.

3.7 Micro-Processor Functional Requirements

3.7.1 The source transfer control shall be a micro-processor based unit, which can be programmed to perform specific control operations, as directed by settings programmed into the device at the factory and in the field.

3.7.2 The settings for the micro-processor control unit shall include the following:

3.7.2.1 Source-transfer control's operating characteristics

3.7.3 Keypad Entry

3.7.3.1 The micro-processor control unit shall have the capability to have the settings (§ 4.10.2) entered with a keypad. This keypad shall be readily accessible in the field and shall be located in the front of the control panel.

3.7.4 Remote Indication

3.7.4.1 Remote shall be capable of monitoring for the presence or absence of both source voltages, manual or automatic operating mode, status of ready indicator, "event" indicator, and overcurrent lockout.

3.7.5 Communications Card

3.7.5.1 Communications shall be provided to permit local downloading of system events records, operating characteristics and voltage, current, time –related operating parameters and settings from the control to a personal computer. Connecting cable shall be included with each unit.

3.7.6 Remote Supervisory Control

3.7.6.1 The remote communication and equipment shall include voltage sensors, current sensors, self-contained power source 120VAC to 24VDC converter that will be provided for power from RPM to the radio. Space shall be available for installation of Sierra Wireless RV55 (Part Number 1104303) with antenna (or Standards Engineer approved equal) and surge protector. The following shall be included microprocessor-based programmable remote terminal unit (RTU), SEL 451 Relay (or Standards Engineer approved equal) for use as an RTU for communication and event recording. Relay shall have Ethernet Port.

Potential transformers for voltage sensing and current transformers for current sensing are acceptable alternatives.

3.7.7 The switchgear shall communicate using DNP 3.0 protocol.

3.7.8 Remote Terminal Unit Indication and Control

3.7.8.1 The Remote Terminal Unit shall be pre-programmed to control or report the following:

3.7.8.1.1 Open/Close for both preferred and alternate source

3.7.8.1.2 Transfer between both alternate and preferred source

3.7.8.1.3 Remote or manual control position

3.7.8.1.4 Auto-Transfer or manual control position

3.7.8.1.5 Switch source position

3.7.8.1.6 Three phase current and voltage both preferred and alternate source

3.7.8.1.7 Transfer healthy

3.7.8.1.8 RPM to provide power to control devices

3.7.8.1.9 Over-Current lockout alarm

3.7.8.1.10 Loss of control power

3.7.8.1.11 Fault Indication

3.7.8.1.12 Low SF_6 Pressure

3.7.9 Visual Display

3.7.9.1 The display for the entry and review of the settings shall be a liquid-crystal display (LCD) with backlighting. The liquid-crystal display (LCD) shall provide a means for viewing the operating characteristics and operating parameters, which have been programmed into the micro-processor control unit.

3.7.10 Menu Driven Settings

3.7.10.1 The micro-processor control unit shall have menu driven settings for the operating characteristics and operating parameters.

3.7.11 Access Code

3.7.11.1 There shall be provisions for use of access codes, to prevent unauthorized changes to the operating characteristics and operating parameters of micro-processor control unit. Each item shall be protected by an access code; the correct access code shall be entered before an item can be altered.

3.7.12 Microprocessor shall be Schweitzer SEL 451.

3.8 Voltage Sensing and Control Power

3.8.1 Voltage sensing shall be provided by potential transformers.

3.8.2 Control power shall be provided by fused potential transformers internal to the tank.

3.8.3 The PT's provided are Single Phase, GE/ITI or Amran, Ratio 60:1, One Bushing/One Fuse, 7200:120V with 1.0E Continuous Amp Fuse. A total of six PT's are provided, three for each source.

3.8.4 Acceptable alternative, utilize potential transformers which are mounted inside the switch tanks to provide voltage inputs to the source voltage control, as well as control power.

3.9 Remote Supervisory Control

3.9.1 The remote communication and control equipment shall include voltage sensors, current sensors, self-contained 120 volt 60 hertz power source, DC battery charger with battery. Alternatively, potential transformers and current transformers can be used as substitute.

3.9.2 SEL 451 Relay with Ethernet port (or Standards Engineer approved equal) for use as an RTU for communication and event recording.

3.9.3 Overcurrent control shall be achieved through SEL 451 (or Standards Engineer approved equal).

3.9.4 The switchgear shall communicate using DNP 3.0 protocol.

3.9.5 Switchgear shall have the following remote indication points:

3.9.5.1 Source voltage 1 available

3.9.5.2 Source voltage 2 available

3.9.5.3 Control voltage for switch operation

3.9.5.4 Source 1 vacuum interrupter open / closed

3.9.5.5 Source 2 vacuum interrupter open / closed

3.9.5.6 Remote or local indication (manual / auto)

3.9.5.7 Fault Indication

3.9.5.8 Low SF_6 Pressure

3.9.6 Switchgear shall have the following remote control functions:

3.9.6.1 Open command from remote control will cause the closed source vacuum interrupter to open in Manual Mode.

3.9.6.2 Close command from remote control will re-enable automatic transfer functions causing the preferred source vacuum interrupter to close, unless that source is unavailable, which will result in the back-up source closing.

3.10 Indicator Lights & Test Keys

3.10.1 The indicator light emitting diodes (LED) and test keys shall perform the following functions including but not limited to:

3.10.2 Source Voltage

3.10.2.1 Light Emitting Diode (LED) indicator lights shall be furnished for indicating the presence of acceptable voltage on each high voltage source.

3.10.3 Test Keys

3.10.3.1 Test keys shall be furnished for simulating loss of voltage on each of the two (2) sources, as well as for checking the functioning of the indicator lamps, display, and keypad.

3.10.4 A light-emitting diode (LED) lamp shall be furnished for indicating that the control is in the automatic mode, the operation selector for each operator is in the operating position, and all control circuitry is properly connected for automatic transfer Diagnostics & Events Log

3.10.5 The control shall include built-in diagnostics for analyzing system events. The device shall automatically record system status and source-transfer control status every time a control operation occurs.

3.10.6 All operations shall be indicated by the illumination of the light emitting diode (LED) indicator lights.

4.0 MECHANICAL REQUIREMENTS

4.1 Enclosure

4.1.1 The switchgear enclosure shall be in accordance with ANSI C57.12.28.

4.1.2 The roof of the switchgear enclosure shall be crowned for proper water drainage.

4.1.3 Coal-tar epoxy coating, or any tar based coating, shall not be accepted.

4.1.4 The switchgear enclosure shall be of a standing, outdoor type construction. The cabinet shall be constructed of 11 gauge sheet stainless steel (minimum) or mild steel. Bolted sheet metal are is acceptable. All structural joints and butt joints shall be welded and the external seams shall be ground flush and smooth. All welding shall be in accordance with AWS D1.1.

4.1.5 All hinges, hinge pins, parking stands and permanent lifting provisions shall be stainless steel.

4.1.6 The paint finish shall be Munsell No. 7GY3.29/1.5 green in accordance with IEEE C57.12.28 and shall come with a 5 year non prorated finish guarantee.

4.1.7 Removable stainless steel lifting eyes shall be provided and capable of supporting the weight of the enclosure.

4.1.8 The base shall have 90-degree flanges, turned inward and welded at the corners, for bolting to a concrete pad.

4.1.9 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 prevent water entry.

4.1.10 The enclosure shall have provisions for the switchgear drawings, instruction manuals and an appropriate adapter cable to connect from a computer to the SEL-451 relay.

4.1.11 The enclosure termination compartment shall have adequate depth to accommodate the lengthy cable accessories such as double stacked 600 ampere elbows and surge arrester mounted on 600 ampere elbows.

4.1.12 The enclosure shall be separable from the switchgear tanks to allow clear access to the bushings and bushing wells for cable termination.

4.1.13 Both incoming and outgoing bushings shall be located on the same side and offset to provide for ease in routing of elbows and cables.

4.2 Door Latching System

4.2.1 The door latch assembly shall be in accordance with ANSI C57.12.28.

4.2.2 Latching System

4.2.2.1 The latching mechanism when operated shall latch all points at the same time to preclude partial latching.

4.2.2.2 A penta-head socket wrench or tool shall be required to actuate the mechanism to unlatch the door and in the same motion, recharge the spring for the next closing operation.

4.2.2.3 The latching mechanism shall have provisions for padlocking that incorporates a means to protect the padlock shackle from tampering and that shall be coordinated with the latches such that:

4.2.2.3.1 It shall not be possible to unlatch the mechanism until the padlock is removed.

4.2.2.3.2 It shall not be possible to insert the padlock until the mechanism is completely latched closed.

4.3 Exterior Doors

4.3.1 All doors shall have provisions for padlocking.

4.3.2 The doors shall have positive locking action, such that the doors cannot be locked until all latches are securely engaged.

4.3.3 No automatic latching doors will be permitted. The doors shall be manually latched to prevent the possibility of the door closing and trapping any loose clothing or human extremities in the latched door.

4.3.4 All doors shall provide unrestricted access for operation of the equipment. Door retainers shall be provided to secure the door in the open position and to prevent any inadvertent closing into the enclosure.

4.3.5 Once secured, the doors shall be opened only by unlocking the padlock and unlatching the latching mechanism with a penta-head socket wrench or tool.

4.4 Ground Connection Pads

4.4.1 Ground connection pads shall be provided in each termination compartment.

4.4.2 The ground connection pad to the tank shall be constructed of 1/4" thick copper and have a NEMA 2-hole pattern for ground connectors. The momentary rating of the ground studs shall equal or exceed the short-circuit ratings of the pad-mounted gear.

4.4.3 Easily accessible ground bus bar made of 3/8" copper shall run the entire width of both door openings.

4.4.4 The interrupter switches shall be enclosed within an inner grounded compartment for electrical isolation.

4.5 Bushings and Bushing Wells

4.5.1 Bushings and bushing well interfaces shall conform to IEEE standard 386.

4.5.2 Fault Interrupters shall be equipped with 600 ampere rated bushings that include removable threaded studs.

4.6 Interconnecting Buswork

4.6.1 Standard buss connections may use intermediate copper bars. May use Flex Braid to connect the bushings to the bus.

4.6.2 Bus and interconnections shall withstand the stresses associated with short circuit currents up through the maximum rating of the pad-mounted gear.

4.7 Base Spacers

4.7.1 Source bushings shall be 39-inches above grade, and Load bushings are 54.5-inches above grade, with no spacer.

4.8 Switchgear Tanks

4.8.1 The tanks shall be of welded construction and shall be made of ¼”, 7-gauge type 304 stainless steel or mild steel.

4.8.2 The tanks shall withstand system voltage at a gas pressure of 0 psig at 68º F.

4.8.3 The tanks shall be filled with SF6 gas to a pressure of 7 psig at 68º F.

4.8.4 The Tanks shall be provided with Dillo type gas fill valves.

4.8.5 The tanks shall have temperature-compensated pressure gauges that are color coded to show the operating range. The switchgear tanks shall be manufactured from stainless steel or mild steel.

4.8.6 The completed unit must be capable of withstanding internal failure without tank rupture.

4.8.7 The tanks shall have stainless steel lifting eyes for a means of lifting.

4.8.8 Shall include viewing windows, shall be provided for each load-interrupter switch to allow visual verification of the switch-blade position (open, closed, and ground) while shining a light on the blades.

4.8.9 The viewing windows and switching components shall be located on the opposite side of the gear from the bushings and bushing wells so that operating personnel are not required to perform any routine operations in close proximity to the high voltage cable and bushings.

4.8.10 All bushings and bushing wells shall be located on one side for the gear.

4.8.11 The switchgear tank shall be suitable for installation on a concrete pad.

4.8.12 The switch shall be composed of two separate tanks, each with a, open, closed, ground switch, line side by-pass switch and a load side vacuum interrupter. The tanks shall be bolted together to provide for ease of disassembly so that one tank can be replaced while the other remains in service. All external control boxes shall be easily removable and have slack in the cables to allow one tank to remain in service if the other tank is removed.

4.9 Low Voltage Enclosure and Components

4.9.1 All low voltage components shall be located in a 305 grade stainless steel or mild steel enclosed compartment separate from high voltage and shall be arranged to allow complete accessibility for testing and/or maintenance without exposure to high voltage.

4.9.2 Low voltage wiring, except for short lengths such as at terminal blocks and the secondary of sensing devices, shall be shielded by grounded raceways where necessary for isolation from high voltage.

4.9.3 The control shall be located in the grounded, 305 grade stainless steel or mild steel enclosed, low voltage compartment with the operators. The compartment shall provide isolation from high voltage. The enclosure shall be large enough to house all low voltage components.

4.9.4 All low voltage components, including batteries, shall operate between -40°C to 65°C.

4.9.5 The low voltage enclosure shall not have any externally accessible hardware.

4.9.6 The Low Voltage Control Enclosures are rated for an equivalent of NEMA 4/12.

4.10 High Voltage Components

4.10.1 The terminations for load-interrupter shall be 600 ampere, 15kV, dead-break bushings with removable studs. The terminations for the fault interrupters shall be 600 ampere bushings with removable studs. The bushings shall be in accordance with ANSI/IEEE standard 386. All apparatus bushings shall be shipped with protective caps.

4.10.2 Load-interrupters shall be three-phase gang operated. The switch shall be provided with an integral ground position that is visible through a viewing window. The open gaps of the switch shall be designed to allow cable testing through a feed thru bushing or the back of the elbow.

4.10.3 Fault interrupters shall be three phase gang operated. Fault-interrupters shall be provided with a disconnect with an integral ground position that is visible through a viewing window. The disconnect in the open or ground position shall be visible through the viewing window. 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 ground positions is accomplished with a single movement. The disconnect gaps on fault-interrupters shall be designed to allow cable testing through a feed-thru bushing or the back of an elbow. Each fault-interrupter shall have an internal indicator to show when it is in the tripped condition. This shall be clearly visible through the viewing window.

4.10.4 An acceptable alternative shall be a vacuum fault interrupter (VFI) that is an individual unit by itself that does not have an integral disconnect. The design uses a separate 3-position incoming load break switch as the isolation device for the switch. The VFI is an electrically operated unit in the closed and open positions and utilizes a magnetic actuator for its operation.

4.10.5 Bus and interconnections shall withstand the stresses associated with short circuit currents up through the maximum rating of the pad-mounted gear.

4.10.6 Vacuum bottles and load break switches shall be mounted vertically with the moveable contact shaft at the top. The moveable contact shaft shall have a contact position indicator visible through a viewing window for each phase.

5.0 Nameplates, Diagrams, and Labels

5.1 The information on the stainless steel or aluminum nameplate, ratings label and connection diagram shall remain legible throughout the operational life of the Padmount Switchgear.

5.2 A stainless steel or aluminum nameplate shall be provided showing all data as specified by ANSI C37.74 Par. 9.11 and C37.60 Par.9.7 and the manufacturer CT ratio. This shall include, but not be limited to, manufacturer's name, catalog number, model number, serial number, date of manufacture, AE purchase order number, rated maximum voltage, rated impulse withstand voltage, rated continuous current, rated load interrupting current, rated momentary current, and CT ratio.

5.3 The inside of each door shall be provided with a ratings label indicating the voltage rating; main bus continuous rating; short-circuit ratings (amperes, RMS symmetrical and MVA 3Ø symmetrical at rated nominal voltage); Interrupter switch ratings, including duty-cycle fault closing capability and amperes, short-time, RMS (momentary, asymmetrical and one-second, symmetrical).

5.4 Stainless steel or aluminum three-line diagrams shall also be provided at appropriate locations for operator reference.

5.5 Stainless steel or aluminum plates shall show the phase identification. Drawing packet holder with drawings shall be inside door of padmount enclosure.

5.6 Warning Labels

5.6.1 Alerting signs shall be in Accordance with ANSI Z535, NESC, and NEC.

5.6.2 A label stating, "DANGER-HIGH VOLTAGE BEHIND PANEL" shall be attached to each fuse door barrier.

5.6.3 The inside of each door shall have a "DANGER-HIGH VOLTAGE-KEEP OUT-QUALIFIED PERSONS ONLY" sign.

5.6.4 All external doors shall be provided with "CAUTION-HIGH VOLTAGE-KEEP OUT" signs.

5.6.5 A door latching warning label shall be attached to the inside of the latching compartment doors.

6.0 OTHER REQUIREMENTS

6.1 The manufacturer shall provide a separate line item in quote for one-time, on-site, training session(s) on operation & maintenance of products new to Austin Energy.

6.2 The manufacturer shall notify Austin Energy of any software or firmware upgrades and provide upgrades to Austin Energy free of charge for the life of the product

6.3 . One USB Overcurrent-Control adapter cable shall be packaged with each unit shipped.

7.0 INSPECTION AND TESTING

7.1 Inspection

7.1.1 Austin Energy reserves the right to visit the manufacturing facility and observe the switch undergoing construction and testing. This visit shall be at no charge to Austin Energy. Advance notice of at least two weeks shall be given to Austin Energy before the start of testing.

7.2 Testing

7.2.1 The switchgear shall be tested in accordance with applicable sections of IEEE as outlined in Section 2.0. 100% production testing shall include a mass spectrometer leak test, SF_6 moisture content test, and an AC high potential test.

7.2.2 The Padmount Switchgear shall be tested in accordance with IEEE C37.72:

7.2.3 The apparatus bushings shall be tested in accordance with IEEE 386.

7.2.4 An SF_6 mass spectrometer leak test using Helium (ASTM E499) shall be used to determine the leakage rate of each unit. The leakage rate shall be less than 0.1% per year. After installation, units with a leakage rate greater than 0.1% per year and still under warranty shall be returned to the manufacturer for repair or replacement.

7.2.5 Three (3) copies of certified test reports shall be furnished prior to shipment.

7.2.6 The manufacturer shall be completely and solely responsible for the performance of the basic switch components as well as the complete integrated assembly as rated.

7.2.7 The manufacturer shall furnish, at the time of bid, certification of the rating of the integrated padmounted gear assembly consisting of the fault interrupting components in combination with the enclosure.

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ONE LINE DIAGRAM