CITY OF AUSTIN ELECTRIC

UTILITY DEPARTMENT

PURCHASE SPECIFICATION

FOR

SWITCHGEAR,DISTRIBUTION,PADMOUNT,3PH,600A-900A,15KV,SF_6 INSULATED

DATE	PREPARED BY	CHANGE SUMMARY	APPROVAL
6/30/2004	Steve Booher	ISSUANCE	
7/17/17	Michael Pittman, PE	Changed Utilinet series 3000 IWR-U3100 radio to Utilinet Integrated Wangate Radio (IWR), Series IV	Michael Pittman, PE
09/18/17	Obaid Rehman, EIT	Changed Utilinet Integrated radio ,Series IV to Sierra Wireless RV50X, antenna, surge arrestor, and connecting cables	Michael Pittman, PE
10/30/20	Michael Pittman, PE	Added pad detail and enclosure dimension requirements.	Michael Pittman, PE

This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein.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

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2.0 SCOPE AND CLASSIFICATION

2.1 The City of Austin Electric Utility Department, hereinafter referred to as Austin Energy (AE), requires a qualified manufacturer to provide an arc-resistant 600 or 900 Ampere, 15 kV, 95 kV BIL, outdoor, fully-enclosed, padmounted, SF_6 insulated, load interrupting switchgear to provide switching and resettable fault interrupting for underground distribution systems with a solidly-grounded neutral. The switchgear shall be S&C Vista or System VI with standard options as listed on an add-or-deduct basis, or AE Standards Engineering approved equal.

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

3.0 SPECIFICATIONS

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

3.1.1 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

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

3.1.3 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

3.1.4 IEEE Std C37.100.1™, IEEE Standard of Common Requirements for High Voltage Power Switchgear Rated Above 1000 V.

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

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

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

3.1.8 IEEE Std 1247™, IEEE Standard for Interrupter Switches for Alternating Current, Rated above 1000 Volts.

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

3.1.10 ASTM E499 – Standard Practice for Leaks Using the Mass Spectrometer Leak Detector in the Detector Probe Mode

3.1.11 ASTM D2472 -- Standard Specification for Sulphur Hexafluoride High Voltage Switchgear And Controlgear - Part 111: Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems up to 38 kV

3.1.12 AWS D1.1 – Steel Structural Welding Code

4.0 FUNCTIONAL REQUIREMENTS

4.1 EQUIPMENT RATINGS. The ratings and configuration of the switchgear shall be as indicated on the bid sheet and shall meet the requirements outlined below:

4.1.1 Overall Ratings

4.1.1.1 Rated Voltage Class:	15 kV
4.1.1.2 Rated Continuous Current: *	600A or 900A
4.1.1.3 Rated Load Break:*	600A or 900A
4.1.1.4 Impulse Level (BIL):	95 kV
4.1.1.5 Rated Frequency:	60 Hz
4.1.1.6 One Minute AC Withstand	35 kV
4.1.1.7 RMS Symmetrical Amperes*	12,500A or 25,000A
4.1.1.8 Three-time Duty-Cycle Fault-Closing*:	12,500A or 25,000A
4.1.1.9 Operating Temperature Range	-40°C to 55°C
4.1.1.10 Voltage Sensing	+/-3.0% accuracy

4.1.2 Three Pole Load Interrupter Switch Ratings

4.1.2.1 Continuous Amperes*	600A or 900A
4.1.2.2 Load Dropping Amperes*	600A or 900A

4.1.3 Single or Three Pole Fault Interrupter Ratings**

4.1.3.1 Continuous Amperes*	200A or 600A
4.1.3.2 Load Dropping Amperes*	200A or 600A

4.1.4 Fault Closing, Duty Cycle:

4.1.4.1 Amperes RMS symmetrical 10-time*	12,500A or 25,000A

* System configuration and component Ratings shall be in accordance with the bid sheet and switchgear configuration.

** Single Pole Fault Interrupters programmable for either single-pole or three-pole operation

4.2 System Test Features

4.2.1 Voltage Sensing

4.2.1.1 Voltage sensing shall be provided by three capacitively coupled voltage sensors on the line side of each source load-interrupter switch.

4.2.1.2 The output of the voltage sensor shall be directly proportional to line-to-ground voltage.

4.2.2 Voltage Sensing Indication with provisions for low voltage phasing

4.2.2.1 Voltage indication with low voltage phasing shall be provided for each load-interrupter switch and fault-interrupter by means of capacitive taps on the bushings. This feature shall include a flashing LCD display to indicate the presence of voltage for each phase and have a supply power for testing of the complete voltage-indication circuit.

4.3 Control Power

4.3.1 Control power shall be provided by a fused voltage transformer internal to the tank.

4.3.1.1 Control power transformer shall be sized to provide power to all additional systems and functions including but not limited to supervisory control, supplemental relays, motorized switches, source transfer, etc.

4.4 Overcurrent Control Unit

4.4.1 The switchgear shall be supplied with a microprocessor-based overcurrent control unit to initiate fault interruption. The control settings shall be field programmable using a personal computer connected to a data port in the control unit. 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.

4.4.2 The control unit shall be mounted in a NEMA 4 enclosure and be removable without taking the switchgear out of service.

4.4.3 Power and sensing for the control shall be supplied from integral current transformers.

4.4.4 The control shall feature time-current characteristic curves including standard E-speed, K-speed, coordinating-speed tap, coordinating-speed main curves, and relay curves per IEEE C37.112-latest revision fuse curves. In addition, any relay curves shall be per IEEE C37.112-latest revision. 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.

4.4.5 The standard E-speed curve shall have phase-overcurrent settings ranging from 25E through 400E. The standard K-speed curve shall have phase-overcurrent settings ranging from 25K through 200K. 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.

4.4.6 The time-overcurrent relay curves shall conform the IEEE C37.112-latest revision - 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 (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.

4.4.7 Minimum total clearing time (from initiation of the fault to total clearing) for fault interruption shall be no more than 40 milliseconds (2.4 cycles) at 60 hertz.

4.4.8 The control shall have instantaneous-trip (1kA through 8 kA) and definite time delay (32 ms through 96 ms) for speed-tap and (64 ms through 128 ms) for coordinating-speed main curves to the application.

4.5 Remote Supervisory

4.5.1 Switchgear provided with remote supervisory capability shall be able to report on status of fault interrupters, load break switches, and voltage and current sensors and alarms.

4.5.1.1 Refer to section 4.7 for details on communications.

4.6 Remote Supervisory with automated switching

4.6.1 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. Default controller shall be Micro-AT, or as approved by standards engineer.

4.6.2 The remote function shall have the capability of complete switching operations from a remote location. Control shall be field selectable either remote or manual operation via toggle switch and push button. The control shall not operate remotely when the switch is in the manual operation mode.

4.6.3 Switchgear shall have the following remote control functions:

4.6.3.1 All remote control functions shall work only when the Auto mode control function is enabled. When the remote control function is in manual mode no remote control shall operate.

4.6.3.2 Open command from remote control will cause the closed source vacuum interrupter to open and automatic transfer functions will be disabled.

4.6.3.3 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.

4.6.4 Indicator Lights & Test Keys

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

4.6.4.2 Source Voltage

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

4.6.4.3 Test Keys

4.6.4.3.1 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.

4.6.4.3.2 Test keys shall be provided for simulating an overcurrent condition on each source.

4.6.4.4 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

4.6.4.5 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.

4.6.4.6 All operations shall be indicated by the illumination of the light emitting diode (LED) indicator lights and shall be available for display by means of a dedicated event key.

4.7 COMMUNICATIONS

4.7.1 Communications Card

4.7.1.1 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 using a standard USB type A connection. One connecting cable shall be included with each unit.

4.7.2 Remote Supervisory Communications

4.7.2.1 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, Sierra Wireless RV50X, antenna(4G/LTE Multiband Puck Antenna 2x1M RG174 SMA-Male, Manufacture part # FCMO35303-SMSM-1K),surge arrestor, and connecting cables (or Standards Engineer approved equal), surge protector and a microprocessor-based programmable remote terminal unit (RTU), SEL 700GT relay, or Standards Engineering approved equal, for communication and event recording.

4.7.2.2 The switchgear shall communicate using DNP 3.0 protocol.

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

4.7.2.3.1 Open/Close for both preferred and alternate source

4.7.2.3.2 Transfer between both alternate and preferred source

4.7.2.3.3 Remote or manual control position

4.7.2.3.4 Source voltage 1 available

4.7.2.3.5 Source voltage 2 available

4.7.2.3.6 Control voltage for switch operation

4.7.2.3.7 Source 1 vacuum interrupter open / closed

4.7.2.3.8 Source 2 vacuum interrupter open / closed

4.7.2.3.9 Switch source position

4.7.2.3.10 Three phase current and voltage both preferred and alternate source

4.7.2.3.11 Auto-transfer indication

4.7.2.3.12 Battery condition – overcharge or undercharge alarm

4.7.2.3.13 Over-Current lockout alarm

4.7.2.3.14 Loss of control power

4.7.2.3.15 Fault Indication

4.7.2.3.16 Low SF_6 Pressure

4.7.2.4 Provision shall be made to accept Fiber Optic cable using a standard type ST connection for both transmit and receive functions. A third party adapter may be used with Standards Engineering approval.

4.8 Supplemental Sensing and Relaying

4.8.1.1 Provide SEL relays, or Standards Engineering approved equal, as required for supplemental protection including, but not limited to ANSI functions: 25, 27, 32, 59, 81

4.8.1.2 Supplemental relays to provide trip functions and shall be connected to spare contacts to enable tripping of fault interrupters.

4.8.1.3 Relays to be provided in external NEMA3R enclosure. All connections to relay shall use weatherproof standardized separable connectors through metering blocks with shorting jumpers provided as needed.

4.9 Automatic Source Transfer Switch (As Required)

4.9.1 Manual/Automatic Transfer Selection

4.9.1.1 The source-transfer control shall have a selector switch for choosing manual or automatic operating mode. In the manual mode, local electrical trip-open and trip-closed operation by means of pushbuttons shall be enabled, while automatic switching shall be inhibited.

4.9.1.2 The source-transfer control and interrupter switches shall be driven by stored energy switch operators and shall provide fully automatic two-way source transfer with the ability to connect either of the two (2) radial feeders to the Padmount Switchgear's main bus.

4.9.1.3 In auto mode the source-transfer control shall monitor the condition of both power sources and initiate automatic switching with open transition when the preferred source voltage has been lost or reduced to a user defined predetermined level, for a user defined period of time sufficient to confirm that the loss is not transient. The switch associated with the preferred source shall be automatically opened and the alternate-source switch shall then be automatically closed, restoring power to the load.

4.9.1.4 The source-transfer control shall be completely factory assembled, tested, and be ready for installation. The source-transfer control shall not require any external wiring or control power.

4.9.1.5 Two-way source transfer shall provide for both automatic and manual re-transfer to the preferred source when normal voltage returns for a preset time.

4.9.1.6 In the automatic return mode, the control shall provide either open transition (non-paralleling) or closed transition (paralleling) on re-transfer, as field-programmed.

4.9.1.7 A selector switch shall be furnished for choosing manual or automatic operating mode. In the manual mode, local electrical open and closed operation by means of push buttons shall be enabled while automatic switching shall be inhibited.

4.9.2 Two-Time Duty-Cycle Fault-Closing

4.9.2.1 The source-transfer control shall be able to cause the switch to be closed twice, remain operable and be able to carry and interrupt rated currents.

4.9.3 Unbalance Detection

4.9.3.1 The switchgear shall have the capability to initiate an automatic transfer, when there is a 3Ø-voltage unbalance because one (1) or two (2) phases of a source are open.

4.9.3.2 A field-programmable unbalance detection feature shall initiate automatic switching on detection of source-side open-phase conditions at the same system voltage level as the switchgear, whether caused by utility-line burndown, broken conductors, single-phase switching, equipment malfunctions, or single-phasing resulting from blown source-side fuses. The control shall continuously develop and monitor the negative-sequence voltage to detect any unbalance present as a result of an open- phase condition. Automatic switching shall occur when the system unbalance exceeds a predetermined unbalance-detect voltage for a period of time sufficient to confirm that the condition is not transient.

4.9.3.3 The reference voltage level, which will be used to determine an unbalance condition, shall be field programmable.

4.9.4 Overcurrent Lockout

4.9.4.1 The source-transfer control shall have a lockout mode, which will prevent a transfer operation that would close the source switch into a fault.

4.9.4.2 A light emitting diode (LED) indicator for the lockout condition, a reset key for manually resetting the lockout condition, and three current sensors for each source shall be provided.

4.9.4.3 A means shall be furnished for manually resetting the overcurrent-lockout feature from a remote location.

4.9.4.4 The reference current level, which will be used to determine an overcurrent, shall be field programmable.

4.9.5 Micro-Processor Functional Requirements

4.9.5.1 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.

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

4.9.5.2.1 Source-transfer control's operating characteristics

4.9.5.2.2 Voltage, current and time-related parameters

4.9.6 Keypad Entry

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

4.9.7 Remote Indication

4.9.7.1 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.

4.9.8 Visual Display

4.9.8.1 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.

4.9.8.2 When not being used to show menu information the display shall show any messages regarding light emitting diode (LED) function (on or off).

4.9.9 Menu Driven Settings

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

4.9.10 Access Code

4.9.10.1 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.

4.10 Motor Operators and Controls

4.10.1 Motor operators shall be furnished for the load-interrupter and fault interrupter switches as noted on the bid sheet

4.10.2 Each motor operator shall have its own control board, located within the low-voltage compartment/enclosure.

4.10.3 The control board shall have push buttons for locally operating the switches between the closed, open, and grounded positions.

4.10.4 Each control board shall have position indicating light emitting diode (LED) lamps to show the closed, open, and grounded state of the motor operator.

4.10.5 Each motor operator control board shall have a non-resettable, four-digit-minimum operation counter, which will only increment on a closed-to-open transition.

4.10.6 Each motor operator control board shall have an adapter for a portable remote control device, which will allow the user to activate the motor operator at a maximum distance of 50 feet from the gear. The adapter and device shall be provided with each gear. Each device shall be packaged in its own watertight case for ease of transportation and protection of the device.

4.10.7 No decoupling or any adjustments shall be required to manually operate a motor operator.

4.10.8 Removing the motor operator for decoupling shall be a simple, quick process requiring only standard tools.

4.10.9 Only one local/remote switch shall be required for the entire switchgear.

4.10.10 The motor operator shall be watertight. Each unit shall be submersion-tested to verify that water under pressure does not enter the operator housing.

4.10.11 It shall not be possible for the motor operator to be changed from the closed position directly to the grounded position using local push-button or remote control. The grounded position shall be directly accessible only from the open position.

4.10.12 A mechanical interlock shall be provided to prevent a decoupled motor operator from being incorrectly recoupled.

4.10.13 An integral means shall be provided for testing the position indicating lamps on the motor controls.

4.10.14 Controls shall be easy to operate with or without 25-kV high-voltage rubber gloves and protectors

4.11 Primary Metering Cabinets When Required

4.11.1 One (1) Primary Metering Cabinet (PMC) for revenue metering of the transformer load, located between the totalizing cubicle and feeder cubicles, shall be included. The service shall be metered at 12.4 kV, 3 phase, 4 wire wye. The PMC shall contain the following:

4.11.1.1 The fused Potential Transformer (PT's) for 12470Y/7200 service shall be 60:1 ratio 110 kV BIL, 0.3% meter accuracy: GE Style number 765X023011 or Complex Metering Engineer-approved equivalent. The customer shall also furnish 1 spare set of fuse, to be stored in the metering compartment.

4.11.1.2 Three (3) metering accuracy class CT's, shall meet ANSI C12.11 and C57.13.6, be 15 kV rated, and have 0.15% metering high-accuracy with a rating factor of 3.0 at (55^0 C), General Electric Bus Style, or Complex Metering Engineer-approved equivalent. The CT's shall be sized so that CT ratio is properly sized for the minimum and maximum load current as outlined by the following criteria. The CT shall be sized so that the minimum load current is greater than or equal to 10 percent of the first value of the CT ratio. The CT shall also be sized so that the maximum load current is less than or equal to the product of the rating factor (RF) times the first value of the CT ratio. For example a 200: 5 CT with a RF of 3 is suitable for a minimum load current of 20 amps and maximum load current of 600 amps.

4.11.1.3 The CT's and PT's shall be wired at the factory within the metering compartment to separate current and potential terminal blocks. The current terminal block shall be six terminal shorting type. The CT and PT terminal blocks shall be on the side of the cabinet located in a NEMA 3R rated pad lockable junction box mounted on the right side exterior wall of PMC facing the line compartment. All wiring shall be #10 AWG copper and terminated with insulated ring type compression terminators.

The wiring shall conform to the AE standard color code as per listed below:

Phase Identification Current	Terminal Block Position (Left to Right)	Wire Color Code
Current (AØ)	1	Red
Current Return (AØ)	2	Red /white
Current (BØ)	3	Black
Current Return (BØ)	4	Black/white
Current(CØ)	5	Green
Current Return (CØ)	6	Green/white

The Potential Transformer terminal block shall be a four terminal type. The wiring shall conform to AE standard color code as listed below:

Phase identification Voltage	Terminal Block Position (Left to Right)	Wire Color Code
Voltage (AØ)	1	Orange
Voltage (BØ)	2	Yellow
Voltage (CØ)	3	Blue
Voltage Return (Ground/Neutral)	4	White

4.11.1.4 The Customer shall mount a meter enclosure with 10 pole test switch on a separate stand installed on a pad adjacent to the PMC pad for secondary metering. The meter shall be installed 48" minimum to 72" maximum to the center of the meter above finished concrete grade. A 2 inch conduit shall be installed for the installation of fiber for AE communications. A 1.5 inch conduit shall be provided for the CT and PT wiring from the junction box mounted on the PMC to the meter enclosure. AE shall wire the Test switch as per AE color code below:

Phase Arrangements Test switch	Switch Handle Color Code	Switch Pole No. (Left to Right)	Wiring Color Code To Switch And Socket
Voltage (AØ) Voltage (BØ) Voltage (CØ)	Orange Yellow Blue	1 2 3	Orange Yellow Blue
Current (AØ) Current Return (AØ) Current (BØ) Current Return (BØ)	Red White Black White	4 5 6 7	Red Red Black Black
Current (CØ)	Green	8	Green

Current Return (CØ)	White	9	Green
Voltage Return	White	10	White

4.11.1.5 he Manufacturer shall provide two (2) ION 8650 meters with Interval Data recorders. The first ION 8650 will be used for primary revenue metering the incoming feed; the second ION 8650 meter will be used for backup metering. Both meters shall be series connected to the CT's circuit.

4.11.1.6 Fiber shall be provided to each meter for AE's use. This service shall be coordinated with AE Complex Metering Operation.

4.12 Cyber Security

4.12.1 Contractor must understand that the smart grid could be penetrated by cyber intrusions, embedding malicious software into utility systems to either gain control or restrain the distribution of energy to consumers. It is important that Contractor maintains strict security protocols to prevent systems from external attacks or unauthorized use. These control actions can result in potentially significant changes in the power flow over AE's distribution system. As such, The Contractor effectively serves as an extension of AE's remote control capabilities and must reasonably protect all of its AE-related system components from exposure to cyber security threats. This includes the Contractor's host platform (as it represents exposure to AE's interests) and all data connections through which these instructions are processed. The specific technology solutions and communication protocols used for establishing the required data connections (between AE, the Contractor and the commercial locations) shall be proposed by the Contractor and subject entirely to the approval of AE, at its sole but reasonable discretion. The proposed system shall employ generally accepted best practices regarding cyber security.

5.0 PHYSICAL REQUIREMENTS

5.1 Switchgear Construction

5.1.1 Switchgear Configuration

5.1.1.1 Provide switchgear with switch contacts and cable entrance terminations contained in a sealed, dielectric-filled stainless steel tank configured with load interrupting and fault interrupting switched ways as indicated on bid sheet.

5.1.1.2 Provide switchgear and matching enclosure suitable for installation on a concrete pad.

5.1.2 Switchgear Tank

5.1.2.1 The tank shall be of welded stainless steel construction and shall be capable of withstanding internal failure without tank rupture.

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

5.1.2.3 The switchgear tank shall be filled and shipped with SF6 gas to a pressure of 7 psig at 68º F and provided with Dillo type gas fill valves capable of being refilled while the switch is energized.

5.1.2.4 The switchgear shall have a temperature-compensated SF_6 pressure gauge that is color coded to show the operating range. This gauge shall be visible from the switch operating position.

5.1.2.5 A large viewing window 6” x 12” shall be provided for each switch to allow visual verification of the switch-blade position (open, closed, and ground). A cover shall be provided for each viewing window so that the window can be covered during switching. Viewing windows shall be located opposite the bushings.

5.1.2.6 . All bushings shall be a minimum of 40” from the bottom of the switchgear.

5.1.3 Low Voltage Enclosure and Components

5.1.3.1 All low voltage components and controls shall be located in a grounded, steel enclosed compartment separate from medium voltage and shall be arranged to allow complete accessibility for testing and/or maintenance without exposure to medium voltage.

5.1.3.2 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 medium voltage.

5.1.3.3 Low voltage enclosure should be no more than 60” deep.

5.1.3.4 Low voltage enclosure shall have a channel covering (to cover the low voltage enclosure conduit entrances) beneath the low voltage enclosure extending to the base of the switchgear.

5.1.4 Medium Voltage Components

5.1.4.1 All current carrying components shall be 100% copper. The terminations for 600 or 900 ampere interrupters shall be bushings with removable studs. The terminations for the 200A rated interrupters shall be bushing. The bushings shall be in accordance with ANSI/IEEE standard 386. All apparatus bushings shall be shipped with protective caps.

5.1.4.1.1 Fault interrupters Single-pole programmable to both 1ph and 3ph tripping as specified per the bid sheet 0600

5.1.4.2 Interconnecting Bus work

5.1.4.2.1 The interconnecting bus work shall consist of continuous one (1) piece, copper bar with no intermediate splices. Flexible braid or cable is not acceptable.

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

5.1.4.2.3 Bus work shall be appropriately sized for either 600A or 900A as specified in bid section0600.

5.1.4.3 The fault and load interrupters 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, and switch position shall be clearly indicated.

5.1.4.4 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.

5.1.4.5 Each interrupter switch shall be provided with a folding switch-operating handle. The switch-operating handle shall be secured to the inside of the switch-operating-hub pocket by a brass chain. The folded handle shall be stored behind the closed switch-operating-hub access cover.

5.1.4.6 Load Interrupter Switch Operation

5.1.4.6.1 Load-interrupter switches shall be operated by means of a quick-make, quick-break mechanism.

5.1.4.6.2 The manual handle shall charge the operating mechanism for opening, closing, and grounding of the switches.

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

5.1.5 Vacuum Fault Interrupters

5.1.5.1 Each fault interrupting switched way must utilize internally mounted current transformers and an electronic overcurrent control to provide either single-pole or three-pole ganged tripping as indicated.

5.1.5.2 Interrupter switches shall be operated by means of an externally accessible 3/4-in. hex switch-operating hub. The switch-operating hub shall be located within a recessed stainless-steel pocket mounted on the side of the pad-mounted gear enclosure and shall accommodate a 3/4-in. deep-socket wrench or a 3/4-in. shallow-socket wrench with extension. The switch-operating-hub pocket shall include a padlockable stainless-steel access cover that shall incorporate a hood to protect the padlock shackle from tampering. Stops shall be provided on the switch-operating hub to prevent over travel and thereby guard against damage to the interrupter switch quick-make quick-break mechanism. Labels to indicate switch position shall be provided in the switch-operating-hub pocket.

5.1.5.3 Each interrupter switch shall be completely assembled and adjusted by the switch manufacturer on a single rigid mounting frame. The frame shall be of welded steel construction such that the frame intercepts the leakage path which parallels the open gap of the interrupter switch to positively isolate the load circuit when the interrupter switch is in the open position.

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

5.1.5.5 Interrupter switches shall be provided with a single 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.

5.2 Enclosure

5.2.1 Coating

5.2.1.1 The inside surface of the switchgear enclosure roof shall have a coating of "no-drip" compound to prevent condensation.

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

5.2.2 Construction

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

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

5.2.2.3 Stainless steel lifting eyes shall be provided and be capable of supporting the weight of the enclosure.

5.2.2.4 The enclosure shall have 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.

5.2.2.5 The base shall have 90-degree flanges, turned inward and welded at the corners, for bolting to a concrete pad. This flange shall have a closed-cell material applied to the entire underside bottom flange. The material shall be abrasion resistant and isolate the bottom flange from the concrete foundation to help protect against corrosion.

5.2.2.6 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.

5.2.2.7 The enclosure termination compartment shall be no more than 71” deep to accommodate lengthy cable accessories such as double stacked 600/900 ampere elbows and surge arrester mounted on 200/600 ampere elbows.

5.2.2.8 The enclosure shall have 19/64” holes drilled for each way (3 phases) on the cable termination side of the switchgear, 20” from the bottom of the enclosure. The holes shall be equally spaced and shall have a field removable plug so that the hole may accommodate a fault indicator light. The plug shall be designed so that if the plug is not removed the integrity of the enclosure still complies with IEEE C57.12.28.

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

5.2.3 Exterior Doors

5.2.3.1 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.

5.2.3.2 All doors shall have provisions for padlocking.

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

5.2.3.4 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.

5.2.3.5 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.

5.2.3.6 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.

5.3 Ground Connection Pads

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

5.3.2 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.

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

5.4 Bushings and Bushing Wells

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

5.4.2 Fault Interrupters shall be equipped with 200 or 600 ampere rated bushings that include removable threaded studs.

5.4.3 Load interrupter switches shall be equipped with 600 or 900 ampere bushing wells.

5.4.4 Parking stands shall be available for each bushing.

5.5 Base Spacers

5.5.1 A carbon steel Non-compartmental base spacer shall be provided to increase the elevation of bushing parts above the mounting pad to 40 inches.

5.6 Dimensions

5.6.1 Switchgear and compartments shall effectively be positioned on the pad shown in drawing 1438-36, covering all open compartment such that no access to the inside of the enclosure(s) is available from outside of the enclosure(s) and providing cable connection bushings directly above the conduit entries.

6.0 NAMEPLATES, DIAGRAMS, AND LABELS

6.1 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.

6.2 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 as well as the manufacturer CT ratio and Austin Energy Purchase Order Number.

6.3 Stainless steel or aluminum three-line diagrams shall also be provided for operator reference.

6.4 Stainless steel or aluminum plates shall show the phase identification. A non-corroding, non-fading, weather resistant operating diagram (schematic) shall be affixed to the inside door of both open sides of the unit.

6.5 Warning Labels

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

7.0 QUALITY ASSURANCE AND TESTING

7.1 Quality Assurance

7.1.1 Switchgear Drawings: Two hardcopy sets as well as soft copies of final as-built drawings shall be provided with each system.

7.1.1.1 One hardcopy set of final as-built drawings shall be included in a switchgear compartment as well as instruction manuals and an adapter cable for field programming the control from a 25 pin personal computer.

7.2 Testing

7.2.1 The switchgear shall be tested in accordance with all applicable sections of IEEE as outlined in Section 2.0. 100% production testing shall include, but not be limited to, a mass spectrometer leak test, SF6 moisture content test, and an AC high potential test.

7.2.1.1 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.

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

7.2.3 An SF6 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.

7.2.4 All electronic devices shall be design tested as per IEEE C37.90.1.

7.2.5 Three (3) copies of certified test reports shall be furnished to Distribution Standards Engineering 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.

8.0 OTHER REQUIREMENTS

8.1 The manufacturer shall provide a one-time, on-site, free training session(s) on operation, maintenance and all control systems of products new to Austin Energy within 4 weeks of delivery.

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

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

9.0 ORDERING INFORMATION

9.1 Switchgear configuration shall be provided as required on bid sheet.

9.2 This specification serves as a starting point for the design of the switchgear. Each bidder is required to meet this initial specification. Once the bid is awarded the manufacturer will provide a list of all available options for the switchgear with an add price for each item.

9.3 A complete list of configurations is not possible. When ordering, Austin Energy will call out the specifics of the switchgear on the order. Each item on the order shall be listed as a line item with an add/deduct price.

9.4 Minimum Ordering Information

9.4.1 The total number of ways of the switchgear, where each way is either a load interrupting way, or a fault interrupting way. i.e., 6-2-4, would have 2 load interrupter switches and 4 fault interrupter switches for a total of 6 ways.

9.4.2 Base Models shall be 6-0-0, 4-0-0, and 2-0-0 (total ways - # switch ways - # fault interrupting ways) with the number of Load Interrupter and Fault Interrupter ways to be specified per order.

9.4.3 Available Options Required Per Purchase

9.4.3.1 Maximum bus current carrying capacity; 600A or 900A

9.4.3.2 Voltage Transformer sizing

9.4.3.3 Potential Indication with test feature with provisions for low voltage phasing

9.4.3.4 Load-interrupter and fault-interrupter switch amapacity rating

9.4.3.5 Ground pad size and configuration (i.e., two hole nema pads)

9.4.3.6 Remote low-pressure alarm

9.4.3.7 Motor operator option with cabled, hand-held remote and case

9.4.3.8 Voltage Indicator with LCD display

9.4.3.9 Potential Indication with test feature

9.4.3.10 Single-pole fault interrupters programmable for both single-pole tripping or three-pole tripping, per way

9.4.3.11 Overcurrent Lockout

9.4.3.12 Overcurrent Control Adapter

9.4.3.13 Remote Indication

9.4.3.14 Automatic restoration switch control, for use with remote supervisory switchgear. Includes any software licenses

9.4.3.15 Current / voltage sensor configuration

9.4.3.16 Internal auxiliary contacts per way, bottles and blades (“tripped” for vacuum bottles, and “open/closed/ground” on blades).

9.4.3.17 Separate control enclosure

9.4.3.18 Supervisory control (including microprocessor based control and all wiring and hardware)

9.4.3.19 Source Transfer Control (including microprocessor based control and all wiring and hardware)

9.4.3.20 Communications card

9.4.3.21 Auxiliary contacts on the load interrupter ways for switch position

9.4.3.22 Auxiliary contacts on the fault interrupter ways for fault bottle and switch positions.

9.4.3.23 Specified SEL Relay

9.4.3.24 SEL 351S-7 Relay

9.4.3.25 Allied Telesis Fast Ethernet Switch Media Converter (AT-FS232/2-90)

9.4.3.26 Three phase current sensors for SCADA application

9.4.3.27 Three phase voltage sensors for SCADA application

9.4.3.28 Test Accessory Kit to permit preliminary checkout of source transfer control using single phase 120V AC source (before medium voltage connections are made to the switchgear) to expedite full service once medium voltage is available

9.4.3.29 USB cable kit for connection of a PC to the overcurrent control. Must include the USB cable, any adapter cables, driver CD, and installation instructions

9.4.3.30 Communications cable for connecting optional communications card to a PC. PC shall have a 9-pin serial communications port

9.4.3.31 Penta-head socket for ½" Drive

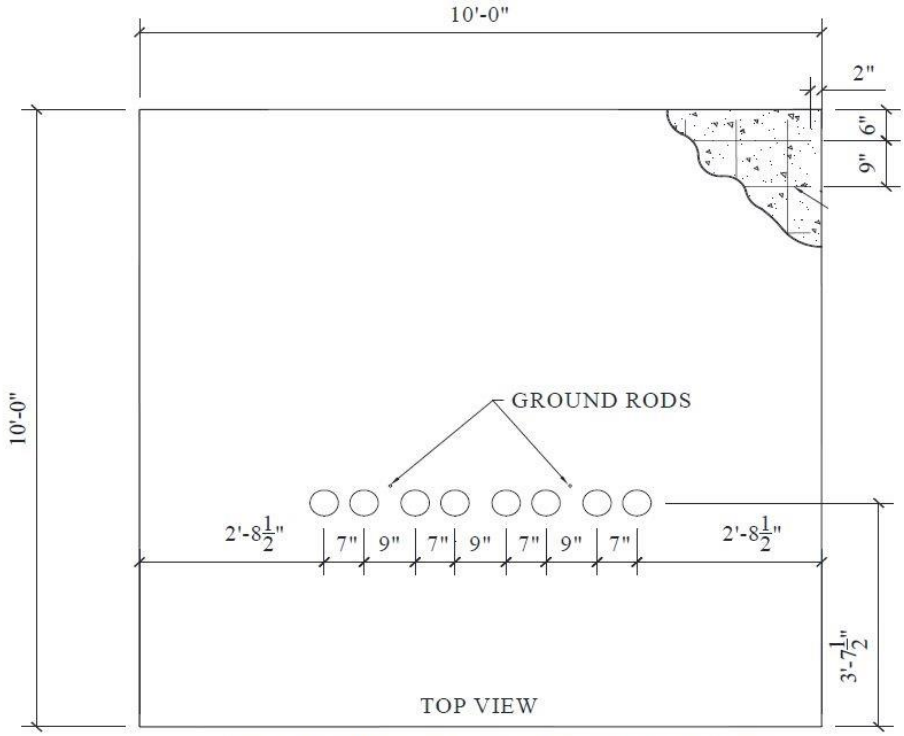
9.4.3.32 ION 8650 meter

9.4.3.33 Fiber Optic Cable

9.4.3.34 Aluminum DIN Rail with associated terminal blocks

Drawing 1438-36 – Switchgear Pad Detail

1438-36	CIVIL	AUSTIN ENERGY
Sheet 1 of 2	PADS, CLEARANCES AND BARRIERS	
Rev: 08/01/20	**VISTA 4 WAY 600 AND 900 AMP PAD DETAIL**	



5" CONDUITS FOR LINE-SIDE AND LOAD-SIDE