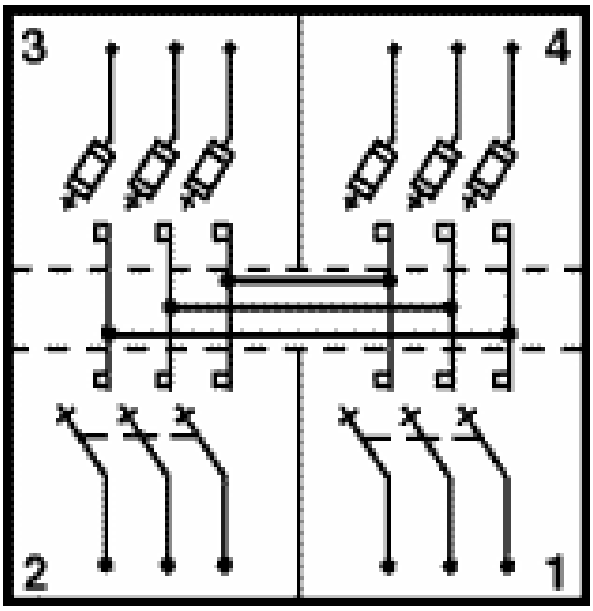
| Material Specifications | SWITCHGEAR | 1513.02 |
|---|---|---|
| CHELAN COUNTY PUBLIC UTILITY DISTRICT *Owned By The People We Serve* P.U.D. | 15kV 600Amp Air-Insulated Live-Front Pad-Mounted Automatic Transfer Switchgear With Supervisory Control | |
| Orginator: D. Smith / Date: 7/20/06 | | |
| Approval: C. Bowman / Date: 7/25/06 | | Page 1 Of 19 |
| Revision: See Revision Log in Section 22.0 | | Std Committee Approval: Approved |

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## 1 Scope

**1.1** This specification covers the requirements for furnishing and delivering free-standing, self-contained, cabinet enclosed 15kV rated air-insulated live-front pad-mounted switchgear with 600 amp interrupter switches and/or 200 amp fuses with integral load interrupters configured as shown in Figure 1. In addition Automatic Source-Transfer Control & Remote Supervisory Control & Indication are provided.

**1.2** This switchgear is intended for use in 60 hertz, three-phase, 12470 volt grounded-WYE underground distribution systems.

**1.3** This switchgear will be used for sectionalizing and protecting underground distribution express feeders, sub-loops, and laterals as well as switching and protecting transformers.

**1.4** This switchgear shall be designed for outdoor installation and operation. It shall be designed for mounting on a concrete pad or Fiberglass Ground Sleeve.

## 2 General

**2.1** The manufacturer shall be responsible for ensuring compatibility among all components of the switchgear.

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

**2.3** Upon the District's request, the manufacturer shall provide sufficient notice to allow the District or its representatives to inspect the switchgear during its manufacture and to witness any or all tests performed on it.

**2.4** The manufacturer shall furnish, upon request, certified tests establishing the electrical ratings of the switchgear, including ratings of the basic switches and fuse components.

**2.5** The manufacturer shall provide product information for the pad-mounted switchgear with the initial bid or as changes are made for, but not limited to, the following:

2.5.1 Internal and external dimensions

2.5.2 Electrical specifications

2.5.3 Weight of unit

2.5.4 Method of latching and stops on doors

## 3 Reference Standards

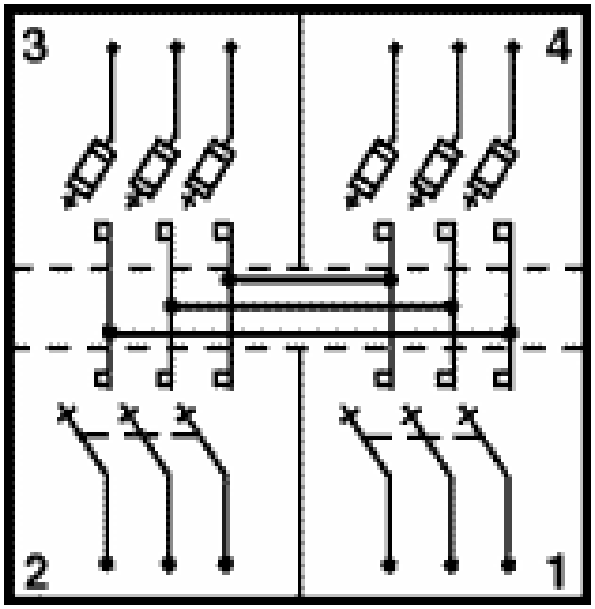
Except as modified by this specification, the switchgear furnished shall meet the requirements of the latest revisions of all applicable ANSI, IEEE and NEMA standards in addition to the standards listed below:

**3.1** IEEE C37.74 IEEE Standard Requirements for Pad-Mounted Fused Switchgear

**3.2** ANSI C57.12.28 ANSI Standard for Switchgear and Transformers Pad-Mounted Equipment Enclosure Integrity

**3.3** ANSI C2 National Electrical Safety Code

## 4 Connection Diagrams and Stock Numbers (Figure 1)




**PM-9TS**

FIGURE 1

## 5 Ratings

**5.1** The switchgear shall have the following electrical ratings:

| | | |
|---|---|---|
| 5.1.1 | Power Frequency | 60 Hz |
| 5.1.2 | Nominal Voltage | 14.4kV |
| 5.1.3 | Maximum Voltage | 15.5kV |
| 5.1.4 | BIL | 95kV |
| 5.1.5 | Main Bus Continuous Current. | 600A |
| 5.1.6 | Three-Pole Interrupter Switches | |
| 5.1.6.1 | Continuous Current | 600A |
| 5.1.6.2 | Load Dropping Current…… | 600A |
| 5.1.6.3 | Two-Time Fault Closing Duty Cycle | |
| 5.1.6.4 | RMS Asymmetrical at 14.4kV……. | 20,000A |
| 5.1.7 | Fuses (S&C Type SML-4Z) with Integral Load Interrupter | |
| 5.1.7.1 | Continuous Current (Fuse) | 200A |
| 5.1.7.2 | Load Dropping Current (Fuse) | 200A |
| 5.1.7.3 | One-Time Fault Closing Duty-Cycle Capability, RMS Asymmetrical at 14.4kV | 20,000A |
| 5.1.7.4 | Two-Time Fault Closing Duty-Cycle Capability, RMS Asymmetrical at 14.4kV | 12,500A |
| 5.1.8 | Short Circuit Ratings of All Components | |
| 5.1.8.1 | RMS Symmetrical | 12,500A |
| 5.1.8.2 | RMS Asymmetrical | 20,000A |

**5.2** Fuse mountings shall have a minimum three-phase RMS symmetrical short circuit interrupting rating of 200 MVA at 14.4kV.

## 6 Enclosure

**6.1** General

6.1.1 The switchgear cabinet shall be of unitized construction (not structural frame and bolted sheet).

6.1.2 The cabinet, including the doors, shall be of 11 gauge steel sheet.

6.1.3 All structural joints and butt joints shall be welded, and the external seams shall be ground flush and smooth.

6.1.4 The base shall be square and smooth to enable it to rest solidly on a smooth concrete surface. The base shall consist of continuous 90° flanges, 1-inch minimum width, turned inward and welded at the corners for bolting to a concrete pad.

6.1.5 The cabinet shall have adequate size and strength for fuse handling, fuse exhaust and venting, and shall withstand all pressure build-up during interruption without permanent distortion or damage to any portion of the structure.

6.1.6 The cabinet shall be so designed to permit free flow ventilation from bottom to top to minimize condensation without sacrificing security.

6.1.7 The cabinet shall meet or exceed ANSI C57.12.28 tamper resistance requirements.

6.1.8 A stainless steel noncompartmented base spacer shall be provided to increase the elevation of live parts in the pad-mounted gear above the mounting pad by 18 inches.

**6.2** Dimensions

6.2.1 The nominal height of all cabinets shall be 62 inches high (not counting the lifting tabs).

6.2.2 The footprint external dimensions of the switchgear enclosure shall be 67 inches wide x 60 ¾ inches deep.

**6.3** Roof

6.3.1 The cabinet roof shall be constructed so as to shed water. If two roofs are used, water shall not collect at their intersection.

6.3.2 The roof shall be undercoated with a heavy coat of an insulating "no-drip" compound to prevent condensation of moisture on its inside surface.

**6.4** Access

6.4.1 Access into the cabinet shall be through the doors to the switch and fuse compartments only.

6.4.2 The design of the cabinet, bus work, and support insulators shall be such that all support insulators shall be completely visible without disassembly (in order to facilitate inspection and cleaning).

**6.5** Doors

6.5.1 All doors shall include a three-point latching scheme that requires doors to be latched before the padlock shackle can be inserted. The door handles shall be padlockable and shall use a hood to protect the padlock from tampering. This door latching scheme shall

require only a single padlock per door or per set of double doors. Each door handle shall be provided with a recessed Penta head bolt as part of its security system.

6.5.2 Doors shall be bulkhead type, side-hinged to swing open horizontally. Top-hinged, clam shell type are unacceptable.

6.5.3 Doors shall be equipped with stainless steel hinge assemblies and stainless steel hinge pins.

6.5.4 Each door shall be equipped with a zinc-nickel plated steel or stainless-steel door-holder located above the door opening. These holders shall be hidden from view when the door is closed. It shall not be possible for the door-holders to swing inside the enclosure. The door-holders shall hold the doors open at an angle of at least 103° and at most 120°.

**6.6** Interlocks and Barriers

6.6.1 All enclosures shall include compartmentalization between three-phase circuits to permit isolated access to individual circuits while other circuits are energized. Steel barriers shall separate side-by-side compartments.

6.6.2 Each switch shall have a removable transparent front barrier to guard against inadvertent contact with the live parts. These barriers shall be capable of being inserted in the open gap when the switch is in the open position.

6.6.3 All switches shall have means of padlocking in the open position.

6.6.4 Each power or electronically fused switch shall have a transparent removable front barrier to guard against inadvertent contact with live parts. These barriers shall be capable of being inserted in the open gap when the power or electronic fuses are in the disconnect position.

6.6.5 All phase separation panels and barriers shall be of inert material. The manufacturer shall insure that the phase separation panels will not warp or bend and or in any way decrease design clearances.

**6.7** Lifting Tabs

6.7.1 Lifting tabs shall be removable.

6.7.2 A resilient material shall be placed between the lifting tabs and the enclosure to prevent the tabs from scratching the enclosure finish. To help retard corrosion, the resilient material shall be closed-cell to prevent moisture from being absorbed and held between the tabs and the enclosure in the event that the lifting tabs are not removed.

**6.8** Finish

6.8.1 The finish of the switchgear cabinet shall meet or exceed the requirements of ANSI C57.12.28, latest revision. Combined primer and topcoat thickness shall be no less than

3.0 mils. Paint and primer shall be lead free. A certified test abstract to indicate compliance with these requirements shall be furnished upon request.

6.8.2 The topcoat of the finish shall be dark green Munsell No. 7GY 3.29/1.5.

6.8.3 A resilient closed-cell material, such as PVC gasket, shall be applied to the entire underside of the enclosure bottom flange to protect the finish on this surface from scratching during handling and installation. This material shall isolate the bottom flange from the alkalinity of a concrete foundation to help protect against corrosive attack.

## 7 Grounding Provisions

**7.1** Grounding Pads

7.1.1 A ground connection pad shall be provided in each compartment of the pad-mounted gear. The pads shall be welded to the interior of the enclosure near the cable entrances.

7.1.2 The pads shall be of unpainted copper-faced steel, unpainted stainless steel or unpainted galvanized steel. The pads shall be a minimum of 2 inches x 3-1/2 inches with two 1/2-13 UNC tapped holes, a minimum 7/16 inch deep, spaced 1-3/4 inches center-to-center.

7.1.3 The grounding pads shall be capable of carrying the fault duty of the switchgear.

**7.2** Grounding Studs

7.2.1 Each switch terminal, fuse terminal and compartment ground terminal shall have a grounding stud for attaching working grounds equipped with duckbill type clamps.

7.2.2 The grounding studs shall be of galvanized steel.

7.2.3 The compartment grounding studs shall be a minimum of 10 inches long.

7.2.4 The grounding studs shall be located such that the working ground clamps may be easily applied or removed with a hotstick.

7.2.5 The grounding studs shall be capable of carrying the fault duty of the switchgear.

## 8 Buses

**8.1** All buses shall be of copper or aluminum.

**8.2** All joints shall have suitable hardware and treatment to prevent harmful oxidation and loss of optimum contact pressure.

**8.3** Bus and interconnections shall withstand the stresses associated with short circuits up through the maximum rating of the switchgear.

## 9 Cable Terminal Pads

**9.1** All cable terminal pads shall be of tinned or silver-plated copper.

**9.2** All cable terminal pads shall have two - 9/16 inch holes spaced 1-3/4 inch center-to-center for connecting cable terminators.

**9.3** The cable terminal pads shall be located such that the bottom cable terminator mounting hole is at least 16 inches above the bottom surface of the switchgear cabinet ignoring the 18 inch base spacer.

**9.4** There shall be ample space around the cable terminal pads to accommodate 3M coldshrink, or District approved equivalent, outdoor type 1000 kcm 15 kV cable terminators with rainskirts.

## 10 Interrupter Switches

**10.1** Interrupter switches shall have a two-time duty-cycle fault-closing rating equal to or exceeding the short-circuit rating of the pad-mounted gear. These ratings define the ability to close the interrupter switch twice against a three-phase fault with asymmetrical current in at least one phase equal to the rated value, with the switch remaining operable and able to carry and interrupt rated current. Tests substantiating these ratings shall be performed at maximum voltage with current applied for at least 10 cycles. Certified test abstracts establishing such ratings shall be furnished upon request.

**10.2** Interrupter switches shall be operated by means of stored-energy operators installed by the switch manufacturer.

**10.3** 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.

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

**10.5** 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.

**10.6** Circuit interruption shall be accomplished by use of an 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. Circuit interruption shall take place completely within the interrupter, with no external arc or flame. Any exhaust shall be vented in a controlled manner through a deionizing vent.

**10.7** Interrupter switches shall have a readily visible open gap when in the open position to allow positive verification of switch position.

**10.8** Ground studs shall be provided at all switch terminals. Ground studs shall also be provided on the ground pad in each interrupter switch compartment. The momentary rating of the ground studs shall equal or exceed the short-circuit ratings of the pad-mounted gear.

**10.9** Bearings shall be maintenance-free or sealed type, with all-temperature lubricants, and shall be capable of free-operation through a specified temperature range.

## 11 Fuse Mountings

**11.1** Each fuse compartment shall be equipped with mountings to accommodate three S&C SML-4Z power fuseholders designed for S&C SM-4 power fuses.

**11.2** Three S&C SML-4Z power fuseholders will provided for each fuse compartment.

**11.3** All power fuse mountings are to have a built-in load-break device in the contact assembly to provide live switching ability using only a standard hotstick with station prong or grappler, without the necessity of opening the line switches to isolate and replace a single blown fuse unit.

**11.4** Live-switching shall be accomplished by a firm steady opening pull on the fuse pull ring with a hook stick. No separate load-interrupting tool shall be required.

**11.5** Circuit interruption shall take place completely within the integral load interrupter with no external arc or flame.

**11.6** The integral load-interrupter and the fuse shall be provided with separate fault-closing contacts and current-carrying contacts. The fuse hinge shall be self-guiding and, together with the fault-closing contacts, shall guide the fuse into the current carrying contacts during closing operations. Circuit-closing inrush currents and fault currents shall be picked up by the fault-closing contacts, not by the current-carrying contacts or interrupting contacts.

**11.7** A storage rack shall be provided in each fuse compartment to accommodate up to thee S&C SM-4 fuse refill units.

## 12 Fuse Handling Tool

**12.1** A fuse handling tool recommended for use by the fuse manufacturer shall be identified.

## 13 Stored-Energy Operators

**13.1** Stored-energy operators shall be provided to operate the high-voltage source interrupter switches they shall be motor charged with solenoid trip-open and solenoid trip-closed operation.

**13.2** Stored-energy operators shall be equipped with an integral quick-make quick-break mechanism installed by the switch manufacturer, which shall store sufficient mechanical energy to open or close the associated interrupter switch. The quick-make quick-break mechanism shall swiftly and positively open and close the source interrupter switch independent of the speed of the charging motor or manual handle.

**13.3** Stored-energy operators shall be equipped with tripping solenoids to release the stored energy to open or close the associated source interrupter switch in response to a control signal.

**13.4** Stored-energy operators shall be equipped with a charging motor that shall charge the quick-make quick-break mechanism after each trip operation when voltage is present on the associated source.

**13.5** Pushbuttons shall be provided to permit local electrical trip-open and trip-closed operation.

**13.6** Local electrical operation shall be prevented when the source-transfer control is in the automatic mode. Stored-energy operators shall be provided with an operation selector that shall have the following three positions:

13.6.1 An operating position—when in this position, permits mechanical or electrical opening or closing of the source interrupter switch.

13.6.2 A lock position—when padlocked in this position, prevents all mechanical and electrical operation.

13.6.3 A charging position—when in this position, permits manual charging of the quick-make quick-break mechanism while prohibiting mechanical and electrical operation.

**13.7** Stored-energy operators shall be provided with a charging shaft and a removable manual charging handle to allow manual charging of the quick-make quick-break mechanism in the event control power is lost. The manual charging shaft shall be accessible only when the operation selector is in the “charging” position.

**13.8** Stored-energy operator shall be equipped with provisions for local mechanical trip-open and trip-closed operation in the event control power is lost.

**13.9** Stored-energy operators shall be located in a grounded, steel-enclosed low-voltage control compartment. The control compartment shall provide complete isolation from high voltage to help protect operating personnel.

**13.10** Stored-energy operators shall be equipped with indicators to show whether the quick-make quick-break mechanism is charged or discharged; whether the associated source interrupter switch is in the open or closed position; and whether the stored-energy operator is in the switch-open or switch-closed position.

**13.11** Each stored-energy operator shall be equipped with an operation counter.

**13.12** Stored-energy operators shall be provided with a decoupling feature to permit decoupling of the stored-energy operator from the associated source interrupter switch for testing and exercising of the stored-energy operator and source-transfer control without opening or closing the interrupter switch and without exposure to high voltage. A tool shall not be required for decoupling or coupling the switch and switch operator. An indicator shall be provided to show whether the operator is coupled or decoupled. When the stored-energy operator is decoupled, the associated source interrupter switch shall be locked in the position it was in at the time of decoupling. It shall

not be possible to recouple the stored-energy operator to the source interrupter switch unless the stored energy operator is in the same position (open or closed) as the source interrupter switch.

**13.13** The following optional features are required:

13.13.1 Stored-energy operators shall be provided with an extra 4-PST auxiliary switch coupled to each source interrupter switch.

13.13.2 Stored-energy operators shall be provided with an extra 4-PST auxiliary switch coupled to each stored-energy operator.

13.13.3 Mechanical cable interlocks shall be provided between each stored-energy operator and the associated switch-compartment door to prevent operation of the source interrupter switch when the associated compartment door is open.

## 14 Automatic Source-Transfer Control

**14.1** Operating Description

14.1.1 Transfer on Loss and Return of Source Voltage

14.1.1.1 The source-transfer control shall utilize the common-bus primary-selective system. The normal condition shall be with one source interrupter switch (for the preferred source, as field programmed) closed to energize the high-voltage bus, and with the other source interrupter switch (for the alternate source) open with its associated circuit available as a standby. The control shall monitor the conditions of both power sources and shall initiate automatic switching when the preferred-source voltage has been lost (or reduced to a predetermined level) for a period of time sufficient to confirm that the loss is not transient. Automatic switching shall open the preferred source interrupter switch and then close the alternate-source interrupter switch to restore power to the high-voltage bus.

14.1.1.2 When normal voltage returns to the preferred source for a preset time, the control shall initiate retransfer to the preferred source if in the automatic return mode, or await manual retransfer if in the hold return mode. In the hold return mode, if the alternate source fails and the preferred source has been restored, the control shall initiate automatic retransfer to the preferred source.

14.1.1.3 In the automatic return mode, the control shall provide either open transition (nonparalleling) or closed transition (paralleling) on retransfer, as field programmed.

14.1.2 Transfer on Unbalance Condition

14.1.2.1 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 pad-mounted gear, 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.

14.1.2.2 When normal phase voltages return to the preferred source, the control shall initiate retransfer to the preferred source as described above.

**14.2** Control Features

14.2.1 The operating characteristics of the source-transfer control and its voltage-, current-, and time-related operating parameters shall be field programmable and entered into the control by means of a keypad. To simplify entry of this information, a menu arrangement shall be utilized including keys dedicated to the operating characteristics and to each of the operating parameters. Entry of an access code shall be necessary before any operating characteristic or operating parameter can be changed.

14.2.2 All operating characteristics and operating parameters shall be available for review on a liquid-crystal display with backlighting.

14.2.3 Light-emitting diode lamps shall be furnished for indicating the presence of acceptable voltage on each high-voltage source.

14.2.4 A light-emitting diode lamp shall be furnished for indicating that both stored-energy operators are coupled to their respective interrupter switches and in the correct positions, the control is in the automatic mode, the operation selector for each stored-energy operator is in the operating position, and all control circuitry is properly connected for automatic transfer. The display, when not being used to show menu information, shall show messages explaining why this lamp is not lighted.

14.2.5 A selector switch shall be furnished 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.

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

14.2.7 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. All such operations shall be indicated by the illumination of a light-emitting diode lamp and shall be available for display by means of a dedicated event key.

14.2.8 The present source voltage and current inputs, and the present status of discrete inputs to and outputs from the control shall be available for display by means of a dedicated examine key.

14.2.9 The control shall have the capability to automatically calibrate to a known voltage on each source. This capability shall be keypad selectable.

**14.3** Construction Features

14.3.1 The source-transfer control shall use an advanced microprocessor and other solid-state electronic components to provide the superior reliability for use in power equipment. All components shall be soldered on printed circuit boards to minimize the number of interconnections for increased reliability.

14.3.2 All interconnecting-cable connector pins and receptacle contacts shall be gold-over-nickel plated to minimize contact pressure.

14.3.3 The surge withstand capability of the control shall be verified by subjecting the device to both the ANSI Surge Withstand Capability Test (ANSI Standard C37.90.1) and to a 5-kV, 3.75-joule capacitive-discharge test. For the capacitive-discharge test, a suitable capacitor shall be charged to 5 kV, and shall then be used to discharge 3.75 joules into each input circuit and each output circuit of the device.

14.3.4 To identify and eliminate components that might be prone to early failure, the control shall be subjected to a dielectric test, a functional check, and a 72-hour screening test followed by a second functional check. For the screening test, the device shall be energized at rated control voltage while subjected to a maximum-design operating temperature of +70ºC for 24 hours, followed by 48 hours during which the temperature is cycled repeatedly between –40ºC and +70ºC.

14.3.5 The control shall be located in the grounded, steel-enclosed low-voltage compartment with the stored-energy operators. The control compartment shall provide isolation from high voltage.

**14.4** Voltage Sensing and Control Power

14.4.1 Voltage sensing and control power shall be provided by three capacitively coupled voltage sensors on the line side of each source interrupter switch.

14.4.2 To maximize usable cable-training space within the pad-mounted gear, the voltage sensors shall directly replace the lower apparatus insulators of the source interrupter switches. Furthermore, the voltage sensors shall be constant-current-output devices that do not require primary fuses.

14.4.3 The output of the voltage sensors shall be directly proportional to line-to-ground voltage and shall have relay accuracy over an ambient temperature range of –40ºF to +160ºF.

14.4.4 Each voltage sensor shall be equipped with a secondary-side protective device to prevent damage to the voltage sensor in the event that the secondary circuit is inadvertently opened or the burden is removed.

**14.5** Additional Features:

14.5.1 An overcurrent-lockout feature shall be provided to prevent an automatic transfer operation that would close a source interrupter switch into a fault. The feature shall include a light-emitting diode lamp for indicating when a lockout condition has occurred, a reset key for manually resetting the lockout condition, and three current sensors for each source. Provisions shall be furnished for manually resetting the overcurrent-lockout feature from a remote location. Test keys shall be provided for simulating an overcurrent condition on each source.

14.5.2 Remote-indication provisions shall be provided to permit remote monitoring of the presence or absence of preferred- and alternate-source voltage; the operating mode of the source-transfer control (i.e., automatic or manual); and the status of the indicating lamps overcurrent lockout.

14.5.3 A test panel shall be provided to permit the use of an external, adjustable three-phase source to verify, through independent measurement, the response of the control to loss-of-source, phase-unbalance, and (where applicable) overcurrent-lockout conditions.

14.5.4 A communications card shall be provided to permit local loading, to a user-furnished personal computer, of system events recorded by the source-transfer control; operating characteristics and voltage-, current-, and time-related operating parameters programmed in the control; discrete inputs and outputs from the control; and messages explaining why the indicating lamp furnished in is not lighted. The communications card shall also permit local downloading of the user's standard operating parameters from the personal computer to the control.

14.5.5 A maintenance cable shall be provided for connecting the optional source-transfer control communications card to a user-furnished personal computer having a (25-pin, 9-pin) serial communication port.

## 15 Remote Supervisory Control & Indication

15.1.1 A GE IBOX RTU shall be provided and installed and to support the following functions.

15.1.1.1 The RTU shall support a DNP 3.0 Ethernet PPP Protocol.

15.1.1.2 Connection shall be a TCP/IP RJ45 Ethernet connector.

15.1.2 Supervisory control provisions shall be provided to permit switch operation from a remote location.

15.1.2.1 Control Functions

- Auto/Manual
- Ability to Open/Close Each Switch
- Ability to reset the Overcurrent Lockout

15.1.2.2 Status Functions via dry contacts the following

- Indicate Position of Local "Auto/Manual" Switch
- Indicate Position of Remote "Auto/Manual" Switch
- Source Indication – Primary Source / Alternate Source
- "AUTO TRANSFER READY" – Yes/No

## 16 Labeling

**16.1** Hazard-Alerting Signs

16.1.1 All external doors shall be provided with "Warning—Keep Out—Hazardous Voltage Inside—Can Shock, Burn, or Cause Death" signs.

16.1.2 The inside of each door 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.

16.1.3 Interrupter switch compartments shall be provided with "Danger" signs indicating that "Switches May Be Energized by Backfeed."

16.1.4 Fuse compartments shall be provided with "Danger" signs indicating that "Fuses May Be Energized by Backfeed."

16.1.5 Barriers used to prevent access to energized live parts shall be provided with "Danger—Keep Away—Hazardous Voltage—Will Shock, Burn, or Cause Death" signs.

**16.2** Nameplate

16.2.1 The outside of each door, or set of double doors, of the switchgear shall be provided with a durable corrosion-resistant nameplate indicating:·

16.2.1.1 Name of manufacturer

16.2.1.2 Date of manufacture

16.2.1.3 Model No.

16.2.1.4 Catalog No.

16.2.1.5 Serial No.

**16.3** Ratings Label

16.3.1 The inside of each door, or set of double doors, shall be provided with a ratings label.

16.3.2 This label shall include the ratings required in section 5.0 of this specification.

**16.4** Connection Diagram

16.4.1 The inside of each door, or set of double doors, and the inside of each switch operating hub access cover shall be provided with a three-line connection diagram of the switchgear.

16.4.2 The diagram shall show the interrupter switches, fuses with integral load interrupters and bus.

**16.5** Compartment and Phase Identification

16.5.1 The number of each compartment shall be clearly labeled with a decal on the inside of the switchgear cabinet. The preferred location for each decal is on the face of the cabinet directly above each compartment.

16.5.2 Each switch and fuse position phase shall be labeled with a decal on the inside of the switchgear cabinet. Phase identification labels shall be located on the face of the cabinet directly above each phase position.

## 17 Instruction Manual

One instruction manual covering installation, operation and maintenance of the equipment shall be provided with each switchgear cabinet. This manual shall be packaged in a weatherproof bag or envelope and secured on the inside of the door of compartment no. 1.

## 18 Certification

**18.1** Upon the District's request, the manufacturer shall provide certified test reports verifying that the equipment meets or exceeds the electrical ratings, tamper resistance and finish required by this specification.

## 19 Packaging

**19.1** Each switchgear shall be completely assembled and packaged in accordance with good commercial practice to ensure safe delivery without damage to the finish or any other part of the unit.

**19.2** Provisions shall be made to protect switchgear shipped on flatbed trucks from contamination of the cabinet exterior and interior from rocks, dirt, insects and other foreign materials encountered in shipment.

**19.3** Each switchgear shall be shipped on a nonreturnable wood pallet designed for handling with a forklift. Pallets shall have a minimum of 3-1/2 inches of vertical clearance for the forks. Pallets shall be of adequate strength to withstand normal shipping and handling of the switch.

**19.4** To reduce shipping costs, switchgear may be doubled stacked. If this shipping method is proposed, a detail sketch shall be provided and approved by the District prior to shipment.

**19.5** Switchgear shall be shipped so that they may be removed from the truck or trailer by forklift.

**19.6** No material or other switchgear shall be stacked or carried on top of the switchgear.

## 20 Data to be Submitted with Bid

**20.1** Each bidder shall submit with its proposal the data listed below. The bidder shall submit a description of any changes, additions, or exceptions to this specification it proposes, together with the reasons for the departure. Product evaluation and conformance to specification will be determined on the basis of the information submitted. The drawings and data furnished must be sufficient in detail and clarity to enable making a complete and positive check with the technical provisions of this specification.

20.1.1 Outline drawings with overall dimensions including those dimensions described in Sections 5.1

20.1.2 Statement of type of stainless steel to be used.

20.1.3 Total weight of complete switchgear assembly.

20.1.4 Electrical schematics.

20.1.5 Indicate construction and testing compliance per latest revision of ANSI C57.12.28.

20.1.6 One copy of an instruction book covering installation, operation, and maintenance of the equipment.

## 21 Data to be Furnished by Successful Bidder

**21.1** The successful bidder shall supply:

21.1.1 Outline drawings with overall dimensions; see Sections 5.1, 15.5, and 15.6, dimension requirements.

21.1.2 One copy of an instruction book covering installation, operation, and maintenance of the equipment shall be packaged in a water resistant envelope and placed inside each switch.

21.1.3 Time-current curves of all fuses and protective relays.

21.1.4 One certified copy of all standard tests except as noted below.

21.1.5 One certified copy of the enclosure coating system performance tests required by ANSI C57.12.28 only when requested.

21.1.6 One certified copy of the enclosure security performance tests required by ANSI C57.12.28 only when requested.

## 22 Specifications Revisions Log

| # | Date | Section | Description |
|---|---|---|---|
| 1 | 7/24/06 | 14 & 15 | Modified Spec 1513_02 to 1513_03 PM with Transfer SW & Supervisory Control |
| 2 | 9/5/06 | All | Revised per review from S&C and Federal Pacific. |
| 3 | 9/15/06 | 15 | Modified Protocol required |
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