



**S&C Source-Transfer Vista® Underground Distribution Switchgear  
Outdoor Distribution (15.5 kV through 38 kV)  
Detailed Functional Specification Guide**

**PART 1 - GENERAL**

- 1.1 The switchgear shall be in accordance with the single-line diagram, and shall conform to the following specification.
- 1.2 The switchgear shall consist of a gas-tight tank containing SF6 gas, load-interrupter switches and resettable fault interrupters with visible open gaps and integral visible grounds, sensing, motor operators and controls, low-voltage compartment/enclosure, microprocessor-based overcurrent control for the fault interrupters, and microprocessor-based source-transfer control. Load-interrupter switch terminals shall be equipped with bushings rated 600 amperes continuous, and fault-interrupter terminals shall be equipped with bushing wells rated 200 amperes continuous to provide for elbow connection. Manual operating mechanisms and viewing windows shall be located on the opposite side of the tank from the bushings and bushing wells, so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.
- 1.3 **Ratings:**  
The ratings for the integrated switchgear shall be as designated below.
- Frequency, Hz: 60
- Short-Circuit Current
- Amperes, RMS, Symmetrical: 12,500
  - Voltage Class, kV: 15.5
  - Maximum Voltage, kV: 15.5
  - BIL Voltage, kV: 95
  - Main Bus Continuous Current, Amperes: 600
- Three-Pole Load-Interrupter Switches
- Continuous Current, Amperes: 600
  - Load Dropping Current, Amperes: 600
- Fault Closing Current, Duty-Cycle
- Three-Time, Amperes, RMS, Symmetrical: 16,000
  - Three-Time, Amperes, Peak: 41,600
  - Ten-Time, Amperes, RMS, Symmetrical: 16,000
  - Ten-Time, Amperes, Peak: 41,600

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Check is Only for Conformation with the Design Concept of the Project and Compliance with the information Given in the Contract Documents. Contractor is Responsible for Dimensions to be Confirmed and Corrected at Job Site. For Information, that pertains solely to the Fabricator, process or to Techniques of Construction; and for Coordination of the of All Trades.

*Ashley Morgan*  
7/15/17

VIRGIN ISLANDS WATER AND POWER AUTHORITY

**Fault Interrupters:**

- Continuous Current, Amperes: 200
  - Load Dropping Current, Amperes: 200
- Fault Interrupting Current, Duty-Cycle**
- Three-Time, Amperes, RMS, Symmetrical: 12,500
  - Ten-Time, Amperes, RMS, Symmetrical: 12,500
- Fault Closing Current, Duty-Cycle**
- Three-Time, Amperes, RMS, Symmetrical: 12,500
  - Three-Time, Amperes, Peak: 32,000
  - Ten-Time, Amperes, RMS, Symmetrical: 12,500
  - Ten-Time, Amperes, Peak: 12,500

**1.4 Certification of Ratings:**

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

**1.5 Compliance with Standards and Codes:**

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

- A. The applicable portions of ANSI C57.12.28, covering enclosure integrity for pad-mounted equipment.
- B. The applicable portions of ANSI C37.71, ANSI C37.72, ANSI C37.73, IEC 56, and IEC 265-1 (Class A), which specify test procedures and sequences for the load-interrupter switches, fault interrupters, and the complete switchgear assembly.

**PART 2 - CONSTRUCTION:**

**2.1 SF6 -Gas Insulation**

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

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

## **2.2 Gas-Tight Tank:**

- A. The tank shall be submersible and able to withstand up to 10 feet of water over the base.
- B. The tank shall be of welded construction and shall be made of Type 304L stainless steel, as specified in Section 4.0.
- C. Means of lifting the tank shall be provided.

## **2.3 Viewing Windows:**

- A. Each load-interrupter switch shall be provided with a large viewing window at least 6 inches by 12 inches to allow visual verification of the switch-blade position (closed, open, and grounded) while shining a flashlight on the blades.
- B. Each fault interrupter shall be provided with a large viewing window at least 6 inches by 12 inches to allow visual verification of the disconnect-blade position (closed, open, and grounded) while shining a flashlight on the blades.
- C. Viewing windows shall be located on the opposite side of the gear from the bushings and bushing wells so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.
- D. A cover shall be provided for each viewing window to prevent operating personnel from viewing the flash which may occur during switching operations.

## **2.4 High-Voltage Bus:**

- A. Bus and interconnections shall withstand the stresses associated with short-circuit currents up through the maximum rating of the switchgear.
- B. Before installation of aluminum bus, all electrical contact surfaces shall first be prepared by machine-abrading to remove any oxide film. Immediately after this operation, the electrical contact surfaces shall be coated with a uniform coating of an oxide inhibitor and sealant.

## **2.5 Provisions for Grounding:**

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

- C. When an enclosure is provided, no less than one enclosure ground pad shall be provided.
- D. The following optional feature should be quoted with proposal:
  - 1. One ground-connection pad per way shall be provided.

## **2.6 Connections;**

- A. Load-interrupter switches shall be equipped with 200-ampere bushings, and fault interrupters shall be equipped with 200-ampere bushing wells.
- B. Bushings and bushing wells shall be located on one side of the gear to reduce the required operating clearance.

## **2.7 Bushings and Bushing Wells:**

- A. Bushings and bushing wells shall conform to ANSI/IEEE Standard 386.
- B. Bushings and bushing wells shall include a semi-conductive coating.
- C. Bushings and bushing wells shall be mounted in such a way that the semi-conductive coating is solidly grounded to the gas-tight tank.

## **PART 3 - BASIC COMPONENTS**

### **3.1 Load-Interrupter Switches:**

- A. The three-phase, group-operated load-interrupter switches shall have a three-time and ten-time duty-cycle fault-closing rating as specified under "Ratings." This rating defines the ability to close the switch the designated number of times against a three-phase fault with asymmetrical (peak) current in at least one phase equal to the rated value, with the switch remaining operable and able to carry and interrupt rated current. Certified test abstracts establishing such ratings shall be furnished upon request.
- B. Each switch shall be provided with an integral ground position that is readily visible through the viewing window, eliminating the need for cable handling and exposure to high voltage to ground the equipment.
- C. The ground position shall have a three-time and ten-time duty-cycle fault-closing rating.
- D. The switch shall be provided with an open position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to establish a visible gap.
- E. The open gaps of the switch shall be sized to allow cable testing through a feed thru bushing or the back of the elbow.

### 3.2 **Fault Interrupters:**

- A. Fault interrupters shall have a three-time and ten-time duty-cycle fault-closing and fault interrupting rating as specified under "Ratings." This rating defines the fault interrupter's ability to close the designated number of times against a three-phase fault with asymmetrical (peak) current in at least one phase equal to the rated value and clear the resulting fault current, with the interrupter remaining operable and able to carry and interrupt rated current. Certified test abstracts establishing such ratings shall be furnished upon request.
- B. The fault interrupter shall be provided with a disconnect with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment.
- C. The ground position shall have a three-time and ten-time duty-cycle fault-closing rating.
- D. The disconnect shall be provided with an open position that is readily visible through the viewing window, eliminating the need for cable handling and exposure to high voltage to establish a visible gap.
- E. The fault interrupter, including its three-position disconnect, shall be a single integrated design so that operation between the closed and open positions or the open and grounded positions is accomplished with a single, intuitive movement.
- F. The open gaps of the disconnect shall be sized to allow cable testing through a feed thru bushing or the back of the elbow.
- G. An internal indicator shall be provided for each fault interrupter to show when it is in the tripped condition. The indicator shall be clearly visible through the viewing window.

### 3.3 **Operating Mechanisms:**

- A. Load-interrupter switches and fault interrupters shall be operated by means of a quick-make, quick-break mechanism.
- B. The manual handle shall charge the operating mechanism for closing, opening, and grounding of the switches and fault interrupters.
- C. A single, integrated operating mechanism shall fully operate each fault interrupter or load interrupter switch in a continuous movement, so that additional operations are not required to establish open or grounded positions.
- D. Operating mechanisms shall be equipped with an operation selector to prevent inadvertent operation from the closed position directly to the grounded position, or from the grounded position directly to the closed position. The operation selector shall require physical movement to the proper position to permit the next operation.
- E. Operating shafts shall be pad-lockable in any position to prevent operation.
- F. The operation selector shall be pad-lockable to prevent operation to the grounded position.

- G. The operating mechanism shall indicate switch position which shall be clearly visible from the normal operating position.

#### 3.4 Overcurrent Control:

- A. A microprocessor-based overcurrent control shall be provided to initiate fault interruption.
- B. For dry-vault-mounted style and pad-mounted style switchgear, the control shall be mounted in a watertight enclosure. For UnderCover™ style and wet-vault-mounted style switchgear, the control shall be mounted in a submersible enclosure. The control shall be removable in the field without taking the gear out of service.
- C. Control settings shall be field-programmable using a personal computer connected via a data port to the control. The data port shall be accessible from the exterior of the enclosure. Neither external power nor energization of the gear shall be required to set or alter control settings.
- D. Power and sensing for the control shall be supplied by integral current transformers.
- E. The minimum total clearing time (from initiation of the fault to total clearing) for fault interruption shall be 40 milliseconds (2.4 cycles) at 60 hertz or 44 milliseconds (2.2 cycles) at 50 hertz.
- F. The control shall provide time-current characteristic (TCC) curves including standard E<sub>speed</sub>, K-speed, coordinating-speed tap, coordinating-speed main, and relay curves per IEEE C37.112-1996. Coordinating-speed tap curves shall optimize coordination with load-side weak-link/backup current-limiting fuse combinations, and coordinating-speed main curves shall optimize coordination with tap-interrupter curves and upstream feeder breakers.
- G. 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 10K 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 settings ranging from 100 amperes through 800 amperes and independent ground-overcurrent settings ranging from 100 amperes through 400 amperes.
- H. Time-current characteristic curves shall conform to the following IEEE C37.112-1996 IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays: U.S. Moderately Inverse Curve U1, U.S. Inverse Curve U2, U.S. Very Inverse Curve U3, U.S. Extremely Inverse Curve U4, U.S. Short-Time Inverse Curve U5, I.E.C. Class A Curve (Standard Inverse) C1, I.E.C. Class B Curve (Very Inverse) C2, I.E.C. Class C Curve (Extremely Inverse) C3, I.E.C. Long-Time Inverse Curve C4, and I.E.C. Short-Time Inverse Curve C5.
- I. The control shall have field-adjustable instantaneous-trip settings (0.2 kA through 6 kA) and definite-time delay settings (32 ms through 96 ms for coordinating-speed tap and 64 ms through 128 ms for coordinating-speed main), to allow tailoring of the coordinating-speed tap and coordinating-speed main curves to the application.
- J. Event records shall be easily extractable from the control using a personal computer connected to the data port.

### 3.5 Source-Transfer Control:

#### A. Operating Description.

##### 1. Transfer on Loss and Return of Source Voltage in Common-Bus Primary-Selective Systems

###### Recommendation:

During transfer on loss and return of source voltage the following conditions shall be applied through logic-  
1. When way 2 closes (N.O.) on the loss of source voltage, way 1 (N.C.) shall open to de-energize TX-MV1 (Open Transition).  
2. When source voltage returns, Way 2 shall open and way 1 shall close to re-energize TX-MV1 (Open Transition).

a. The normal condition shall be with one source load-interrupter switch (for the preferred source, as field-programmed) closed to energize the high-voltage bus, and with the other source load-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 load-interrupter switch and then close the alternate-source load-interrupter switch to restore power to the high-voltage bus. The total transfer time from the preferred to the alternate source shall be approximately 6-10 seconds.

b. 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.

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

##### 2. Transfer on Unbalance Condition:

- a. 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. (Open Transition - Non-parallel)
- b. When normal phase voltages return to the preferred source, the control shall initiate retransfer as described in 3.05 (A) (1) (b) and (c).

#### B. Control Features:

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.
2. All operating characteristics and operating parameters shall be available for review on a liquid-crystal display with backlighting.
3. Light-emitting diode lamps shall be furnished for indicating the presence of acceptable voltage on each high-voltage source.
4. A light-emitting diode 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. The display specified in

- 3.05 (B) (2), when not being used to show menu information, shall show messages explaining why this lamp is not lighted.
5. 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.
  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.
  7. The control shall automatically record system status and source-transfer control status every time a control operation occurs, for use in analyzing system events. 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.
  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.
  9. The control shall have the capability to automatically calibrate to a known voltage on each source. This capability shall be keypad-selectable.

**C. Construction Features:**

1. The source-transfer control shall use an advanced microprocessor and other solid-state electronic components to provide the superior reliability and serviceability required for use in power equipment. All components shall be soldered on printed-circuit boards to minimize the number of interconnections for increased reliability.
2. All interconnecting-cable connector pins and receptacle contacts shall be gold-over-nickel plated to minimize contact pressure.
3. The surge withstand capability of the control shall be verified by subjecting the device to both the ANSI/IEEE Surge Withstand Capability Test (ANSI Standard C37.90.1), and to ANSI Standard C62.41 Category B Power Line Surge.
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 48-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 48 hours of temperature cycling repeatedly between  $-40^{\circ}\text{C}$  and  $+65^{\circ}\text{C}$ .
5. The control shall be located in the grounded, 304 L Stainless Steel enclosed low-voltage compartment/enclosure, with the operators. The compartment shall provide isolation from high voltage.

**D. Voltage Sensing and Control Power:**

1. Voltage sensing shall be provided by three capacitive coupled voltage sensors on the line side of each source load-interrupter switch.
2. The output of the voltage sensors shall be directly proportional to line-to-ground voltage.
3. Control power shall be provided by unfused voltage transformers internal to the tank.

**The following optional features are required:**

- E. An overcurrent-lockout feature shall be provided to prevent an automatic transfer operation that would close a source load-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.

- F. 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 lamp furnished in 3.05 (b) (4), the indicating lamp furnished in 3.05 (b) (7), and overcurrent lockout.
- G. A test panel shall be provided as an option 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 overcurrent-lockout conditions.
- H. Supervisory control provisions shall be provided as an option to permit switch operation from a remote location.
- I. 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 3.05 (b) (4) 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.

### **3.6 Low-Voltage Compartment/Enclosure and Components:**

- A. The low-voltage compartment/enclosure shall be a separate, grounded structure, and shall allow complete accessibility for test and/or maintenance without exposure to medium voltage. The low-voltage compartment shall be mounted on the outside of the pad-mounted enclosure
- B. The low-voltage compartment/enclosure shall be large enough to house all motor operator controls and the source-transfer control.
- C. All low-voltage components, including the batteries, shall operate over the temperature range of  $-40^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$ .
- D. To guard against unauthorized or inadvertent entry, the low-voltage compartment/enclosure shall not have any externally accessible hardware.
- E. The low-voltage compartment/enclosure shall include appropriate vents to prevent moisture buildup. Vents shall be screened and filtered to prevent entry of insects and shall be mounted to prevent rain entry and to minimize entry of dust into the enclosure.
- F. Low-voltage wiring, except for short lengths, such as connections to terminal blocks, shall be shielded for isolation from medium voltage.
- G. The low-voltage compartment/enclosure shall be made of 304 L Stainless Steel.
- H. Control cabling between the tank and the low-voltage enclosure 15 feet or greater in length shall be furnished with a braided shield to protect electronic components from damage under surge and transient conditions.
- I. Single-point grounding methods shall be used on cabling between the tank and the low-voltage enclosure to protect electronic components from damage under surge and transient conditions.

- J. To guard against corrosion due to extremely harsh environmental conditions, the exterior of the compartment/enclosure shall be fabricated from Type 304L stainless steel.

### **3.7 Motor Operators and Controls:**

- A. Motor operators shall be furnished for the load-interrupter switches.
- B. Each motor operator shall have its own control board, located within the low-voltage compartment/enclosure.
- C. The control board shall have push buttons for locally operating the switches between the closed, open, and grounded positions.
- D. Each control board shall have position indicating lamps to show the closed, open, and grounded state of the motor operator.
- E. 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.
- F. 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.
- G. No decoupling or any adjustments shall be required to manually operate a motor operator.
- H. Removing the motor operator for decoupling shall be a simple, quick process requiring only standard tools.
- I. Only one local/remote switch shall be required for the entire gear.
- J. The motor operator shall be watertight. Each unit shall be submersion-tested to verify that water under pressure does not enter the operator housing.
- K. 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.
- L. A mechanical interlock shall be provided to prevent a decoupled motor operator from being incorrectly recoupled.
- M. An integral means shall be provided for testing the position indicating lamps on the motor controls.
- N. Controls shall be easy to operate with or without 25-kV high-voltage rubber gloves and protectors.

### 3.8 Voltage Indication:

- A. Voltage indication with provisions for low-voltage phasing.
  - 1. Voltage indication with provisions for low-voltage phasing shall be provided for each load-interrupter switch and fault interrupter by means of capacitive taps on the bushings, eliminating the need for cable handling and exposure to high voltage to test the cables for voltage and phasing. This feature shall include a flashing liquid crystal-display to indicate the presence of voltage for each phase, and a solar panel to supply power for testing of the complete voltage-indication circuit and phasing circuit.
  - 2. The voltage-indication feature shall be mounted on the covers for the viewing windows, on the opposite side of the gear from the bushings and bushing wells, so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

## PART 4 - SWITCHGEAR STYLE

### 4.1 Pad-Mounted Style

- A. To guard against corrosion due to extremely harsh environmental conditions, the gas-tight tank shall be made of Type 304L stainless steel.
- B. The switchgear shall conform to or exceed the requirements of applicable portions of IEC 298, Appendix AA covering arc resistance, through 12.5 kA for 15 cycles.
- C. Enclosure
  - 1. The switchgear shall be provided with a pad-mounted enclosure suitable for installation of the gear on a concrete pad.
  - 2. The pad-mounted enclosure shall be separable from the switchgear to allow clear access to the bushings and bushing wells for cable termination.
  - 3. The basic material shall be 14-gauge hot-rolled, pickled and oiled steel sheet.
  - 4. The enclosure shall be provided with removable front and back panels, and hinged lift-up roof sections for access to the operating and termination compartments. Each roof section shall have a retainer to hold it in the open position.
  - 5. Lift-up roof sections shall overlap the panels and shall have provisions for pad-locking that incorporate a means to protect the padlock shackle from tampering.
  - 6. The base shall consist of continuous 90-degree flanges, turned inward and welded at the corners, for bolting to the concrete pad.
  - 7. Panel openings shall have 90-degree flanges, facing outward, that shall provide strength and rigidity as well as deep overlapping between panels and panel openings to guard against water entry.
  - 8. For bushings rated 600 amperes continuous, the termination compartment shall be of an adequate depth to accommodate encapsulated surge arresters mounted on 600-ampere elbows having 200-ampere interfaces.
  - 9. For bushing wells rated 200 amperes continuous, the termination compartment shall be of an adequate depth to accommodate 200-ampere elbows mounted on feed-through inserts.
  - 10. An instruction manual holder shall be provided.

11. Non-removable lifting tabs shall be provided.
12. To guard against corrosion due to extremely harsh environmental conditions, the entire exterior of the enclosure shall be fabricated from Type 304 stainless steel.

D. Enclosure Finish

1. All exterior welded seams shall be filled and sanded smooth for neat appearance.
2. To remove oils and dirt, to form a chemically and anodically neutral conversion coating to improve the finish-to-metal bond, and to retard underfilm propagation of corrosion, all surfaces shall undergo a thorough pretreatment process comprised of a fully automated system of cleaning, rinsing, phosphatizing, sealing, drying, and cooling, before any protective coatings are applied. By utilizing an automated pretreatment process, the enclosure shall receive a highly consistent thorough treatment, eliminating fluctuations in reaction time, reaction temperature, and chemical concentrations.
3. After pretreatment, protective coatings shall be applied that shall help resist corrosion and protect the steel enclosure. To establish the capability to resist corrosion and protect the enclosure, representative test specimens coated by the manufacturer's finishing system shall satisfactorily pass the following tests:
  - a. 4000 hours of exposure to salt-spray testing per ASTM B 117 with:
    - 1) Underfilm corrosion not to extend more than 1/32 in. from the scribe, as evaluated per ASTM D 1645, Procedure A, Method 2 (scraping); and
    - 2) Loss of adhesion from bare metal not to extend more than 1/8 in. from the scribe.
  - b. 1000 hours of humidity testing per ASTM D 4585 using the Cleveland Condensing Type I Humidity Cabinet, with no blistering as evaluated per ASTM D 714.
  - c. 500 hours of accelerated weathering testing per ASTM G 53 using lamp UVB-313, with no chalking as evaluated per ASTM D 659, and no more than 10% reduction of gloss as evaluated per ASTM D 523.
  - d. Crosshatch-adhesion testing per ASTM D 3359 Method B, with no loss of finish.
  - e. 160-inch-pound impact, followed by adhesion testing per ASTM D 2794, with no chipping or cracking.
  - f. 3000 cycles of abrasion testing per ASTM 4060, with no penetration to the substrate. Certified test abstracts substantiating the above capabilities shall be furnished upon request.
4. The finish shall be inspected for scuffs and scratches. Blemishes shall be touched up by hand to restore the protective integrity of the finish.

**PART 5 - LABELING**

**5.1 Hazard-Alerting Signs:**

- A. The exterior of the pad-mounted enclosure shall be provided with "Warning—Keep Out—Hazardous Voltage Inside—Can Shock, Burn, or Cause Death" signs.
- B. Each unit of switchgear shall be provided with a "Danger—Hazardous Voltage—Failure to Follow These Instructions Will Likely Cause Shock, Burns, or Death" sign. The text shall further indicate that operating personnel must know and obey the employer's work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.

**5.2 Nameplates, Ratings Labels, and Connection Diagrams:**

- A. Each unit of switchgear shall be provided with a nameplate indicating the manufacturer's name, catalog number, model number, date of manufacture, and serial number.
- B. Each unit of switchgear shall be provided with a ratings label indicating the following: voltage rating; main bus continuous current rating; short-circuit rating; fault-interrupter ratings including interrupting and duty-cycle fault-closing; and load-interrupter switch ratings including duty-cycle fault-closing and short-time.

**PART 6 - ACCESSORIES**

- 6.1 A USB cable kit shall be provided for connecting an overcurrent control to a user-furnished personal computer.

END OF SPECIFICATION

<input type="checkbox"/> NOT APPROVED
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<input type="checkbox"/> REVISED AND RESUBMIT

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