

TECHNICAL SPECIFICATION
FOR
12.47 KV OUTDOOR METAL-ENCLOSED FUSED
AIR INTERRUPTER SWITCHGEAR ASSEMBLY
SSRL 3 GeV INJECTOR 12 KV SUBSTATION
PS-586-140-01

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TECHNICAL SPECIFICATION

1.1 SCOPE

This document specifies minimum requirements for furnishing all labor, materials, equipment, transportation, and services necessary to fabricate and deliver one (1) outdoor 12.47 KV metal enclosed air interrupter switchgear assembly.

DOCUMENTS AND STANDARDS

2.1 APPLICABLE DOCUMENTS

All work under this Subcontract shall be in accordance with the codes and standards listed below which shall be considered minimum requirements.

2.2 CODES AND STANDARDS

1. Safety Standards and Codes
 - a. Safety Code for Building Construction, ASA-A, 10.2
 - b. California Administrative Code, Title 8, Division of Industrial Safety, Safety Orders
 - c. American Safety Standards as applicable
2. Fire Codes: National Fire Codes
3. Building Codes
 - a. Uniform Building Code (Pacific Coast Building, Officials' Conference)
 - b. National Electric Code

4. Standards

- a. American National Standards Institute - ANSI
- | | |
|-----------------------------------|---|
| ANSI C37-20-
1969/C37/20c-1974 | IEEE Standards for Switchgear
Assemblies |
| ANSI C37.41-1981 | Design Tests Fuse Disconnecting
Switches, etc. |
| ANSI C37.46-1981 | Specifications for Power Fuses and
Fuse Disconnecting Switches |
| ANSI/IEEE C68.1-1968 | Techniques for Dielectric Tests |
| ANSI C37.32-1972 | Schedules of Preferred Ratings,
Manufacturing Specifications, and
Application Guide for High Voltage
Air Switches, Bus Supports, and
Switch Accessories |
| ANSI C37.35-1976 | Application, Installation,
Operation, and Maintenance of
High-Voltage Air
Disconnecting and Load Interrupter
Switches |
| ANSI C62.1-1975 | Surge Arresters for Alternating-
Current Power Circuits
(IEEE 28-1974) |
| ANSI C57.13-1978 | Instrument Transformers |
- b. State of California
E.S.A. Electrical Safety Orders
- c. National Electrical Manufacturers' Association
- | | |
|--------------|-----------------------------|
| NEMA No. SG2 | High Voltage Fuses |
| NEMA No. SG5 | Power Switchgear Assemblies |
| NEMA No. SG6 | Power Switching Equipment |
- d. Underwriters' Laboratories Inc. - UL

5. All codes, standards and referenced specifications indicated shall mean latest edition, including supplements when such exist, unless otherwise stated.
6. Where differences exist between codes, standards and referenced specifications, the greatest protection shall govern.
7. Other codes which may be involved elsewhere in the specifications and drawings shall apply as fully as if repeated here.
8. Where any conflict occurs between the California Administrative Code, Title I, Division of Industrial Safety, Electrical Safety Orders, and the National Electrical Code of the National Board of Underwriters, the code giving the greater protection as determined by the University shall govern the work.

GENERAL REQUIREMENTS3.1 CONSTRUCTION

1. The Interrupter Switchgear shall be assembled for outdoor application, and shall be weatherproof and waterproof, non walk-in. All sections shall be "dead front" construction.
2. Each independent frame of the Switchgear Assembly shall consist of welded and bolted sheet steel (minimum 11 gauge) construction with full side sheets. Each frame shall be adequately braced, vented and constructed to properly and safely function under normal operating or short-circuit conditions when the non-current limiting power fuses are operating under 3-phase fault conditions.
3. Each switch cubicle shall have an individual door. The door shall contain laminated safety glass observation windows to permit observing the switch position without opening the door.
4. The door shall be mechanically or Kirk-key interlocked so that the switch must be opened before access to the fuses is possible, and the door must be closed before the switch can be closed.
5. Provisions for padlocking shall be included for the Users' locking procedure.
6. Adequate barriers shall be provided to protect personnel from contacting live parts of the switch while changing fuses.
7. The entire Switchgear Assembly shall be designed and coordinated by the manufacturer to safely withstand the effects of closing, carrying and interrupting all values of current up to the system characteristics as specified in Section 4.1 without damaging the integrity of the structure.
8. The Interrupter Switchgear Assembly equipment and construction shall comply with or exceed the latest ANSI, IEEE, NEMA and OSHA standards.
9. Main feeder shall enter the compartment through the bottom of the switchgear. The branch feeders shall enter through the top.

10. Sufficient space shall be provided below the terminal pads to allow for stress cones, cable training and connections to the terminal pads.
11. The assembly shall be equipped with eyes or similar facilities for lifting.
12. The metal enclosure and switchgear component bracing shall be adequate to sustain the explosive forces of 600 MVA faults. Successful interruption shall be accomplished without damage to its components or enclosure. The exhaust control device shall be reusable. Certified prototype fault interruption tests for similar design shall be submitted with the bids.

3.2 CLEANING AND PAINTING

1. All steel surfaces to be painted shall receive a phosphating treatment or equivalent prior to application of paint. External and internal surfaces shall be coated with at least one coat of corrosion-resisting paint. External surfaces of outdoor assemblies shall receive at least one more coat than a similar indoor unit. In addition, the undersurface of outdoor assemblies shall receive a corrosion-resistant undercoating.
2. Finish coat shall be light gray machinery enamel.

3.3 IDENTIFICATION AND LABELING

1. Nameplates shall be provided for each device and each structure.
2. Nameplate material shall be laminated phenolic with white surface and black core.
3. Nameplate dimensions shall be mechanically fastened, and device nameplates shall be located as close as possible to the related device.
4. Warning and/or Danger signs shall be applied to the switchgear by the manufacturer as stipulated by OSHA.
5. The integrated Switchgear Assembly shall be provided with a nameplate indicating the manufacturer's drawing number and the following nomenclature:
 - a. Voltage ratings (KV, nominal maximum design, BIL)
 - b. Bus continuous rating (amperes)

- c. Switch ratings (continuous, interrupting, fault closing, and momentary)
- d. Fuse ratings (MVA)
- e. Catalog number of the power-fuse refill units
- f. Fuse holder and exhaust control device catalog number

3.4 SUBMITTALS

1. Within 30 calendar days following award of the Subcontract, the following shall be submitted for review and approval:
 - a. Shop drawings showing complete layouts, construction and assembly details, details of field anchorage and assembly requirements, wiring diagrams and all other related details.
 - b. Materials lists identifying all materials, components and devices by name, manufacturer, catalog number, size and capacity. Such lists shall be prepared on 8-1/2" by 11" sheets or multiples thereof.
2. Production test data shall be submitted prior to shipment of the equipment.
3. Five (5) copies of a complete manual covering installation, operation and maintenance of all equipment furnished under this Subcontract shall be submitted prior to delivery of equipment. The manual shall contain, but not be limited to, the following items:
 - a. Drawings, catalog and performance data and wiring diagrams for all equipment and components.
 - b. Installation instructions.
 - c. Operating and maintenance bulletins with complete parts lists.
 - d. Spare parts recommended for a two-year maintenance stock.
 - e. Fuse application data including characteristic curves for all devices used.
 - f. All other information which is essential to the proper installation, operation and maintenance of the switchgear.

- g. The manuals shall be bound in hard back binders and thoroughly cross-indexed.
4. Each submittal of shop drawings and materials lists shall consist of six copies. Following their approval by the engineer, shop drawings shall be corrected as required and a reproducible print, in addition to the standard submittal, of each shall be submitted for permanent record. Following approval of materials lists and data sheets, four (4) additional copies of each as approved shall be submitted for permanent record.

3.5 GUARANTEE

All equipment and materials shall be guaranteed in accordance with the requirements of the Subcontract documents.

3.6 TESTS

The following tests shall be made for proof of performance and shall be witnessed by University representatives. The interrupting tests, impulse test and load-break tests may be waived if the manufacturer can furnish evidence satisfactory to the University that switchgear assemblies of the design and particular type, style and arrangement herein specified have been tested successfully for these tests.

1. Dielectric: Low Frequency, one minute (dry) 36 KV
Impulse: 1.5 x 40 microseconds, full wave
(positive and negative, dry) 95 KV
2. Load-Break Tests per ANSI/IEEE C37.41-1981
3. Interrupting Tests per ANSI/IEEE C37.41-1981. After completion of the interrupting tests the enclosure shall be substantially the same mechanical condition as at the beginning of the test, the doors and access covers shall not be warped or unusable, and the complete assembly shall be capable of operating satisfactorily at maximum design voltage and current.

3.7 TEST REPORTS

Test reports indicating results of tests specified shall be submitted to the University in duplicate. Format of the test reports shall be as called for by the applicable ANSI and NEMA standards.

3.8 EARTHQUAKE DESIGN

The earthquake design criteria shall be in strict accordance with the Uniform Building Code, Zone 4.

TECHNICAL REQUIREMENTS

4.1 SWITCHGEAR ASSEMBLY

A Ratings

1. The power source will be 12.47 KV, 3 phase, 60 Hertz.
2. Load-interrupter switches shall be manually gang-operated, 3-pole single throw, fused, rated as follows:
 - a. Nominal Design Voltage: 15 KV
 - b. Basic Impulse Level (BIL): 95 KV
 - c. Continuous Current: 200 A RMS branch, 600 A RMS Main
 - d. Interrupting Current: 200 A RMS branch, 600 A RMS Main
 - e. Fault Closing Current: 22 KA RMS
 - f. Momentary Current: 49 KA peak
3. Integrated switchgear assemblies shall be rated as follows:
 - a. Nominal Design Voltage: 15 KV
 - b. Basic Impulse Level (BIL): 95 KV
 - c. Main Bus Capacity: 600 A
 - d. Momentary Current: 49 KA peak
4. Fuses shall be provided as indicated on the drawings. They shall have an interrupting rating of 600 MVA at 13.8 KV within the enclosure.

B Equipment Characteristics

1. Switches

- a. Load interruptor switches shall be 3-pole gang-operated and shall normally be arranged with the hinge end of the switch on the load side to provide a "dead" blade when the switches are open.
- b. Fuses shall be located on the hinge end of the switch.
- c. Switch is to be manually operated with a stored energy quick-make-and-break operating mechanism to provide for switch operation independent of the handle speed. Switch handles shall be nonremovable, operable from the front of the cubicle.

2. Fuses and Fuseholders

- a. Fuse shall be expulsion type with E type fuse rating.
- b. Fuse contact shall be retained by a high pressure, cam-locking device to provide optimum contact and to prevent slip-out or blow-out during operation.
- c. The fuses shall be S&C type SM-5S or Westinghouse RBA-400. Three refill kits shall be included for each rating. 25 KA RMS interrupting rating.
- d. Fuse holder exhaust control device shall be reusable at least three times.

3. Bus and Connections

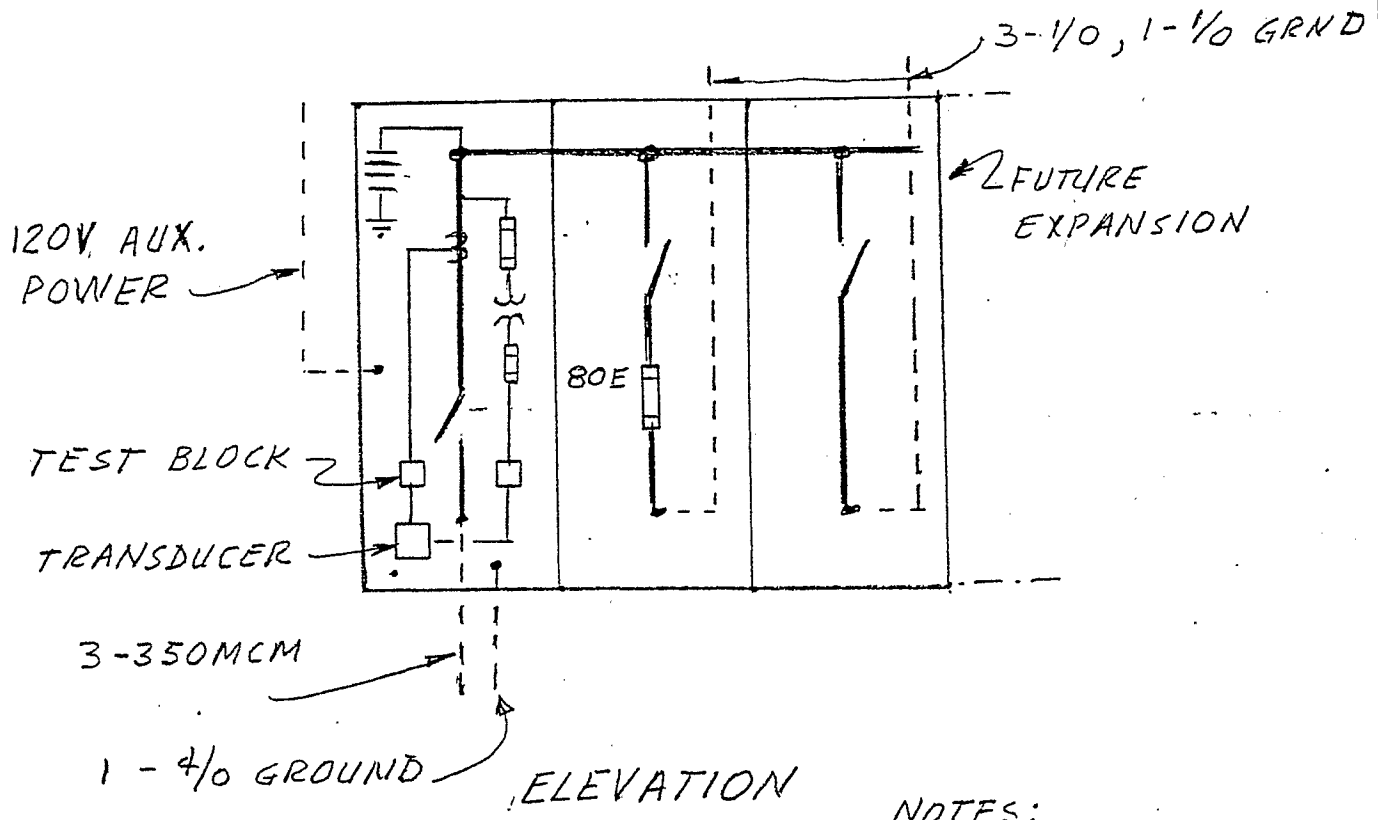
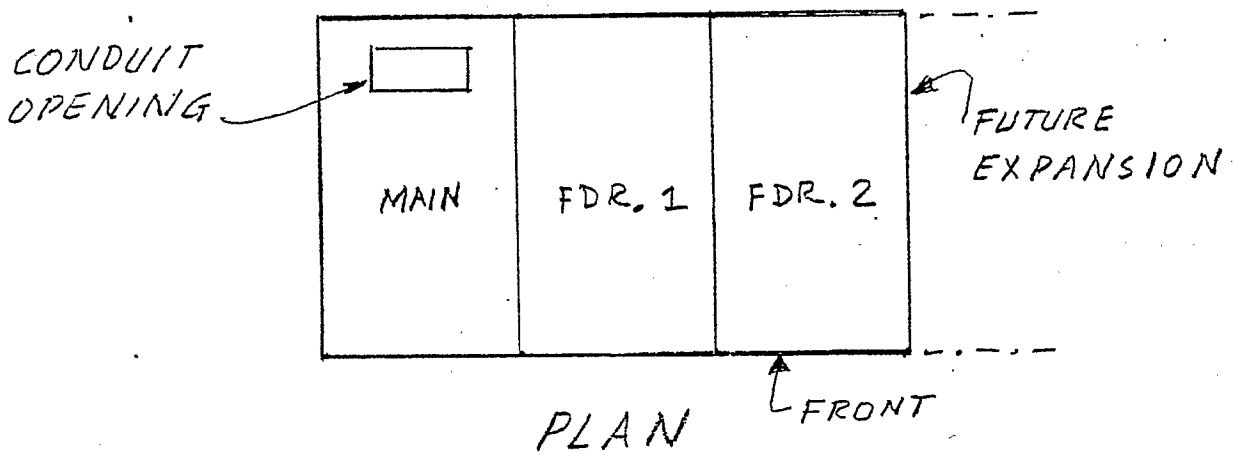
- a. Power buses shall be 98% IAC (International Annealed Copper Society) high conductivity copper or aluminum bar, alloy 6101-T63.
- b. The main three phase buses shall have a continuous current carrying capacity of not less than 600 amperes at 50 degrees C ambient.
- c. Buses shall have provisions for future extension as indicated on the drawing.
- d. Power buses shall be mounted on insulated supports of coordinated dielectric properties and be braced to withstand mechanical stresses developed by the rated short circuit and short time currents. The creepage path length over bus supports shall be not less than twice the bus air spacing.

- e. Power buses shall be fully insulated in accordance with applicable switchgear standards.
 - f. Main bus joints and all tap connections shall be designed for the specific bus materials being supplied to ensure maximum conductivity.
 - g. All bolted bus connections shall be made using a "PAL" or locking nut.
 - h. A copper ground bus of short-circuit rating equal to that of the integrated assembly shall be furnished, extending through the full length of the switchgear and accessible for necessary connections by the customer. The ground bus shall be drilled for two-hole terminal lug for a No. 4/0 AWG ground cable at each end of the bus.
4. Terminal Lugs
All power and ground cable terminal lugs shall be provided and sized as indicated on the drawings. They shall be the two-hole long barrel compression type T&B 5400 series of approved equal. Lugs shall be bolted to terminal pads utilizing suitable sized Belleville and flat washers.
5. Space Heaters
- a. Each section shall be equipped with a 120 V space heater protected by a perforated galvanized steel guard.
 - b. The space heaters shall be wired to switch, fuse (or breaker) and thermostat located in the incoming section.
 - c. Appropriate provisions shall be made to isolate the heaters and associated wiring from the high voltage circuitry.
6. The potential transformers shall be 7200/120 V, 0.3 accuracy class, W burden, Y-Y connected. Provide current limiting fuses in the primary and standard fuses in the secondary.
7. Furnish three current transformers, metering type, 800/5 A, 0.3 accuracy class, B-0.2 burden minimum.
8. Furnish three (3) metal oxide type surge arresters, rated for a solidly grounded system, 15 KV class, intermediate type.
9. The watt/watt-hour transducer shall be 2 1/2 element, 60 Hz, 3 phase 4 wire, 1500 W input calibrated for 1 mA D.C. output. 0.2 percent accuracy. Scientific Columbus Cat. No. XL31K52 1/2 A2 6070.

10. The test blocks shall be General Electric type PK-2, four pole, properly leveled to indicate current, voltage and phase. The test blocks shall be mounted on the front, protected by a rain tight cover.

10. The test blocks shall be General Electric type PK-2, four pole, properly leveled to indicate current, voltage and phase.
11. Furnish three voltmeters for continuous display of phase to ground voltages, 150V rated, 0 to 9000V, 250 degrees full scale, +/- 1% full scale accuracy, 60 Hz G.E. AB-40 or equal.
12. Furnish one ammeter, 5A rated, 0 to 800A, 250 degrees full scale, 1% accuracy, 60 Hz G.E. type AB or equal.
13. One ammeter switch for Item 12 above, four positions (1, 2, 3, and off) G.E. Model No. 10AA009 or equal.
14. Items 10, 11, 12, and 13 shall be mounted in front of the incoming cubicle, protected by a rain tight cover.

PROPRIETARY DATA OF STANFORD UNIVERSITY AND/OR U.S. DEPARTMENT OF ENERGY.
 RECIPIENT SHALL NOT PUBLISH THE WITHIN INFORMATION WITHOUT SPECIFIC
 PERMISSION OF STANFORD UNIVERSITY.



NOTES:
 POWER FUSE ON FDR.
 NO 2 ONLY

STANFORD LINEAR ACCELERATOR CENTER U S DEPARTMENT OF ENERGY STANFORD UNIVERSITY STANFORD, CALIFORNIA		AIR INTERRUPTER SWGR ASSEMBLY SSRL 3GeV INJECTOR 12KV SUB.	
ENGR <u>MM</u> DFTS _____ CHK _____	APPROVALS	PS-586-140-01-20	A

