

**TECHNICAL SPECIFICATION SBS-4
FOR DOUBLE END BREAK,
GROUP OPERATED, AIR BREAK SWITCHES
RATED 15kV THROUGH 345kV**

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ATTACHMENTS

Request For Proposal

1.0 SCOPE

This specification covers the technical requirements for 15kV through 230kV outdoor, three-pole, group-operated air switches, and, also load break air switches for line and bus switching, loop sectionalizing, transformer-bank switching, and load-current switching. The switch shall include grounding blades, arcing horns, insulators, motor operators, and other accessories, as specified. Quantities and ratings of the switches shall be listed in the “Request for Proposal” (RFP).

2.0 GENERAL REQUIREMENTS

2.1 APPLICABLE STANDARDS

The switches shall comply with the latest revisions of the following standards in order of preference, as listed. The specific job technical requirements and this specification shall take final precedence in the event of conflict:

2.1.1 ANSI standards C34, C37, C37.30, C37.32, and C37.35.

2.1.2 NEMA standard SG-6, the latest revision.

2.1.3 ASTM standards A36-84, A123-84, A153-82, B98-83, and B221-83.

2.2 SWITCH / TYPE

This specification covers switch types as listed in Table 1, ANSI C37.32 in ratings of 15.5kV through 345kV, 600 through 3000 Amperes.

- The switch type shall be double end break, Turner Electric, TDB or equal.

2.3 SWITCH RATINGS

2.3.1 Temperature Rise:

The maximum allowable temperature rise as determined by ANSI C37.30 rated current shall be per the following:

_____30°C _____53°C

The manufacturer shall provide, upon request, certified test data on each type of switch to be furnished.

2.3.2 For installations below 3300-ft. altitude, the rated withstand and radio influence voltages shall be as shown in Table 1. Per ANSI C37.30-1971, Table 1 altitude correction factors will apply for altitudes above 3300 ft.

ANSI C37.32 TABLE 1 – RATED WITHSTAND VOLTAGE

Rated Voltage kV RMS (nominal)	Rated Voltage KV RMS (maximum)	Impulse 1.2x50 Micro Sec. Wave kV Crest	60 HZ kV MS		Radio Influence Test Vol. kV	Limit of Riv Micro Volts at 1MH
			Wet 10 sec	Dry 1 min		
15	15.5	110	45	50	9.4	--
23	25.8	150	60	70	15.7	--
34.5	38.0	200	80	95	23.0	--
46	48.3	250	100	120	29.3	--
69	72.5	350	145	175	44.0	--
115	121	550	230	280	73.4	500
138	145	650	275	335	88.0	500
161	169	750	315	385	102.5	500
230	242	900	385	465	147.0	500
230	242	1050	455	545	147.0	500
345	362	1300	525	610	220.0	500

2.3.3 The momentary current withstand shall be as shown in Table 1A

ANSI C37.32 TABLE 1A-RATED MOMENTARY

Continuous Current Rating (Amperes) RMS	Momentary Asymmetrical Current Rating (Thousands of Amperes) RMS	Three Second Rating Thousands of Amperes RMS**
600	40	25
1200	61	38.12
1600	70	43.75
2000	100	62.5
3000	120*	75.0
4000	120	75.0

* 100 KA for center break and side break switches

** Obtained by dividing momentary rating by 1.6

2.3.4 Phase Spacing: Phase spacing of switching equipment to be furnished will not be less than the following values.

ANSI C37.32 TABLE 3

Centerline-to-centerline phase spacing inches (meters)

Nominal Phase-to-phase voltage kV	Maximum Phase-to-phase Voltage kV	BIL kV	Minimum Metal- to-metal for Air Switch Inches (meters)	Vertical Break Disconnect Switches Inches (meters)	Side/Horizontal Break Disconnect Switches Inches (meters)	All Horn Gap Switches
(1)	(2)	(3)	(4)	(5)	(6)	(6)
14.4	15.5	110	12 (.305)	24 (.610)	30 (.762)	36 (.914)
23.0	25.8	150	15 (.381)	30 (.762)	36 (.914)	48 (1.220)
34.5	38.0	200	18 (.457)	36 (.914)	48 (1.220)	60 (1.520)
46.0	48.3	250	21 (.533)	48 (1.220)	60 (1.520)	72 (1.830)
69.0	72.5	350	31 (.787)	60 (1.520)	72 (1.830)	84 (2.130)
115.0	121.0	550	53 (1.350)	84 (2.130)	108 (2.740)	120 (3.050)
138.0	145.0	650	63 (1.600)	96 (2.440)	132 (3.350)	144 (3.660)
161.0	169.0	750	72 (1.830)	108 (2.740)	156 (3.960)	168 (4.270)
230.0	242.0	900	89 (2.260)	132 (3.350)	192 (4.870)	192 (4.870)
230.0	242.0	1050	105 (2.670)	156 (3.960)	216 (5.500)	216 (5.500)
345.0	362.0	1050	105 (2.670)	156 (3.960)	216 (5.500)	216 (5.500)
345.0	362.0	1300	119 (3.020)	174 (4.430)	XX XX	240 (6.100)

NOTES:

- (1) Values listed are for altitudes of 3,300 ft (1000 meters) or less. For higher altitudes, the altitude correction factors per ANSI C37.30 1971 Table 1 shall apply.
- (2) Columns 4 and 5 are recommended values.
- (XX) Values not yet established.

3.0 CURRENT CARRYING PARTS

3.1 CONTACTS

Current carrying parts shall be of copper or aluminum alloy construction with silver-to-silver alloy current transfer contacts.

Contacts shall be of the reverse-loop, self-wiping type. All fixed contacts shall be backed by stainless steel. The current carrying path shall not be springs, pins, or bearings.

Exposed contacts shall be self-wiping silver-to-silver. All other current carrying contacts, including hinged end contacts, shall be silver-to-silver, and sealed and insulated from contamination and corrosion. Internal sealed contacts shall be silver-to-silver. All exposed contacts, both fixed and moveable, shall be replaceable in the field without field welding or brazing.

External silver-to-silver contact surfaces that are applied to copper may be either a brazed silver alloy inlay plated or an approved silver (flame) spray application. Minimum thickness of either type surface shall be .002 inches.

Silver applied to aluminum is NOT acceptable.

3.2 BLADES

3.2.1 The switch blades shall be tubular and 6063-T6 aluminum.

The switch blades and other live parts shall be designed to prevent the accumulation of water. Blade tips shall be field-replaceable.

The blade shall rotate on closing, and one side of the blade shall lock into the jaw contact when closed. The blade shall rotate upon opening, releasing contact pressure and releasing the lock mechanism.

3.3 TERMINAL PADS

All terminal pads shall be machined and copper, aluminum, or bronze. The pads shall be equipped with tin-plated copper shields in a NEMA configuration.

Switches with ampere ratings between 600 and 3000 shall have terminal pads with four holes on a NEMA spacing of 1 ¾-inch. Bolt holes shall be 9/16-inch.

4.0 OPERATION

4.1 Switch blades shall be under positive control at all times and the travel from the fully closed position to the fully open position shall be accomplished with one smooth continuous motion.

4.2 Double-end break switches shall have a positive lock or locking mechanism in the closed position.

5.0 OPERATING MECHANISMS

5.1 Each gang-operated switch unit shall be furnished with an operating mechanism as specified on the Switch Requirement sheet.

Operating mechanisms shall be complete with galvanized steel vertical operating pipe, group operating pipe, and interphase pipe; galvanized steel or malleable iron bell cranks, outboard bearings, pipe guides, operating levers or cranks, universal joints, as needed; and galvanized steel mounting channels, angles, or plates. Details of structural members necessary to support the switches and operating mechanisms on the steel structures will be provided as required.

Galvanized steel shims, bolts, nuts, flatwashers, palnuts, or lockwashers and beveled washers shall be provided for all operator support brackets, bases, etc., required for attachment to the steel structure

- 5.2 Operating mechanisms shall be suitable for operating the switches from grade elevation. The design of the operating mechanism shall provide smooth, completely controlled, synchronized movement of the switch blades throughout the entire cycle of operation of closing or opening. Stops on the switch bases shall be incorporated in the design for both open and closed positions to prevent misalignment of the switch blades.
- 5.3 Galvanized steel control and interphase pipes shall be of sufficient size and design to eliminate twist in the torsional operating pipes and significant sag in push-pull interphase pipes.
- 5.4 All switches shall include provisions for interphase adjustment of each individual switch pole. These provisions shall be of a continuously adjustable type for correction of any misalignment in the switch insulators, bases, and operating pipes. It shall be mechanically impossible, after final adjustment has been made, for any switch to remain in a partially open or closed position at the completion of any operator cycle.
- 5.5 The rotation insulator stack on each switch pole and the outboard bearing shall have maintenance free sealed bearings to provide smooth and trouble free operation of the switch.
- 5.6 The operating assembly shall have position indicators and provisions for pad locking in both the open and closed position. It shall be provided with a 1/0 grounding conductor, 24" in length.
- 5.7 The maximum operating effort shall be fifty pounds for a swing handle operator or thirty-five pounds for a manually operated gear mechanism.

A _____ swing handle _____ wormgear _____ motor operator is required.

6.0 BASES / MOUNTING HARDWARE

All switches shall be provided with bases, clips, shims, galvanized mounting bolts, nuts, split washers, lockwashers, beveled washers, and specified fittings to meet dimensions shown on the drawings.

- 6.1 The base shall be constructed of ASTM A36, the latest revision, steel with sufficient rigidity to maintain proper alignment at the tops of the insulators and adjustment of the blades and contact under all climatic and loading conditions. All steel shall be hot-dipped galvanized in accordance with ASTM A123, the latest revision.
- 6.2 Mounting dimensions shall conform to those shown on the drawings accompanying the order.
- 6.3 Provisions shall be made for the adjustment of the alignment of all insulator stacks. Adjustments shall be made by use of tipping the screws located under the insulator. The use of shims as a means of adjustment is NOT acceptable.

7.0 NAMEPLATES

- 7.1 All switches shall be equipped with a non-corrosive nameplate in accordance with ANSI C37.30, permanently attached. In addition to the requirements of ANSI C37.30, the manufacturer's CO, S.O. or JO number shall be stamped on the nameplate.

8.0 INSULATORS

Supplied insulators, if specified on the RFP, shall be in accordance with the latest revisions of ANSI C29.8 and C29.9 and shall conform to the following table. The insulator type and color, other than ANSI 70 (Sky Grey) is to be noted on the RFP.

TABLE 4

KV	BIL	POST
15.5	110	TR 205 OR 225
25.8	150	TR 208 OR 227
38.0	200	TR 210 OR 231
48.3	250	TR 214 OR 267
72.5	350	TR 216 OR 276 OR 278
121	550	TR 286
145	650	TR 288
169	750	TR 291
242	900	TR 304
242	1050	TR 312
363	1300	TR 367

- 8.1 Station post insulators shall be supplied with the proper fittings required to develop the impulse level and to support the busses or switch parts, as required. Bolts and other hardware for joining the units or stacks shall be furnished.

Galvanized hardware shall be furnished for mounting live parts and bases to insulators. The hardware shall include galvanized lockwashers and sized for the insulator specified.

9.0 DRAWINGS

9.1 APPROVAL DRAWINGS

Within thirty (30) days of receipt of order, three (3) copies of the approval drawings or CAD files, in AutoCAD, DWG, or DXF format, will be submitted for approval.

9.2 FINAL DRAWINGS

Final drawings, three (3) copies and instruction manuals will be sent within forty-five (45) after receipt of approved drawings for file in AutoCAD, DWG, and DXF format.

9.3 FIELD DRAWINGS

One copy of all drawings and installation instructions will be sent with each switch in a sealed waterproof envelope

10.0 SHIPPING REQUIREMENTS

