

Design Requirements for Structures or Pedestals to Support Circuit-Switchers

The Mark V Circuit-Switcher's high operating speed (total blade-travel time of 1.25 to 1.5 seconds) produces high acceleration and deceleration rates, resulting in high dynamic forces—which are transferred to the supporting structures (or pedestals) and adjoining bus.

Supporting structures (or pedestals) must be designed to support dead weight and to minimize deflections from bending moments normal to the longitudinal axis of the circuit-switcher bases. Structures (or pedestals) should limit deflections as follows:

1. Maximum deflection, under dynamic forces, of any supporting member for the circuit-switcher should not exceed $\frac{3}{8}$ inch (9.5 mm) in any direction.
2. Similarly, the deflection under static wind load should not exceed one inch (24.5 mm).
3. The total of the rotational deflections of the switch-operator support and the gearbox support in resisting the switch-operator locked-rotor torque of 21,500 inch-pounds should not exceed 5.0 degrees.

For purposes of supporting-structure design, it is assumed dynamic forces and static wind loads do not occur simultaneously. Generally, the bending moments produced by dynamic forces will dictate the design of the structure and the foundation. Forces produced by wind loads must be considered in the case of high structures, as these static bending moments may exceed the dynamic moments.

M_c and M_w (see pages 2 and 4) are the bending moments at each circuit-switcher pole-unit base. F_c and F_w are the shear loads at each circuit-switcher pole-unit base. For individual pole-units mounted on independent pedestals of height "B," the maximum bending moment M_t at the foundation may be found as follows:

Dynamic Loads: $M_t = M_c + (F_c \times B)$

Wind Loads: $M_t = M_w + (F_w \times B) +$ (Bending moment from wind acting on pedestal)

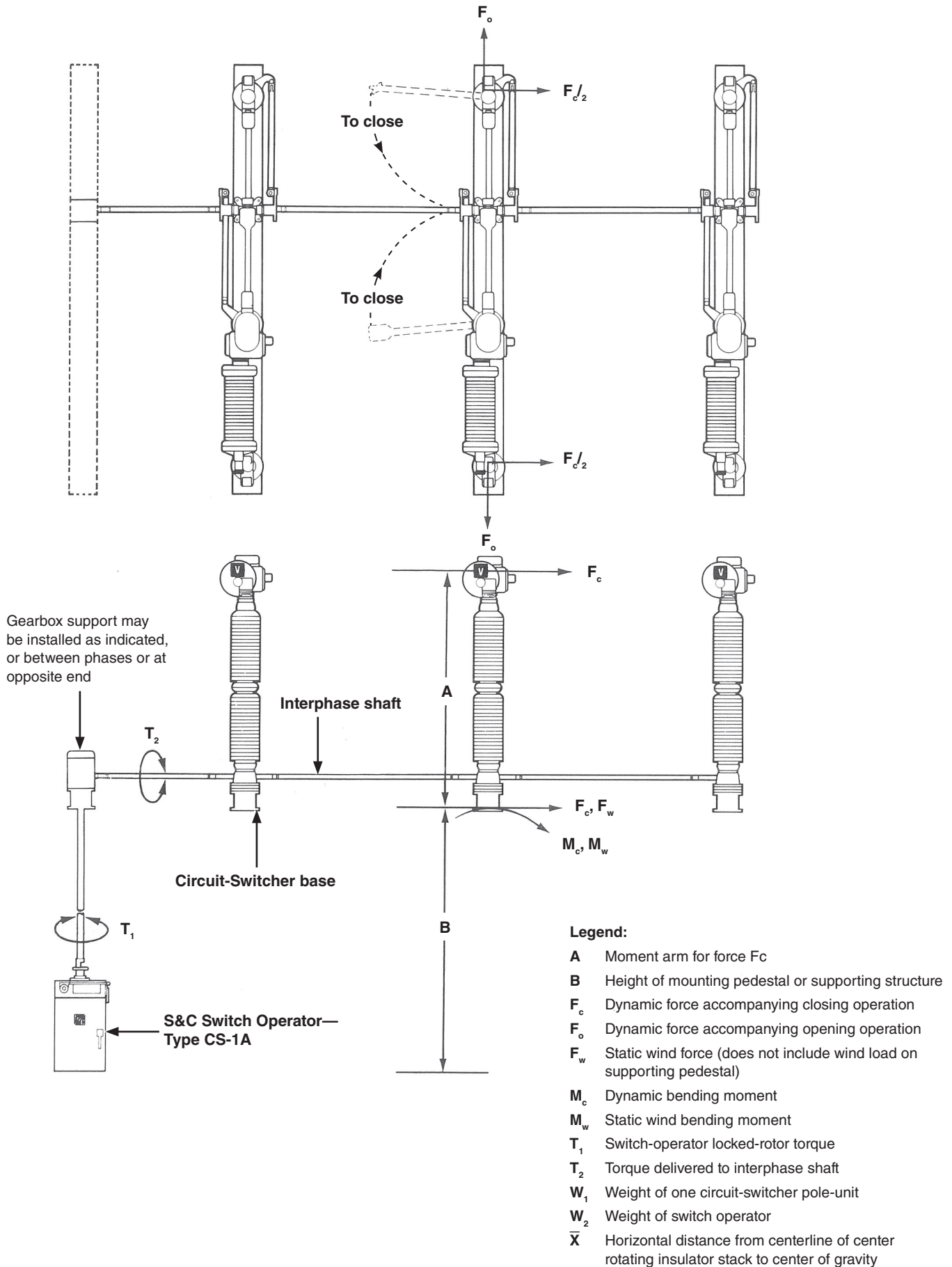
F_c and F_o are forces at the circuit-switcher terminal pads accompanying closing and opening operations. Limiting deflections of the circuit-switcher supporting members to recommended values will ensure these forces will be absorbed by the pedestals and not transferred to the adjoining bus or other apparatus (e.g., bushings). Use of expansion joints at circuit-switcher terminal pads will compensate for inherent insulator-column deflection.

The weight of the bus plus any associated ice load exerts a vertical force on the circuit-switcher terminal pads. This vertical force must not exceed 400 pounds (181 kg) on the terminal pads at the interrupting-unit end, or 300 pounds (136 kg) on the terminal pad at the disconnect-blade end. Bus connections to the terminal pads on the disconnect-blade end must be sufficiently rigid to preclude wind-induced oscillation of the terminal pads.

★ Information given in this publication applies to equivalent models of Mark IV Circuit-Switchers.



S&C Mark V Circuit-Switchers



In these loading diagrams, no attempt has been made to indicate a specific arrangement of the supporting structure, because there are many ways it can be executed. However, the values shown provide complete loading data. (Steel pedestals are available from S&C which meet the requirements outlined here.)

For further information on the arrangement of the components for a specific installation, refer to the applicable Erection Drawing (ED) supplied by S&C.

Table 1. Loading Data^①

Rating, kV		F _{c'} Lbs. ②	F _{o'} Lbs. ②	F _{w'} Lbs. ②	M _{c'} In-Lbs. ②	M _{w'} In-Lbs. ②	T _{1'} In-Lbs.	T _{2'} In-Lbs.	W _{1'} Lbs. (kg) ②	W _{2'} Lbs. (kg.)	A, Inches (mm)	X̄, Inches (mm)
Nom.	BIL											
230	900	560	260	1570	56 600	79 500	21 500	20 000	22 000 (9979)	350 (159)	104 (2642)	1/2 (12.7)

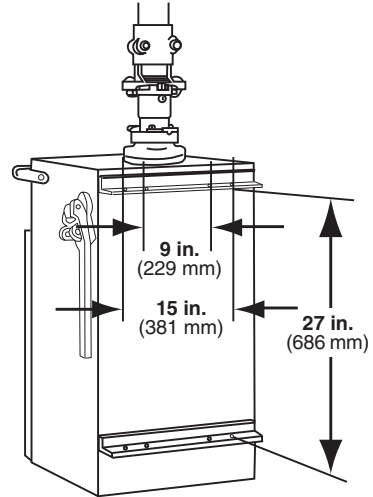
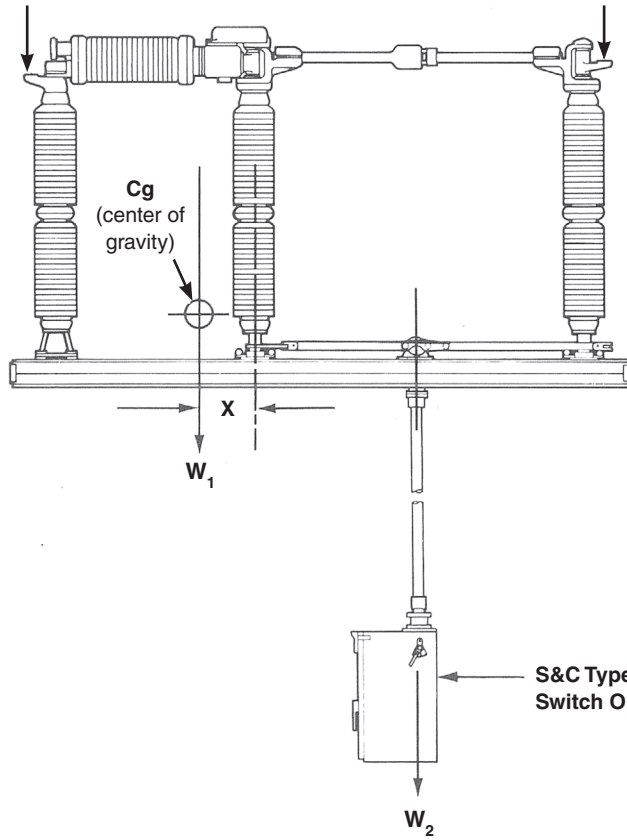
① Values shown are for circuit-switchers equipped with: (a) station post insulators, (b) the maximum number of interrupting gaps, and (c) 2,000-ampere blades, and (d) Type CS-1A Switch-Operator. Wind force is based on 100-mph wind velocity.

② Per circuit-switcher pole-unit.

S&C Mark V Circuit-Switchers

Maximum vertical force from weight of bus plus any ice load not to exceed 400 pounds (181 kg.) at this terminal pad

Maximum vertical force from weight of bus plus any ice load not to exceed 300 pounds (136 kg.) at this terminal pad



Switch operator mounting-hole spacing

S&C Type CS-1A Switch Operator