

SECTION 26 28 16 SAFETY SWITCHES

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish and install safety switches of the types, sizes and quantities indicated on the contract drawings. Provide all lugs and accessories necessary for proper installation and operation.

1.2 RELATED DOCUMENTS

- A. All drawings and general provisions of the Contract including Division 1 requirements apply to this section.
- B. *[The following sections shall be adhered to in the performance of work specified by this section:*
 - 1. *Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables*
 - 2. *Section 26 05 26 – Grounding and Bonding for Electrical Systems]*

1.3 SUBMITTALS

- A. Provide product information prior to fabrication and installation. Product data shall include all dimensions, weights, electrical ratings and replacement parts.

1.4 RELATED STANDARDS

- A. The safety switches and all accessories shall be designed, manufactured and tested in accordance with the latest applicable standards of the following:
 - 1. *[UL98 – Enclosed and Dead-Front Switches]*
 - 2. *[UL98B – Enclosed and Dead-Front Switches for Use in Photovoltaic Systems – 1000V, (200A 1000VDC only)]*
 - 3. UL50 – Enclosures for Electrical Equipment
 - 4. NEMA KS-1 for type GD and HD switches.
- B. *[Manufacturer Seismic Qualification: The safety switch(es) shall meet and be certified to seismic requirements specified in the [IBC 2009 International Building Code] [CBC 2010 California Building Code] [ASCE American Society of Civil Engineers 7-10] [OSHPD Special Seismic Certification (OSP)].*
 - 1. *The safety switch(es) shall be compliant with IBC 2009 parameters:*
 - a. *Building Occupancy Category (as defined in Table 1.1 from ASCE 2010): [I] [II] [III] [IV]*
 - b. *Seismic Design Category: [A] [B] [C] [D] [E] [F]*
 - c. *Site Class: [A – Hard Rock] [B - Rock] [C – Very dense soil and soft rock] [D – Stiff soil profile] [E – Soft Soil Profile] [F – Soil vulnerable to potential failure or collapse under seismic loading] as defined in IBC 2006 Table 1613.5.2 Site Class Definitions*
 - d. *Ip – Importance Factor: [1.5 – Components must function after an earthquake for life safety purposes (Building Occupancy Code IV)] [1.25 - Buildings and structures that represent a substantial hazard to human life in the event of failure or that can cause substantial economic impact or mass disruption of day-to-day civilian life (Building Occupancy Code III)] [1.0 – Non-essential buildings. Function not life critical. (Building Occupancy Code I and II)]*
 - e. *Ss – Mapped Spectral Accelerations for Short Periods at 0.2 seconds – 277%g*
 - f. *Sds – 5% Damped Design Spectral Response Accelerations for Short Periods at 0.2 seconds – 1.85.*

- g. ***z/h – height factor ratio: [] Note: Ratio is a calculated value equal to the floor the gear is installed on divided by 12. A 6th floor installation is a 0.5 value. A basement or ground floor installation is a 0.0 value.***
 - 2. ***Equipment shall be designed to be in a concrete and steel, moment-resisting frame building not exceeding 12 stories in height with a minimum story height of 10 feet.]***
- 1.5 QUALITY ASSURANCE
- A. Manufacturer: For equipment required for the work of this section, provide product which is the responsibility of one manufacturer.
- 1.6 DELIVERY, STORAGE AND HANDLING
- A. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. ***[The safety switches shall be VBI as manufactured by Siemens or pre-approved equal. Approved manufacturers are as follows:***
 - 1. **SIEMENS**
 - 2. **.]**

2.2 GENERAL DUTY SAFETY SWITCHES ***[Note: Section 2.2 is for General Duty. Section 2.3 is for Heavy Duty Safety Switches. Section 2.4 is for Heavy Duty Photovoltaic (Solar). Select the section(s) that apply. Delete the sections in their entirety if they do not apply to your job.]***

- A. SWITCH MECHANISM AND HANDLE
 - 1. Switch operating mechanism shall be non-teasible, positive, quick-make, quick-break such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started for 60 amps and greater..
 - 2. The operating handle shall be an integral part of the box and not the cover.
 - 3. The handle position combined with the "ON" and "OFF" labeling shall clearly indicate the switch position.
 - 4. The operating handle must be made of steel, with no plastic parts other than the handle grip for 60 amps and greater.
 - 5. The operating mechanism must be made of steel, with no plastic parts for 60 amps or greater.
- B. SWITCH INTERIOR
 - 1. All switches shall have switch blades, which are visible when the switch is "OFF", and the cover is open.
 - 2. Lugs shall be UL-listed for Cu/Al 60° or 75°C conductors in 30-60 ampere ratings and for 75°C conductors in 100-600 ampere ratings.
 - 3. All current carrying parts shall be plated to resist corrosion.
 - 4. 100 - 600A fusible switches shall have spring reinforced fuse clips.
- C. SWITCH ENCLOSURES
 - 1. Enclosures for Type 3R switches through 200 amps shall have provisions of for interchangeable bolt-on hubs in the top endwall. Hubs shall be Siemens Type "ECHS" or "ECHV" hubs sized as indicated on the plans.
 - 2. ***[The enclosure shall be finished with [gray baked polyester paint, which is electrodeposited on cleaned, phosphate pre-treated steel Type 1.] [gray baked polyester paint, which is electrodeposited on cleaned, phosphate pre-treated galvanized steel [Type 3R] [Type 12].]***

3. All switch enclosures, except those for 30 amps and 60 amps, shall have a formed front flange to provide additional strength and rigidity.
4. Tangential knockouts shall be provided for switches rated 100 amps through 600 amps.

D. SWITCH RATINGS

1. All switches shall be Underwriters' Laboratories, Inc. listed and meet NEMA Specification KS-1.
2. Switches shall also be horsepower rated for AC and/or DC as indicated on the plans. General duty switch UL-listed short circuit current rating shall be:
 - a. ***[10,000 RMS symmetrical amperes when used with or protected by a circuit breaker or a Class H fuses (30-600 amperes)]***
 - b. ***[100,000 RMS symmetrical amperes when used with or protected by Class R fuse (30-600 ampere)].***
 - c. ***[100,000 RMS symmetrical amperes when used with or protected by Class J or T fuses (100-600 amperes).]***
3. All switches, intended for service entrance, shall be UL approved for this application.

2.3 HEAVY DUTY SAFETY SWITCHES (NON-SOLAR) ***[Note: Delete entire Section 2.X if you do not need Heavy Duty (Non-Solar).]***

A. SWITCH MECHANISM AND HANDLE

1. Switch operating mechanism shall be non-teasible, positive, quick-make, quick-break such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
2. The operating handle shall be an integral part of the box and not the cover.
3. The handle position, combined with large "ON" and "OFF" lettering on the nameplate, shall clearly indicate the switch position.
4. The operating handle of Type 1, 3R, 12 and stainless 4X switches must be made of steel, with no plastic parts other than the handle grip. NEMA 4X switches with non-metallic enclosures shall have non-metallic operating handles.
5. The operating handle of a heavy-duty safety switch shall be provided with a highly visible red plastic grip and must allow for hook stick operation.
6. The operating mechanism must be made of steel, with no plastic parts.
7. All heavy-duty switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override; however, the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
8. 30-200A 4X stainless steel switches shall have stainless steel interior parts as standard.
9. All switches shall have provisions to accept up to three 5/16 in. hasp padlocks to lock the operating handle in the OFF position.

B. SWITCH INTERIOR

1. All switches shall have switch blades, which are visible when the switch is "OFF", and the cover is open.
2. Lugs shall be front removable and UL-listed for Cu/Al 60° or 75°C conductors in 30-60 ampere ratings and for 75°C conductors in 100-1200 ampere ratings. Line and load lugs shall be removable with no need to remove line shields and arc suppressors.
3. 30 to 100 ampere switches shall be capable of accepting field installed fuse puller kits.
4. Optional copper body and crimp type lugs are to be UL approved for field installation in 30-600A ratings.
5. Heavy Duty Switches all shall have all copper current carrying parts other than standard aluminum alloy lugs.
6. All current carrying parts shall be plated to resist corrosion.
7. Heavy Duty Switches shall have provisions for field installable auxiliary switches. There also must low current PLC type auxiliary interlock available for 30-200A switches.

8. All switches shall have spring reinforced fuse clips.

C. SWITCH ENCLOSURES

1. Heavy duty switch covers shall be attached with pin-type hinges.
2. Enclosures for Type 3R switches through 200 amps shall have provisions of for interchangeable bolt-on hubs in the top endwall. Hubs shall be Siemens Type "ECHS" or "ECHV" hubs sized as indicated on the plans.
3. Switches shall have wire-bending space lug capacity for one size larger Al/Cu wire than NEC and UL minimum requirements.
4. *[The enclosure shall be finished with [gray baked polyester paint which is electrodeposited on cleaned, phosphate pre-treated steel Type 1.], [gray baked polyester paint which is electrodeposited on cleaned, phosphate pre-treated galvanized steel [Type 3R] [Type 12].] [a brush finish on type 304 stainless steel Type [4] [4X] stainless steel.]]*
5. All switch enclosures shall have a formed front flange to provide additional strength and rigidity.
6. Tangential knockouts shall be provided for switches rated 30-600A in Type 1 and 3R enclosures where permitted.
7. Cover latching means for Type 4, Type 4X and Type 12 switches in metal enclosures rated through 1200 amperes shall be quick release lift lever type.
8. Type 12 enclosures shall be dual rated as Type 3R to allow their use in outdoor applications.
9. Cover viewing window shall be an available option on 30-400A NEMA 12 and 4 / 4X stainless steel switches. The window must allow viewing of indicating fuses in 30-200A ratings.
10. All heavy-duty switches shall have either metal or plastic nameplates.

D. SWITCH RATINGS

1. All switches shall be Underwriters' Laboratories, Inc. listed and meet NEMA Specification KS-1.
2. Switches shall also be horsepower rated for AC and/or DC as indicated on the plans. Heavy duty switch UL-listed short circuit current rating shall be:
 - a. *[10,000 RMS symmetrical amperes when used with or protected by a circuit breaker or Class H fuses (30-600 amperes)]*
 - b. *[100,000 RMS symmetrical amperes when used with or protected by Class R, Class J or Class T fuses (60 amperes) switches].*
 - c. *[200,000 RMS symmetrical amperes when used with or protected by Class R, Class J or Class T fuses (30-600 amperes) switches].*
 - d. *[200,000 RMS symmetrical amperes when used with or protected by Class L or Class T fuses (800-1200 amperes).]*
3. All switches, intended for service entrance, shall be UL approved for this application.

2.4 HEAVY DUTY SAFETY SWITCHES (SOLAR) *[Note: Delete entire section 2.X if you do not need heavy duty photovoltaic/solar safety switches.]*

A. SWITCH MECHANISM/HANDLE

1. Switch operating mechanism shall be non-teasible, positive, quick-make, quick-break such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
2. The operating handle shall be an integral part of the box and not the cover.
3. The handle position, combined with large "ON" and "OFF" lettering on the nameplate, shall clearly indicate the switch position.
4. The operating handle of Type 1, 3R, 12 and stainless 4X switches must be made of steel, with no plastic parts other than the handle grip. NEMA 4X switches with non-metallic enclosures shall have non-metallic operating handles.
5. The operating handle of a heavy-duty safety switch shall be provided with a highly visible red plastic grip and must allow for hook stick operation.

6. The operating mechanism must be made of steel, with no plastic parts.
 7. All heavy-duty switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
 8. 30-200A 4X stainless steel switches shall have stainless steel interior parts as standard.
 9. All switches shall have provisions to accept up to three 5/16 in. hasp padlocks to lock the operating handle in the OFF position.
- B. SWITCH INTERIOR
1. All switches shall have switch blades, which are visible when the switch is "OFF", and the cover is open.
 2. Lugs shall be front removable and UL-listed for Cu/Al 60° or 75°C conductors in 30-60 ampere ratings and for 75°C conductors in 100-200 ampere ratings. Line and load lugs shall be removable with no need to remove line shields and arc suppressors.
 3. 30 to 100 ampere switches shall be capable of accepting field installed fuse puller kits.
 4. ***[Copper body and crimp type lugs shall be UL approved for field installation in 30-200A ratings.]***
 5. Switches all shall have all copper current carrying parts other than standard aluminum alloy lugs.
 6. All current carrying parts shall be plated to resist corrosion.
 7. Switches shall have provisions for field installable auxiliary switches. There also must low current PLC type auxiliary interlock available for 30-200A switches.
 8. All switches shall have spring reinforced fuse clips.
- C. SWITCH ENCLOSURES
1. Switch covers shall be attached with pin-type hinges.
 2. Enclosures for Type 3R switches through 200 amperes shall have provisions of for interchangeable bolt-on hubs in the top end wall. Hubs shall be Siemens Type "ECHS".
 3. Switches shall have wire-bending space lug capacity for one size larger Al/Cu wire than NEC and UL minimum requirements.
 4. The enclosure shall be finished with ***[gray baked polyester paint, which is electrodeposited on cleaned, phosphate pre-treated steel Type 1.] [gray baked polyester paint which is electrodeposited on cleaned, phosphate pre-treated galvanized steel Type 3R] [gray baked polyester paint which is electrodeposited on cleaned, phosphate pre-treated galvanized steel Type 12] [a brushed finish on type 304 stainless steel Type 4 stainless steel.] [a brushed finish on type 304 stainless steel Type 4X stainless steel.]***
 5. All switch enclosures shall have a formed front flange to provide additional strength and rigidity.
 6. Tangential knockouts shall be provided for switches rated 30-600A in Type 1 and 3R enclosures where permitted.
 7. All switches shall have a ***[metal] [plastic]*** nameplates.
- D. SWITCH RATINGS
1. All switches shall be Underwriters' Laboratories, Inc. listed and meet NEMA Specification KS-1.
 2. Switch UL listed short circuit rating shall be 10,000 RMS symmetrical amperes when used with or protected by PV fuses.
 3. All switches, intended for service entrance, shall be UL approved for this application.
 4. Heavy duty photovoltaic rated safety switches shall be suitable for use at 200 amps and 1000 VDC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The contractor shall install all equipment in accordance with the contract drawings and manufacturers recommendations.

3.2 ADJUSTMENTS AND CLEANING

- A. The contractor shall install the necessary accessories in order to place the safety switches in final operating condition.

3.3 TESTING

- A. Perform factory and installation tests in accordance with applicable NEC, NEMA and UL requirements.

3.4 WARRANTY

- A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

END OF SECTION