	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: Electrical Standards	Section: 26 10 01 Pad Mounted Interrupter Switches
		Date: 6/15/16
		Author: Office of Facilities
CC: Project Folder		

Change History

Date	Description of Change	Pages / Sections Modified	Change Approver Initials
6/15/16	Updated division section from 16341-E to 26 10 01, removed references to other section numbers	-	mgl44

A. Summary


This section contains design criteria for medium voltage pad mounted interrupter switches and protective devices.

B. References

1. ANSI C37.57 Metal-Enclosed Interrupter Switchgear Assemblies – Conformance Testing
2. ANSI C37.72, 1987 Standard for Medium AC Pad Mounted Switches for Use in Metal-Enclosed Interrupter Switchgear
3. ANSI C57.12.28, 2005 Standard for Pad Mounted Equipment
4. ANSI/IEEE 386 standard for separable insulated connector systems for power distribution systems above 600 V


C. System Design and Performance Requirements

1. Switches shall be manually operated, load interrupting, SF6 gas insulated, dead front secondary distribution type, non-ventilated, tamperproof and weatherproof, and suitable for mounting on a concrete pad for buried cable entrance and exit. There shall be no energized parts exposed to the environment or surrounding personnel. There shall be no exposed screws, bolts or other externally removable fastening devices. There shall be no openings through which foreign objects, such as sticks, rods, or wires might be inserted to contact live parts.
2. Enclosure shall be minimum 12 gauges mild steel manufactured to ANSI C37.72 and C57.12.28 standards. The enclosure shall be mounted independent of and separately removable from the switch tank to allow independent replacement of the switch tank. Include four enclosure lifting provisions. Enclosure shall be tamper-resistant incorporating hinged access door to the cable entry and switch compartment with stainless steel and brass fasteners and three point latch and penta-

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head locking bolts and provision for a single padlock. Approximate enclosure dimensions are: 54" wide x 48"; deep x 46" high. Weight with gas: 750 lbs.


3. Switch Tank: The switches shall be contained in hermetically sealed tank construction. The tank shall be minimum 12 gauge welded stainless steel, factory filled with SF6 gas and sealed for the life of the unit. Tank shall be designed to withstand 15 psig internal pressure and an external pressure of 14 psig without affecting performance of the switch. Include viewing windows for each switch position.
4. Switch construction: Switches shall be designed for front access to cables and operators. The multi-position switch operating mechanism shall be externally hook-stick-operated only with door opened. Equip each switching way with an internally mounted operating mechanism capable of providing quick-make, quick-break operation in either switching direction. Switch positions shall be clearly identified, padlockable and adaptable to keylock schemes. Switch contacts shall be tulip-bayonet design using high conductivity copper alloy and clearly visible in the open position through the viewing windows. Contacts shall be designed such that arcing does not occur in the area of main current flow at the closed position and so contact pressure increases with increased current flow. Auxiliary blades used for load interruption are not acceptable. Unit shall be designed to accept two incoming radials with the provisions of a close transition for maintenance purposes.
5. Ratings:
 - a. High voltage BIL: 110 kV
 - b. Maximum Design Voltage: 15.5 kV
 - c. Continuous & Loadbreak Amps: 600
 - d. 1 Minute Withstand, AC kV: 34
 - e. 15 Minute Withstand, DC kV: 53
 - f. Momentary Current, kA Symmetrical: 40
 - g. Fault-close, kA Asymmetrical: 40
 - h. Ten (10) Operation Overload Interrupt Capability, A: 3000
 - i. Load Interrupter Endurance @ 600A, Operations: 1200
 - j. Maximum Gas Leakage Test, cc-atm/second: 1×10^{-7}
6. Cable Entrances & Bushings

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- a. Cable enhances shall conform to ANSI/IEEE 386 consisting of 600 ampere deadbreak bushings 1200 ampere loadbreak bushings complete with parking stands for use with separable connectors, 125 kV BIL. Bushings shall be bolted, gasketed enhance type. Ensure compatibility with the termination connectors normally used by the Owner on campus. Bushing configuration: Diagonal Take-off.
7. All electrical equipment receiving 15 kV underground campus radial feeds shall have a minimum lug size of 500 MCM.
8. All medium-voltage switchgear shall be grounded in two (2) locations, forming two (2) separate ground paths. All ground conductors shall not be smaller than size #4/0 AWG copper wire.
9. Finishes shall be prepared with solvent wash to remove rust, oil and grease. Primer coat tank and enclosure with 2 mils dry finish, ASA 70 light gray primer and final coat with a Munsell No. 7.OGY-3.2911.5 green finish using corrosion resistant epoxy paint, 3 mils thick, minimum.
10. Vacuum Interrupter Electronic Control
 - a. Provide an electronic assembly to sense load and fault current on each phase of the load tap circuits. The electronic control shall be powered from the current transformers mounted inside the SF6 insulated switch tank. No external power source shall be required for overcurrent protection. The electronic control shall monitor the current on the individual phases of the load tap circuits using input from the internal current transformers. Electronic trip capability shall be selectable for each phase. Temperature range shall be -30 degree C to +50 degree C.
 - b. Minimum trip selection shall be accomplished with selector knobs inside the electronic enclosure. Trip time current characteristics (TCC) shall be field selectable using a dip switch. Maximum time for power up and ready-to-trip when closing on a circuit shall be ten percent of the trip time or 112 cycles, whichever is greater. Trip selection may be made with the load taps energized.

D. Submittals

Submit the following design and construction documents.

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1. Manufacturer's product data and shop drawings
 - a. Switch and accessories physical arrangement and sizes.
 - b. Wiring diagrams.
 - c. Mounting, connection, size and location of conduits entrance details and instructions.
 - d. Equipment ratings and performance data, including overcurrent protection time-current curves.
 - e. Location of the nearest service shop, owned and operated by the manufacturer, which is capable of repairing components of the switch.
 - f. ISO 9001 certification.
 - g. Instruction, operating and maintenance manual.
 - h. Ground pad locations.
2. Upon completion of factory production tests, submit certified copies of test reports for each unit, identified by serial number.

E. Product Standards

Products shall conform to ISO 9001 certification

F. Manufacturers

The manufacturer of the medium pad mounted interrupter switches shall be G & W Electric Company. There is no substitute. Use a 600A pad mounted puffer gas switch with switch position indication.


G. Equipment

Materials and products provided shall be suitable for the intended use or application, and, where applicable, UL listed and labeled.

H. Accessories or Special Features

Pad mounted interrupter switches standard features:

1. SF6 gas pressure gauge and fill valve.
2. Grounding provisions for switch tank and cable entrances.
3. Stainless steel three line diagram and corrosion-resistant nameplates.

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4. Phase-designation nameplates.
5. Viewing windows for switch position.
6. Permanently mounted operating handle.
7. Termination parking, one per hushing.
8. Switch operating handle(s) with padlock provision and end stops.
9. Type 1 vacuum interrupter electronics package including a selector switch for 3-phase operation and individual phase trip levels.

I. Extra Materials

One spare set of control power fuses for Vacuum Interrupter Electronic Controller.


J. Installation Guidelines

1. Install each unit on a level, smooth concrete pad of appropriate dimensions, in strict accordance with manufacturer's instructions.
2. Coordinate exact configuration and location of cable conduit entries to suit.
3. Terminate and connect phase and grounding conductors as required
4. Provide minimum of two (2) ground rods and #4/0 bare copper ground loop placed 12-inches below undisturbed earth and 12-inches from pad perimeter and bonded to the switch per Code.
5. Protection: Where subject to vehicular damage, provide one 4-inch vertical steel pipe bollard filled with concrete and located at each corner of the concrete pad. Minimum height above grade shall be 60-inches; minimum depth below grade shall be 40-inches. Deliver the switch after protection is installed.
6. Tighten all electrical connectors and terminals according to manufacturer's published torque values or as specified in UL 486A and UL 486B.

K. Quality Control

1. Factory Quality Control Testing

- a. Each unit shall be fully tested at the factory in accordance with ANSI C37.57 Metal-Enclosed Interrupter Switchgear Assemblies - Conformance Testing.
 - 1) Installed SF6 gas moisture content.
 - 2) Gas tank pressure.
 - 3) Leak test.

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- 4) Mechanical operation.
- 5) AC hi-pot test one minute phase to phase, phase to ground and across the open contacts. Check circuit resistance on ways.
- b. Submit copies of test reports, including certification that units comply with applicable standards and specifications, and are acceptable to use.

2. Field Quality Control Testing

- a. After switches installation, but prior to energizing, the contractor shall provide the services of a factory-authorized field service technician to inspect each installation, perform factory-recommended tests, and certify each as ready to energize. Minimum field testing shall include DC megger, contact resistance, and gas leakage tests.
- b. Test and set electronic fault protection time current settings.
- c. A certified field service report for each unit shall be submitted for record.

L. Cleaning and Adjusting

After installing and cleaning, touch up scratches and mars on finish to match the original finish. Wipe all buses and terminals to remove dust with water or alcohol dampened cloth.

End of Section