

1. General

This instruction specifies procedures, care and precautions to be used in handling and installing 5000 volt insulated wire. This type of wire is used for primary voltage installations on the 4160 and 4800 volt systems where open wire would be hazardous. These installations include primary transformer leads, switch leads and primary taps.

2. Care In Handling And Installing

It is essential that the utmost care and precaution be exercised in handling and installing 5000 volt insulated wire. A flexible insulation is inherently weak to mechanical damage. Even the best insulated wires or cables presently available have certain limitations and require care during handling and installation. The care exercised in storing and handling 5000 volt wire should be similar to that which is given to the storage, handling and use of rubber protective equipment.

2.1 Handling Before Installation

Care shall be taken to avoid cutting and abrading the insulation on 5000 volt wire before installation. The wire shall be supported in the truck on a smooth flat surface and shall be kept free of dirt, grease or other foreign substances. It shall not be thrown into the truck or onto the ground at any time. Throwing the wire on sharp objects will result in possible damage to the insulation. Similarly, objects shall not be thrown on the wire. Dragging the wire from the truck or along the ground will result in abrasion of the wire and shall be avoided.

2.2 Care And Precautions While Installing

2.2.1 Clearance

5000 volt wire shall be installed in such a manner that the insulation will not be damaged by rubbing against other objects nor be pressed against any projection which will cause an indentation in the insulation.

2.2.2 Bending

5000 volt insulated wire shall never be bent at a radius less than 10 times the outside diameter of the wire. (Diameter includes the insulation.) Excessive stretching by too sharp a bend will weaken the insulation.

2.2.3 Corona

5000 volt insulated wire shall be installed as far as possible from grounded objects or other conducting surfaces. Objects with sharp edges, such as bolts, brackets and transformer tanks, when in contact with the insulation cause a concentration of the corona at these edges and will accelerate the destruction of the insulation.

2.2.4 Splices

5000 volt insulated wire shall not be spliced where the splice will be inside conduit or within 6 inches of the point of entry of the insulated wire into the conduit. All splices shall be insulated with two layers of H.V. rubber tape (Stock #25 53 070) half lapped, two layers of friction tape (Stock #25 53 003) half lapped and the splice completed with a single layer of vinyl plastic tape (Stock #25 53 055) half lapped. See Dist. Std. **41 24 30 **** for a cold-shrinkable 5kV splice.

2.2.5 Taps

Joints where 5000 volt insulated wire tap a second 5000 volt insulated wire shall be insulated in the same manner as a splice. The joint shall be insulated with two layers of H.V. rubber tape half lapped, two layers of friction tape half lapped and the joint completed with a single layer of vinyl plastic tape half lapped.

1. General

This instruction prescribes procedures to be followed on group operated airbreak and load-break switches on 13.8kV thru 69kV lines and in customer substations. It does not apply to switches installed in company substations.

2. Procedure

- a. The switch should be disconnected from all electric power sources before service.
Ground leads or their equivalent should be attached to both sides of the switch. Local and applicable OSHA regulations, including all safety precautions should be followed. Switch leads that may have been removed shall be re-connected and all switch terminals shall be checked for tightness before the switch is released for normal service.
- b. Look for evidence of burning, pitting or overheating of the blade and stationary contacts. Inspect all live parts for scarring, gouging, or sharp points that could contribute to excessive radio noise and corona. Check corona balls and rings for damage that could impair their effectiveness.
- c. Inspect the flexible braids or slip-ring contacts used for grounding the operating handle. Replace braids showing signs of corrosion, wear, or having broken strands.
- d. Switches having silver contacts shall be cleaned and those having copper contacts may be lightly dressed with sandpaper.
- e. A preliminary check on the operation of all moving parts shall be made to determine if any bushings, bearings, pins, etc., are missing or worn and replacement shall be made as required.
- f. The mounting bolts that fasten the base of each switch to the crossarms shall be checked for tightness and tightened as needed. Also, the mounting bolts and lag screws that fasten all guide bearings and the operating handle assembly to the pole shall be checked and tightened. All other supporting members of the switch structure that may become loose through weathering should also be checked and tightened.
- g. After all necessary repairs have been made and all mounting bolts, hardware, etc., has been tightened, the overall operation of the switch shall be carefully checked and adjusted.
- h. Inspect interphase linkages, operating rods, levers, bearings, etc., to assure that adjustments are correct, all joints are tight, and pipes are not bent. Clean and lubricate the switch parts only when recommended by the manufacturer. The length of the interphase rods should be adjusted as needed so that all units open and close simultaneously. It is important that all switches operate to the fully closed position. The shortening or lengthening of the interphase rods may have to be repeated several times to assure proper operation. The travel of the operating handle should be set so that a slight effort is required to lock it in either the open or closed position. Check gear boxes for moisture that could cause damage due to corrosion or ice formation.
- i. Inspect the insulators for breaks, cracks, burns, or cement deterioration. Clean the insulators particularly where abnormal conditions such as salt deposits, cement dust, or acid fumes exist. This is important to minimize the possibility of flashover as a result of the accumulation of foreign substances on the insulator surfaces.
- j. Check the switch for alignment, contact pressure, eroded contacts, corrosion, and mechanical malfunction. Replace damaged or badly eroded components. If contact pitting is of a minor nature, smooth the surface with clean, fine sandpaper (not emery) or as the manufacturer recommends. If recommended by the manufacturer, lubricate the contacts. Inspect arcing horns for signs of excessive arc damage and replace if necessary.
- k. Power-operating mechanisms for switches are usually of the motor-driven, spring, hydraulic, or pneumatic type. The particular manufacturer's instructions for each mechanism should be followed. Check the limit switch adjustment and associated relay equipment for poor contacts, burned out coils, adequacy of supply voltage, and any other conditions that might prevent the proper functioning of the complete switch assembly.

- I. Inspect and check all safety interlocks while testing for proper operation for Turner D Switch.

3. Interrupters

Vacuum interrupters (bottles) shall be checked for proper operation. Check the fiberglass housing. If there is evidence of burning from the inside showing or if there are cracks which appear to go through the housing, replace the bottle.

The bottle is designed to interrupt 2000 amps of load current (1200A capacitive). It is not able to carry load current for more than a few seconds.

The actuating arm on the bottle trips the vacuum interrupter internally. Check that the arm operates smoothly and there is a click for tripping and for resetting (when the arm is released). Be sure the actuating arm springs back to its reset or rest position. Check electrical continuity in the reset position and for open in the trip position.

3.1 Turner D Switches:

Check for proper switch blade -- actuating arm operating. The actuating arm on the bottle should be contacted by the opening switch blade pick up hardware before the quick whips separate from the stationary contact. As the blade keeps moving the current is carried through the actuating arm until it trips. As the blade keeps moving it clears the bottle actuating arm (minimum 3/4"). The actuating arm then springs back to reset. When the switch is closed again, momentary contact will be made with the bottle actuating arm.

3.2 SEECO Switches:

Switches supplied with high-speed, snap-out arcing horns for the interruption of limited amounts of line charging and transforming magnetizing currents. Horn shall be tapered design to provide maximum tip speed and shall include a mechanical stop (snubber) to prevent return/rebound of the horn and possible re-strike.

Inspect the arcing horn assemblies to insure that no whips are burned and that no snubber rubbers are broken. Insure that the arcing horn whips engage the hooks and are held as the switch opens. Insure that all jaw assemblies open completely, so that the blade closing in will hit inside the jaw rather than on the outside. Insure that the blade closing in will hit the center of the jaw contact finger assemblies equally.

The switch has vacuum interrupters installed, inspect to insure that interrupter operating arm is engaged correctly by the opening blade and visually inspect the auxiliary contacts to insure that they are not burned and they engage in the proper sequence.

4. Application of Silicone Compound

Silicone compound shall be applied to 13.8kV and 34.5kV airbreak switches to minimize the adhesion of ice to switches and operating mechanisms.

4.1 Areas of Application

Silicone compound shall be applied to the following switch parts.

- a. All bearings, pivot points and pins.
- b. Contact Areas
 1. The stationary contact assembly.
 2. The switch contact area.
 3. Arcing horns.
- c. Any location where ice may form between a moving part and a stationary member. For example: On interphase rods where the clearance between the interphase rods and switch base is small.

4.2 Method of Application

Stock No. 31 51 048 – "Compound – Insulating, Silicone, in 12 oz. Pressurized Cans" – This silicone compound is combined with a solvent in a liquid form and is packaged in an aerosol bomb. Upon application the solvent quickly evaporates leaving the silicone compound. A sufficient amount of spray should be applied to leave a thin film of silicone compound on the area sprayed.

CAUTION: The solvent will attack rubber; do not spray on rubber equipment.

