



SV 002 Bird and Animal Protection—General Installation Instructions

1. Scope

This standard provides information regarding the proper installation of bird and animal protection products to reduce the risk of protected bird electrocutions and bird and animal-caused outages within company substations.

2. Avian-Safe Design and Applicable Voltages

Bird and animal protection products are installed in substations at and near equipment and support structures when the horizontal/diagonal separation between potential points of contact is less than 46" and/or when the vertical separation between potential points of contact is less than 30". Phase-to-phase and phase-to-ground distances must be considered when determining the need for protection. Lower voltage substations up to and including 46 kV require the installation of cover-up products or barriers at and near equipment and support structures to reduce the risk of bird and animal electrocutions. Protection may include covers and/or barriers on bushings, arresters, jumpers, switches, bus support insulators, and station service.

69 kV substations should, by engineering design (where applicable), meet avian-safe separations without the use of cover-up materials. However, if avian-safe separations are not met in 69 kV substations, work with engineering and T&D environmental services to assess the risks and develop an appropriate solution.

3. Personnel-Protective Grounding Provisions

When bird and animal protection is installed on equipment, provisions must be made to allow proper grounding of substation equipment and bus work. Generally, a minimum length of six inches (6") of non-covered, bare conductor should be maintained for grounding. Self-adhesive tape should be installed directly on the hose, adjacent to the grounding gap, to help secure the hose and eliminate sliding and shifting. When possible, these gaps in coverage on conductors should be staggered at alternating heights to minimize bird and animal electrocution risks.

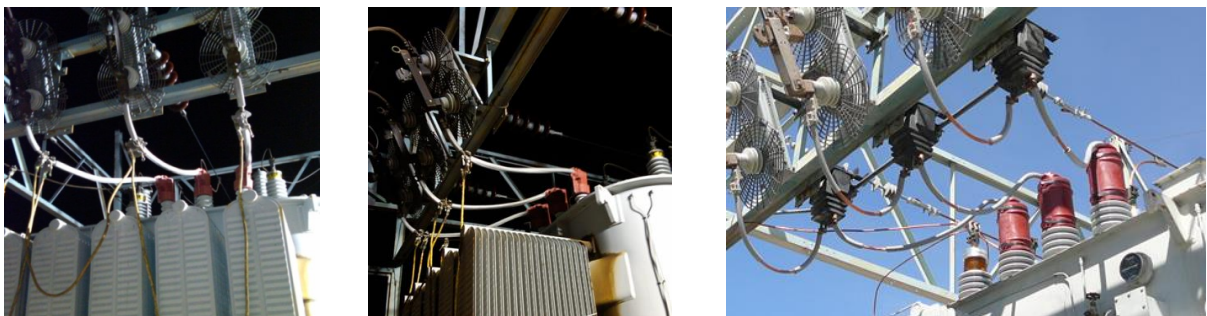


Figure 1—Gaps in Hose Coverage on Conductors for Proper Grounding

4. Proper Installation of Bird and Animal Protection Products

The following section provides general guidance for the proper installation of various bird protection products. It is imperative that products be installed correctly to prevent future operational problems, equipment failures, or nesting issues:

- **Do NOT cover the entire length of bus or conductor**

Bus and conductor covering should be installed at and near equipment and support structures where the horizontal/diagonal separation between potential points of contact is less than 46" and/or when the vertical separation between potential points of contact is less than 30". Hose or heat-shrink tape should not extend the entire length of the bus or cover the entire conductor, but rather, should be installed at, and adjacent to, equipment and support structures, where perching may occur.



Figure 2—Incorrect Installation of Hose on the Entire Length of Conductor



Figure 3—Incorrect Installation of Hose on the Entire Length of the Center Bus

Do not cover the entire length of the bus or conductor. Covering is required at and adjacent to equipment and support structures, but not for the entire length of the bus.



Figure 4—Correct Installation of Heat-Shrink Tape (or Hose) on the Bus

The entire length of the bus is not covered; covers and heat-shrink tape were installed at, and adjacent to, equipment and support structures. Heat-shrink tape should be installed with $\frac{2}{3}$ overlap.

A propane torch is required for the proper installation of heat-shrink tape.



Figure 5—Propane Torch for the Installation of Heat-Shrink Tape

- **Do NOT completely cover bushings, arresters, or insulators**

Bushing, arrester, and insulator covers should be installed near the top of the bushings, arresters, or insulators—between the first and second skirts or sheds. Bird and animal protection products should never cover the entire bushing, arrester, or insulator and should never make contact with the grounded equipment or support structure. Covering entire bushings, arresters, or insulators may prevent natural washing, compromise the BIL of the insulator, and can lead to tracking or flash-overs.



Incorrect Installation



Correct Installation

Figure 6—Incorrect and Correct Installation of Covers

- **DO cover the energized components of bushings, arresters, or insulators**

Install covers so they do not tip or tilt, leaving energized components uncovered. Covers should be installed between the first and second skirts or sheds of bushings, arresters, and insulators. The incorrect installation of bushing covers can leave energized components exposed.



Figure 7—Incorrect Installation of Bushing Covers

- **Do NOT leave large gaps, holes, or openings in the covers**

Covers should be trimmed in the field to fit snugly. To prevent bird and insect access, ensure no large openings or gaps exist.

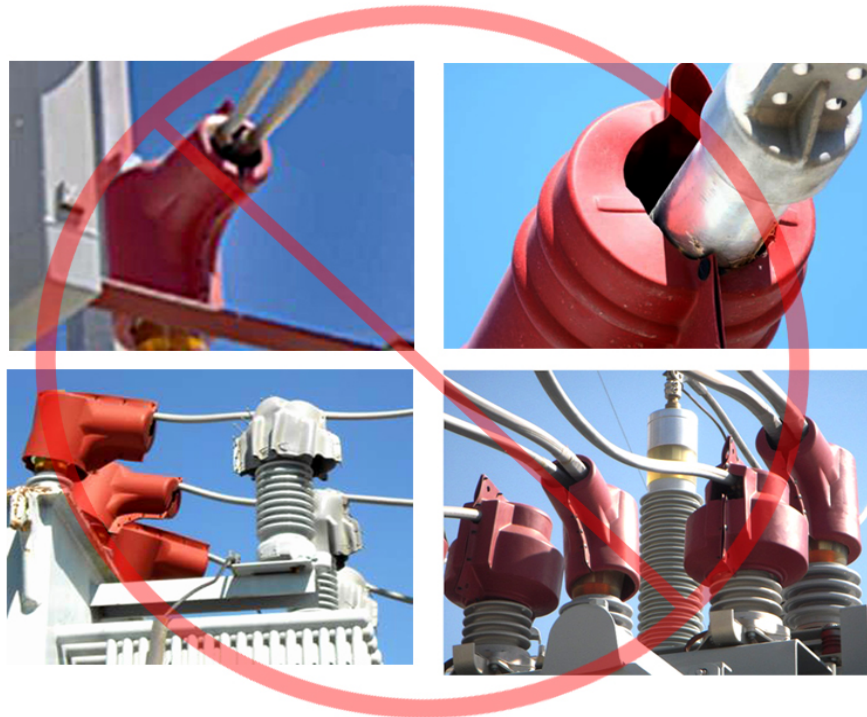


Figure 8—Incorrect Installation of Covers with Large Gaps and Openings

Use the following suggested practices and strategies to prevent and eliminate gaps and openings and reduce the chance of bird and insect use.

Precise holes can be cut in the covers to accommodate conductors (see Figure 9).



Figure 9—Precise Holes Cut Around Conductors to Prevent Gaps

Alternately, “finger-like” slits can be made in the covers to create a tight fit around conductors (see Figure 10).

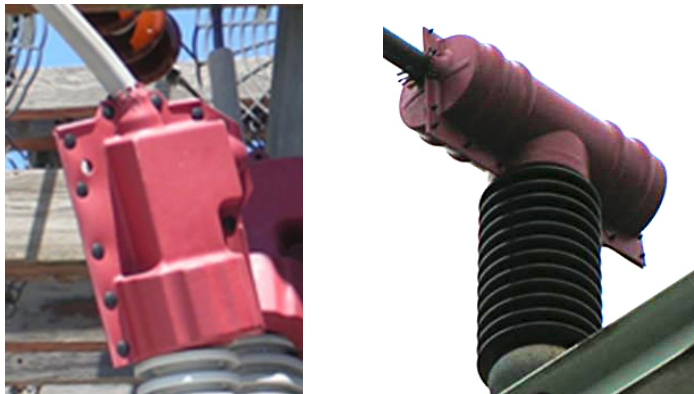


Figure 10—“Finger-Like” Slits Cut Around Conductors to Prevent Gaps

Surplus cut pieces can also be used to fill gaps and close holes by using a leather-punch to create additional pinning holes and piecing together materials. This practice is not a means to repair a bad cut and should only be used when conductors do not align with the cover seams or when there is no other means of eliminating gaps (see Figure 11).

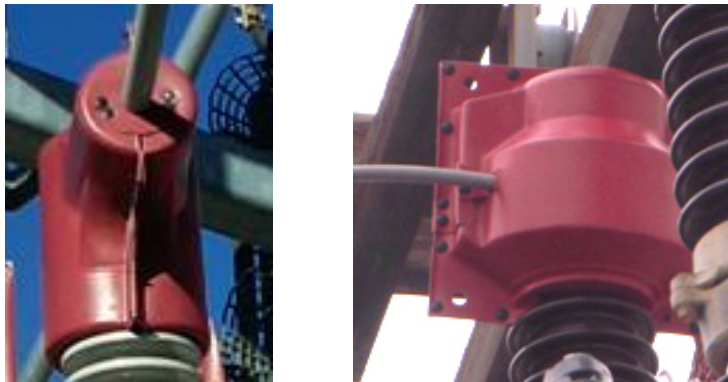


Figure 11—Surplus Cut Material Pieced Together to Prevent Gaps

Extra pins can also be added to prevent gaps adjacent to conductors (see Figure 12). When needed, additional holes should be created using a leather-punch (see Figure 13). Punch additional holes with a diameter to match the existing holes in the cover.



Figure 12—Extra Pins Added to Prevent Gaps Adjacent to Conductors

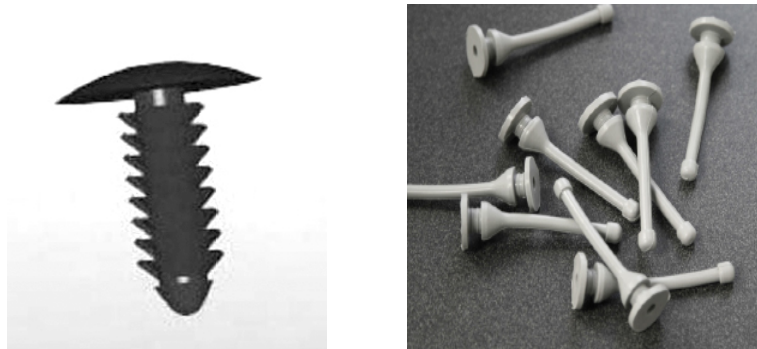


Figure 13—Two Styles of Leather-Punch Tools for Creating Additional Holes for Pinning

Note: These tools are available in local craft stores, or contact T&D environmental services department for guidance.

- **DO install ALL pins provided with the covers to ensure a secure fit**

Black push pins are provided with non-silicone covers and silicone pins are provided with silicone covers. If additional pins are needed, they can be ordered using SI# 7889168 for black push pins and SI# 7889461 for silicone pins. See Figure 14 and SV 651. Pins can be ordered and installed when additional pins are required for securing covers or when pins are missing or lost.



SI# 7889168

SI# 7889461

Figure 14—Black Push Pins and Silicone Pins

- **Self-adhesive tape should only be used to keep bird and animal protection products in place, to prevent gapping in split hose installed on conductor or bus, or to gain the appropriate coverage associated with sight-glass bushings. It is not to be used to cover the bus.**

Do NOT use self-adhesive tape, black electrical tape, or heat-shrink tape on bushings and bolted connections. The use of tape on bushings and bolted connections can trap water and cause corrosion and equipment failure. Covers, which allow water drainage and can be removed and re-installed as needed, should be installed on bushings and bolted connections.



Figure 15—Inappropriate Use of Self-Adhesive Tape

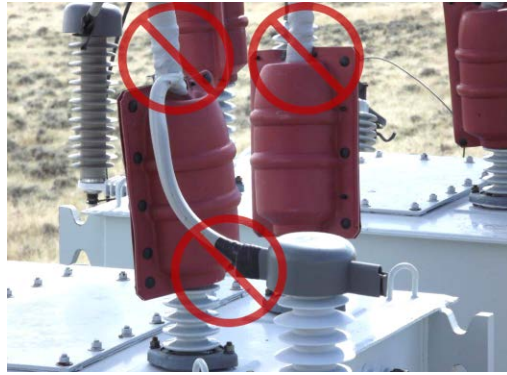


Figure 16—Inappropriate Use of Self-Adhesive Tape and Black Electrical Tape

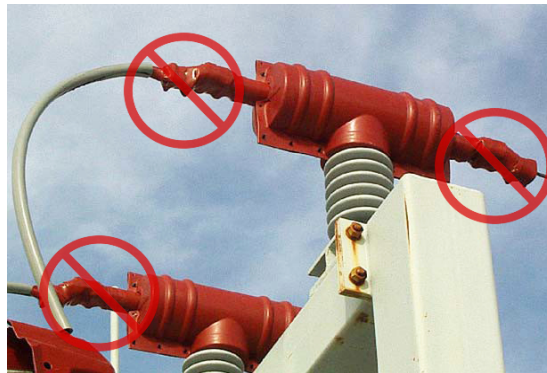


Figure 17—Inappropriate Use of Heat-Shrink Tape

Self-adhesive tape should be handled with care to avoid a loss of adhesion. Avoid touching the inner, adhesive side of the tape. If there is an end section of tape that is handled during installation, cut this “tail” off before securing the final section. When used to keep protection products in place and to prevent gapping in split hose, self-adhesive tape should be installed over the existing cover or hose. It should not be installed directly on the conductor or electrical equipment. Self-adhesive tape should be cut, never stretched and/or torn.

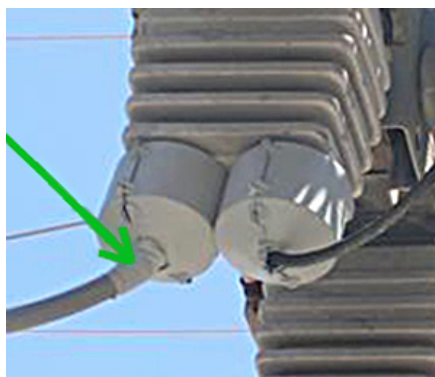


Figure 18—Appropriate Use of Self-Adhesive Tape

Figure 18 illustrates the appropriate use self-adhesive tape to hold bird and animal products in place.



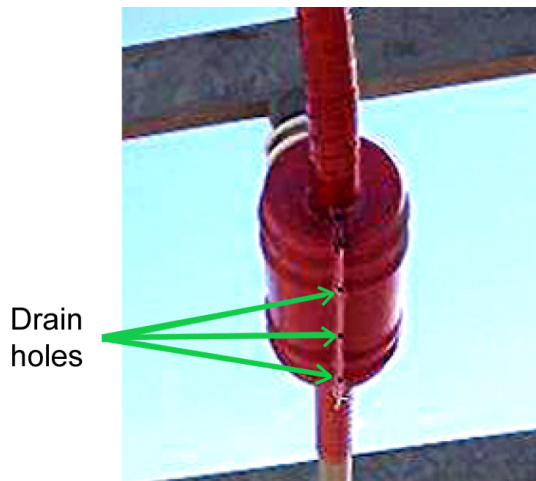
Figure 19—Incorrect and Correct Installation of Self-Adhesive Tape

Figure 19 illustrates the incorrect and correct installation of self-adhesive tape installed on conductor with hose. See Figure 26 for an example of how to use self-adhesive tape in association with sight-glass bushings.

Heat-shrink tape should only be installed on the bus to reduce the chance of bird and animal electrocutions at and near the support structure. See Figure 4 for examples of the correct use of heat-shrink tape.

- **DO encourage water to drain from covers by cutting drainage holes when covers are installed with seams upward**

When water is trapped inside covers, freeze/thaw cycles can cause damage and equipment failure. Cut small drainage holes in covers when they are installed with natural seams upward.



Note: If a cover is installed inverted, 1/8" drain holes shall be drilled into the cover bottom

Figure 20—Drain Holes Cut in Covers Installed with Seams Upward

- **DO add weep holes in the bus and covering when the sections of the bus are covered with heat-shrink tape or hose**

The installation of heat-shrink tape or hose on the bus may cover existing weep holes present in the bus. If, when installing heat-shrink tape or hose on sections of the bus, the existing weep holes are covered, additional weep holes should be drilled through both the heat-shrink tape or hose and the bus.

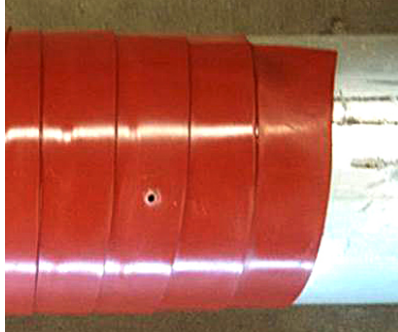


Figure 21—Weep Hole

- **DO install covers on expansion joints and connectors where there is less than 30" vertical separation and 46" horizontal/diagonal separation between potential points of contact**

Box covers, SV 301, can be used to cover expansion joints. Tape should NOT be used for covering expansion joints.

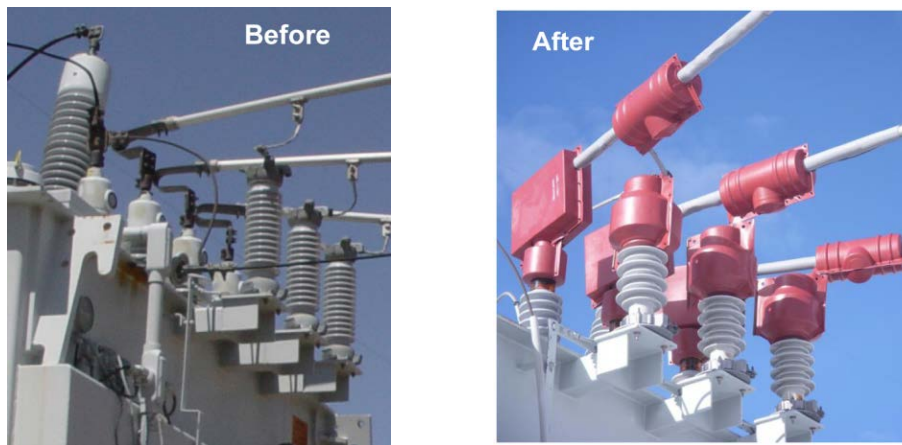


Figure 22—Box Covers

- **DO NOT allow covers to hinder the visibility of gauges or oil sight-glass on bushings**

The installation of covers should not compromise the viewing of gauges or oil level indicator windows.

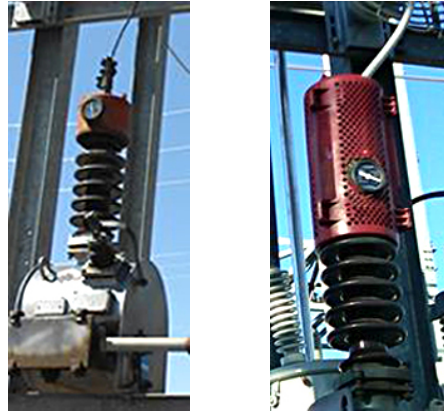


Figure 23—Cover Installation, "Before" and "After"

Figure 23 illustrates views before and after the correct installation of a cover that allows gauge viewing. If present, oil indicator windows must remain visible. This can be achieved by cutting an opening in the bushing cover to allow viewing of the oil indicator window (See Figure 24) or by using an “inspection” bushing cover (See Figure 25). Bushing covers can also be cut to expose the oil indicator window and supplemented with self-adhesive tape (See Figure 26).

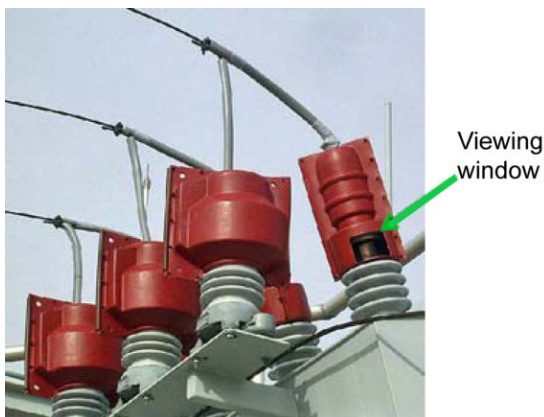


Figure 24—Cover Modification to View Oil Indicator Window



Figure 25—“Inspection” Bushing Cover to View Oil Indicator Window

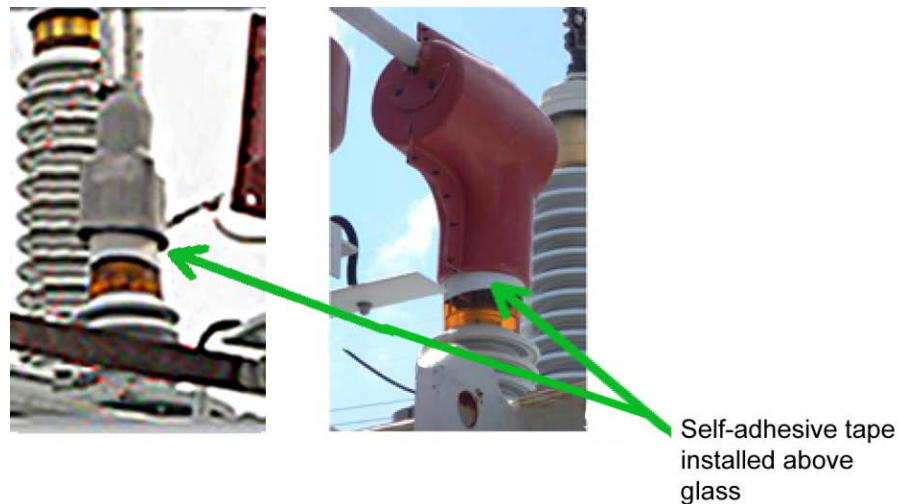


Figure 26—Self-Adhesive Tape Installed Above Glass*

* Heat-shrink tape cannot be used for this application.

Figure 26 illustrates a cover modification and the use of self-adhesive tape to view oil indicator window.

Silicone self-adhesive tape can be installed on the metal directly above the oil indicator window. At least two layers of self-adhesive tape should be installed to achieve the appropriate coverage. When using this strategy for viewing oil indicator windows, ensure the bushing cover overlaps the self-adhesive tape. Heat-shrink tape shall **not** be used as an alternative on the sight glass, as heating the glass could cause it to shatter.

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