avian-safe design

SV 251 Bird and Animal Protection for Miscellaneous Equipment

1. Scope

This standard provides information on avian-safe design of station service transformers; feeder arresters; cutouts; voltage, potential, and current transformers; vacuum switches; and risers. The criteria in this standard is intended to reduce bird and animal electrocutions and outages. This standard applies to both retrofitted and newly-constructed substations.

2. Standard References

The following company construction standards are used in conjunction with this document:

EC 951, *Conductor, Overhead Primary, Leads and Jumpers*
EV 151, *Cutout Cover*
EV 985, *Guard, Bird, Arrester Cover*
SV 001, *Substation Bird and Animal Protection—General Information*
SV 002, *Bird and Animal Protection—General Installation Instructions*
SV 301, *Cover, Box*
SV 311, *Cover, Termination*
SV 315, *Cover, Vacuum Switch*
SV 401, *Cover, Arrester*
SV 421, *Cover, Current Transformer, Bushing*
SV 425, *Cover, Voltage/Potential Transformer, Bushing*
SV 451, *Cover, Bushing/Arrester*
SV 471, *Bushing Cover, Inspection*
SV 473, *Bushing Cover, Silicone*
SV 475, *Bushing Cover, Flared-Bottom*
SV 481, *Bushing Cover, Hard-Sided, Two-Piece*
SV 483, *Bushing Cover, Right-Angle*
SV 485, *Bushing Cover, Spring-Loaded*
SV 491, *Bushing Cover, Straight/Tall*
SV 601, *Split Hose, Silicone*
SV 602, *Tape, Self-Adhesive Silicone*
SV 611, *Jumper, Covered Wire*

ROCKY MOUNTAIN POWER PACIFIC POWER

3. Application Information

Avian-Safe Design and Retrofitting

Covers and covered wire/hose should be installed to reduce the risk of bird and animal electrocution where there is less than 30″ of vertical separation and/or less than 46″ of horizontal/diagonal separation between potential points of contact at, and near, equipment. Phase-to-ground and phase-to-phase distances must be evaluated when determining the need for protection. Covered wire should be used for station service transformers, cutouts, and arrester jumpers. The installation of covered wire for these applications is preferred over hose.

4. Station Service Transformers

Actual station service transformer installations are shown in Figure 1. The service transformer is protected as shown in Figure 2. Energized bushings should be covered and bushing covers should be installed near the top of the bushing--between the first and second skirts or sheds. Bird and animal protection products should never cover the entire bushing and should never make contact with the transformer can. See SV 002, *Bird and Animal Protection—General Installation Instructions*, for additional information and photographs.Covered wire should be used for station service transformer leads. See EV 921, *Guard, Bird, Equipment Bushing* and SV 485, *Bushing Cover, Spring-Loaded*, for the preferred station service transformer bushing cover.

NOTES:

1. Covered wire should be used for arrester grounds when they are present with the cutout
2. When the transformer is mounted on the steel structure, there may be a phase-ground point of contact between the gapped jumper wire and the grounded structure if avian-safe separations are not met. Efforts should be made to minimize this risk of contact by moving the hose gap further from the structure or other appropriate methods.

Figure 1—Station Service Transformer and Arrester Bird and Animal Protection

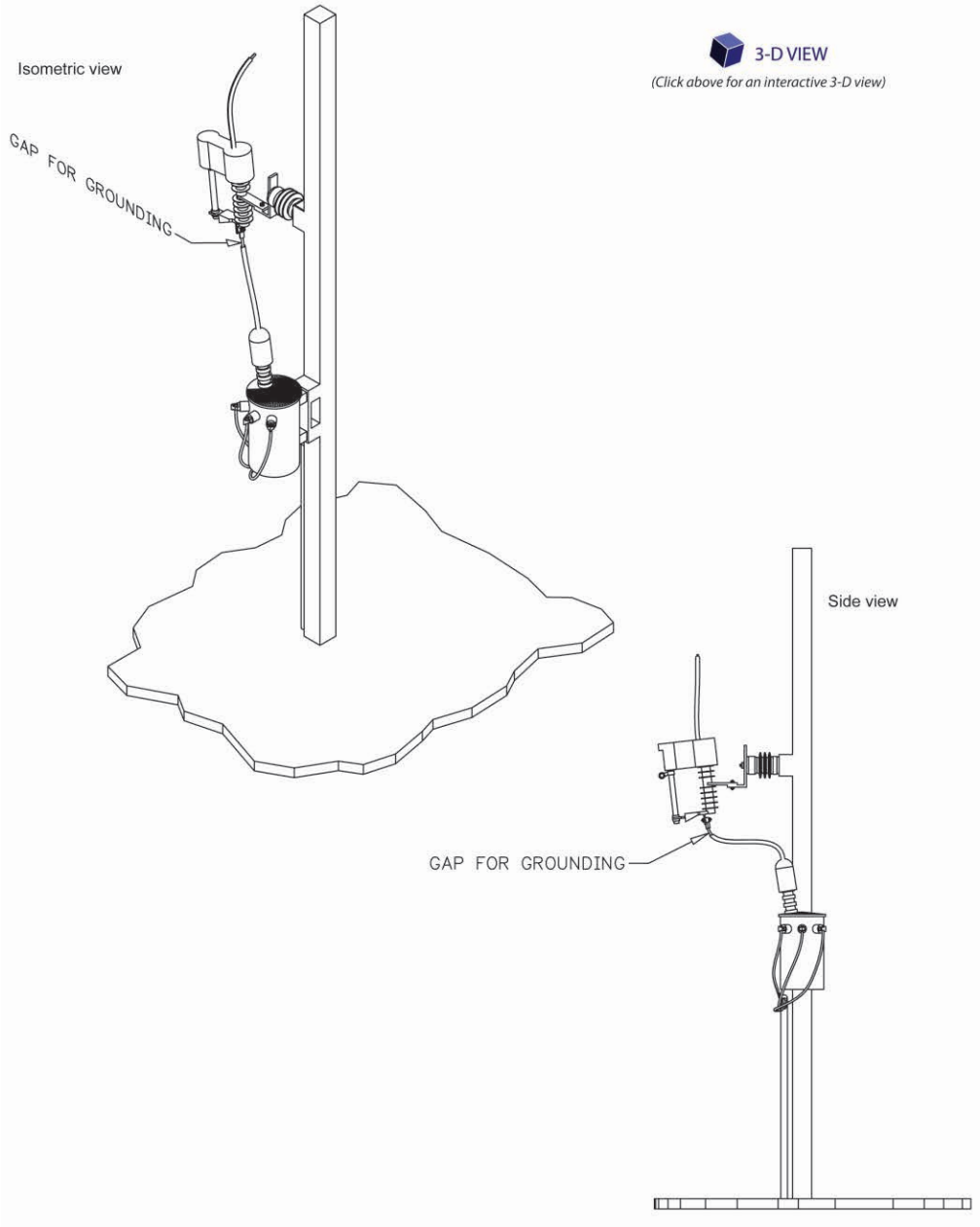

Figure 2—Station Service Transformer, with Bird and Animal Protection

5. Feeder Arresters

Actual feeder arrester installations are shown in Figure 3. The feeder arrester is protected as shown in Figure 4. Multiple cover options exist dependent on the size and manufacturer of the arrester. Factory-installed arrester covers should be evaluated and replaced if the covers have been compromised in any way. Arrester covers should sit on the top of the arrester above the second skirt and should never cover the entire arrester. Arrester jumper wire leads should be protected by covered wire (EC 951/SV 611). See EV 985, SV 401, or SV 451 for feeder arrester product options.

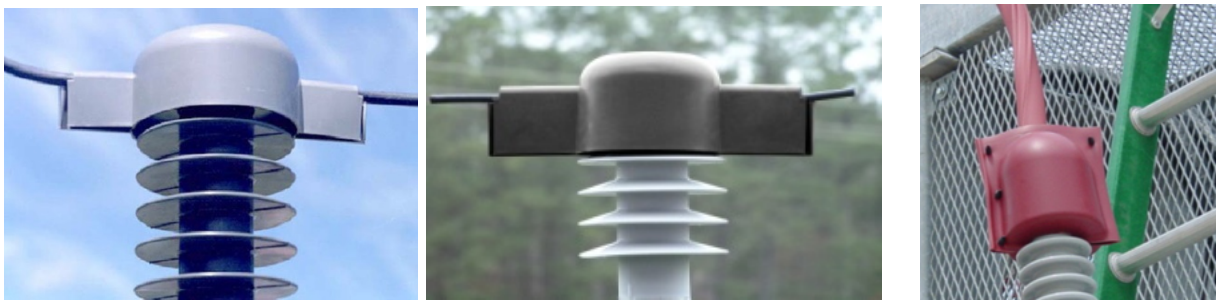

Figure 3—Station Service Transformer and Arrester Bird and Animal Protection

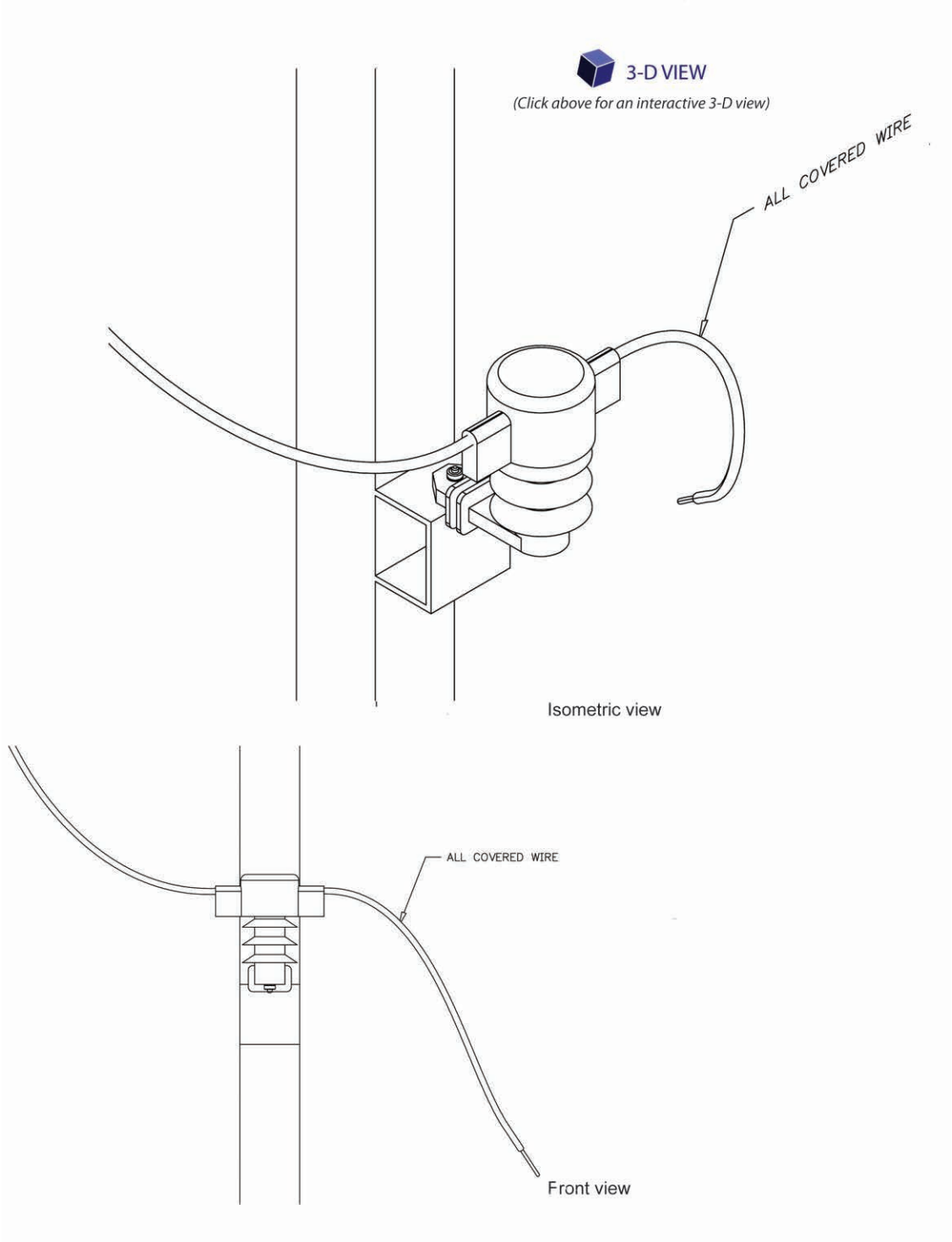

Figure 4—Feeder Arrester, with Bird and Animal Protection

6. Cutouts

An actual cutout installation is shown in Figure 5. Cutouts are protected as shown in Figure 6. Multiple cover options exist dependent on the style (porcelain versus polymer) and voltage of the cutout. Pins are required to keep the covers in place. Cutout jumper wire leads should be protected by covered wire (EC 951/SV 611). See EV 151 and SV 305 for cutout product options.

Figure 5—Cutout, With Bird and Animal Protection

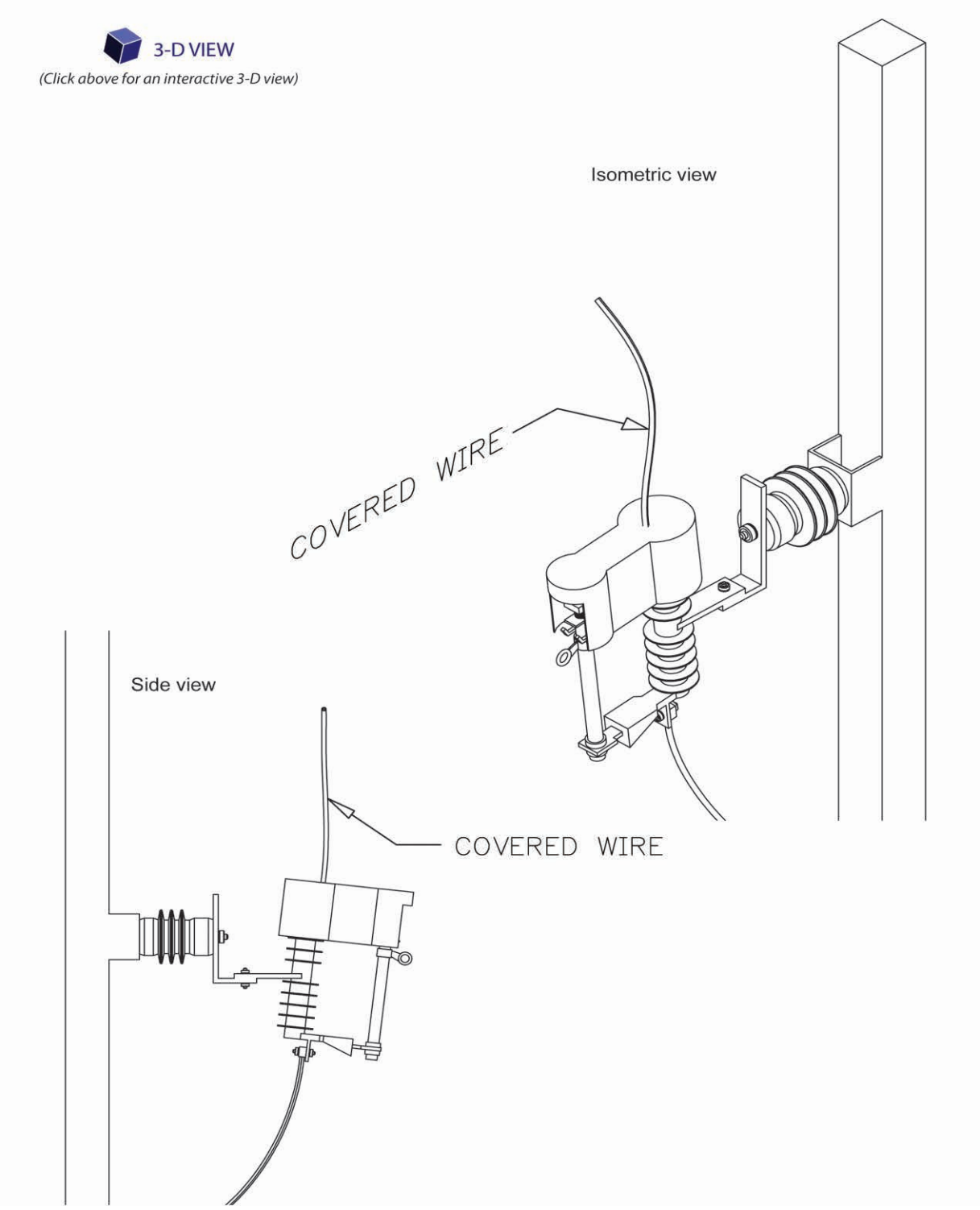

Figure 6—Cutout, with Bird and Animal Protection

7. Voltage/Potential and Current Transformers

Actual voltage/potential and current transformer installations are shown in Figure 7. A voltage transformer connection is protected as shown in Figure 8. Jumper wire leads should be protected by either covered wire (EC 951/SV 611) or hose (SV 601). Do not cover bolted connections with tape. Covers may be trimmed in the field if needed, to fit snuggly. To prevent bird and insect access, ensure no large openings exist. See SV 002, *Bird and Animal Protection—General Installation Instructions*, for additional information and photographs. See SV 421- 483, and SV 491 for VT/PT and CT product options.

Note: The hose or covered wire should be installed at and adjacent to equipment where there is less than 30″ of vertical separation and/or less than 46″ of horizontal/diagonal separation between potential points of contact.

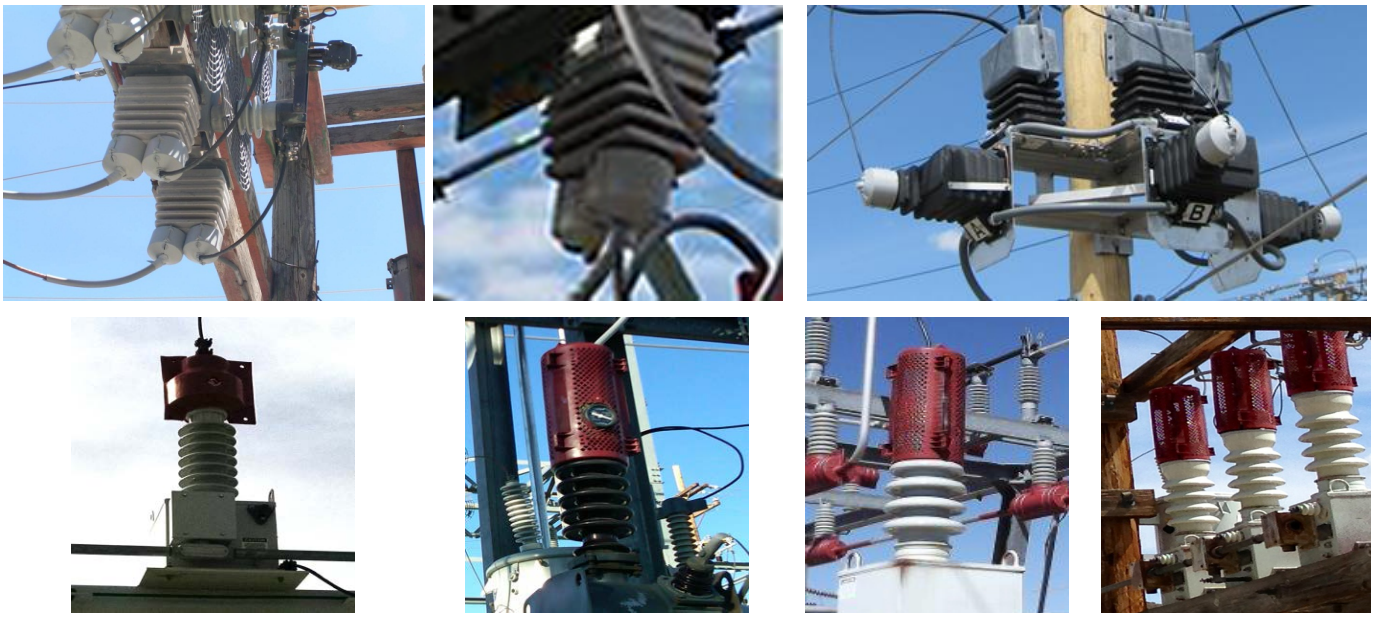

Figure 7—Current and Potential Transformers with Bird and Animal Protection

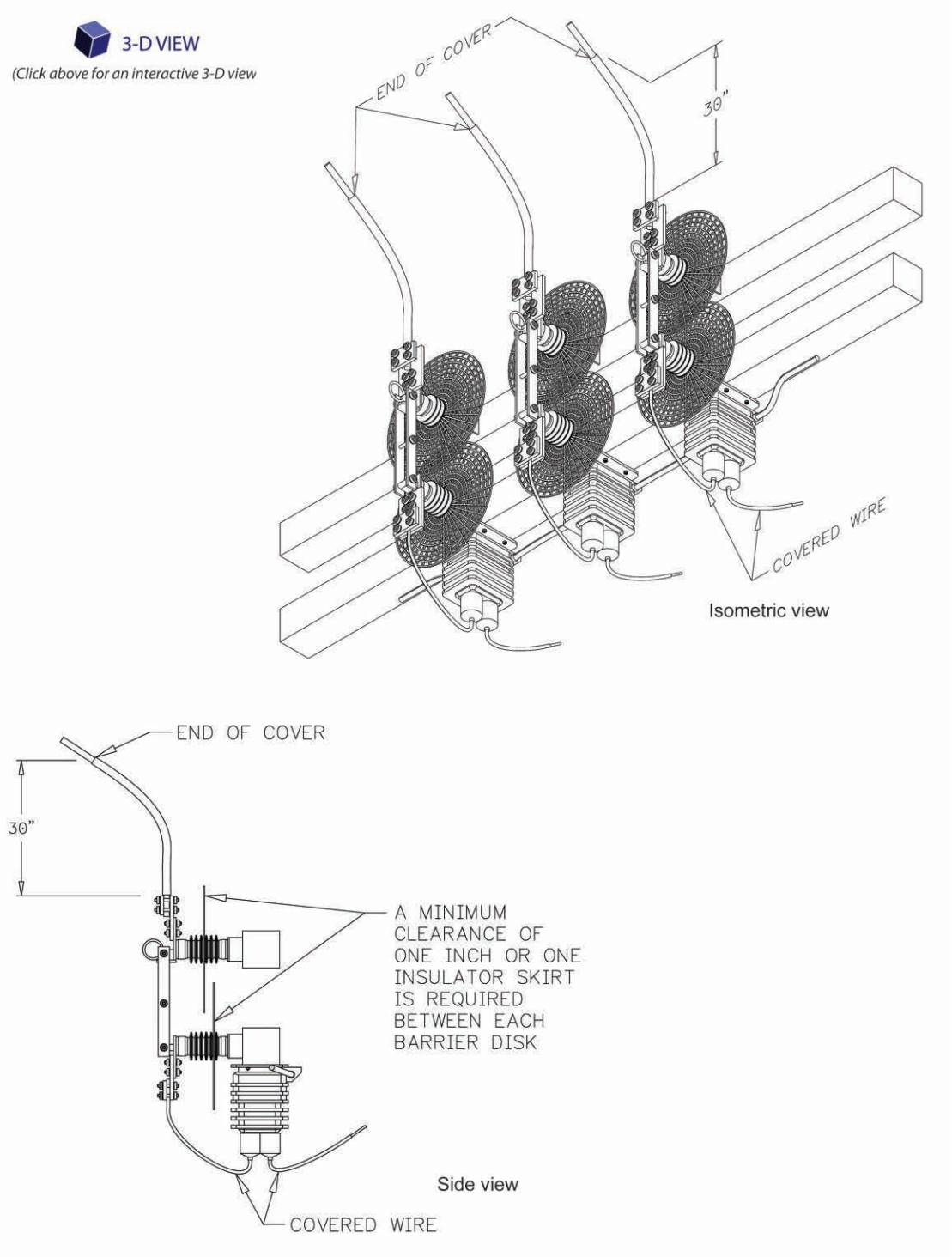

Figure 8—Voltage Transformers, with Bird and Animal Protection

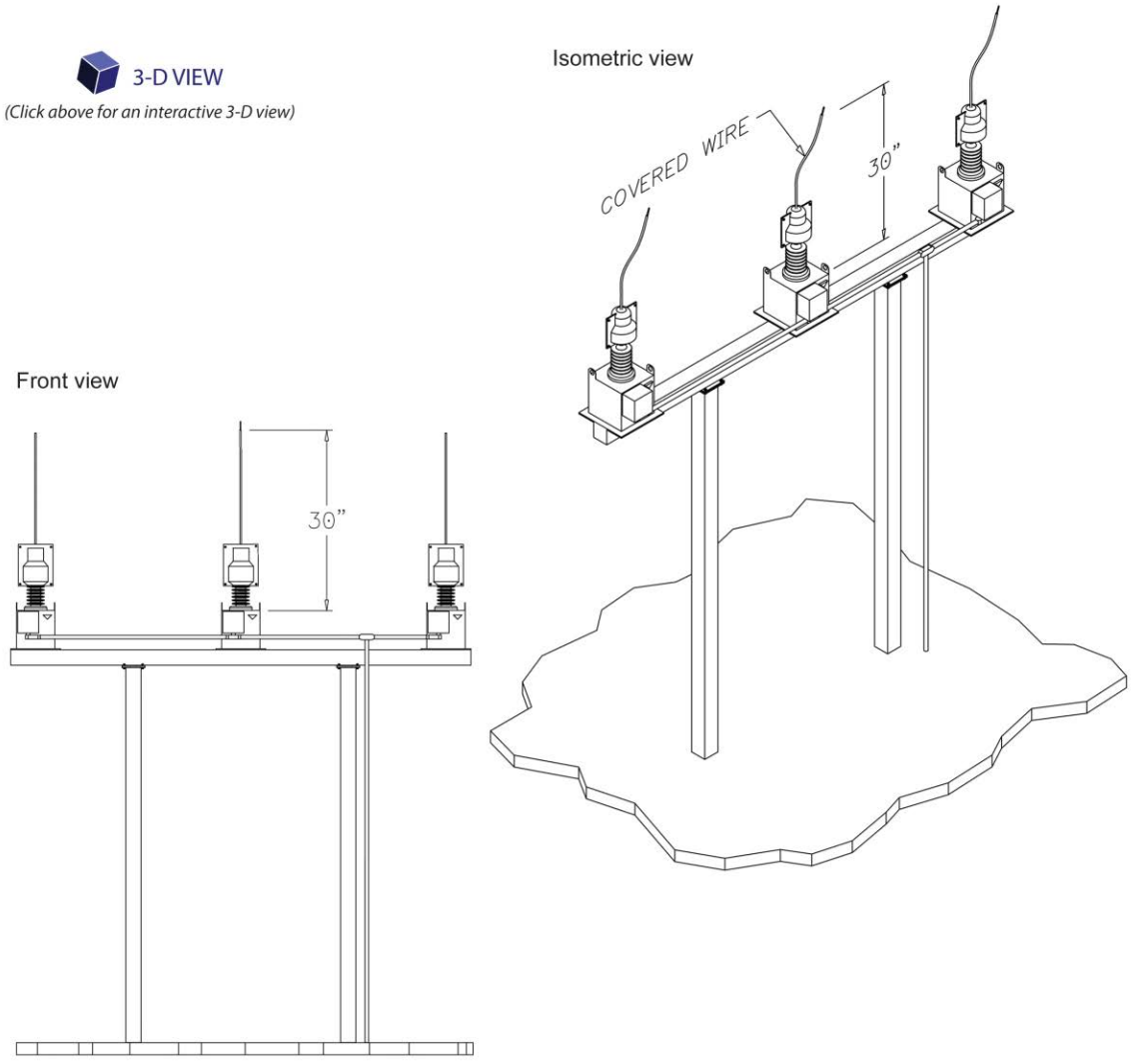

Figure 9—Voltage Transformers, with Bird and Animal Protection

8. Vacuum Switches

An actual vacuum switch installation is shown in Figure 10. A vacuum switch is protected as shown in Figure 11. Covers may be trimmed in the field to fit snuggly. To prevent bird and insect access, ensure no large openings exist. See SV002 for additional information and photographs. Jumper wire leads should be protected by either covered wire (EC 951/SV 611) or hose (SV 601). See SV 315 for vacuum switch product options.

Note: The hose or covered wire should be installed at and adjacent to the vacuum switch where there is less than 30″ of vertical separation and/or less than 46″ of horizontal/diagonal separation between potential points of contact.

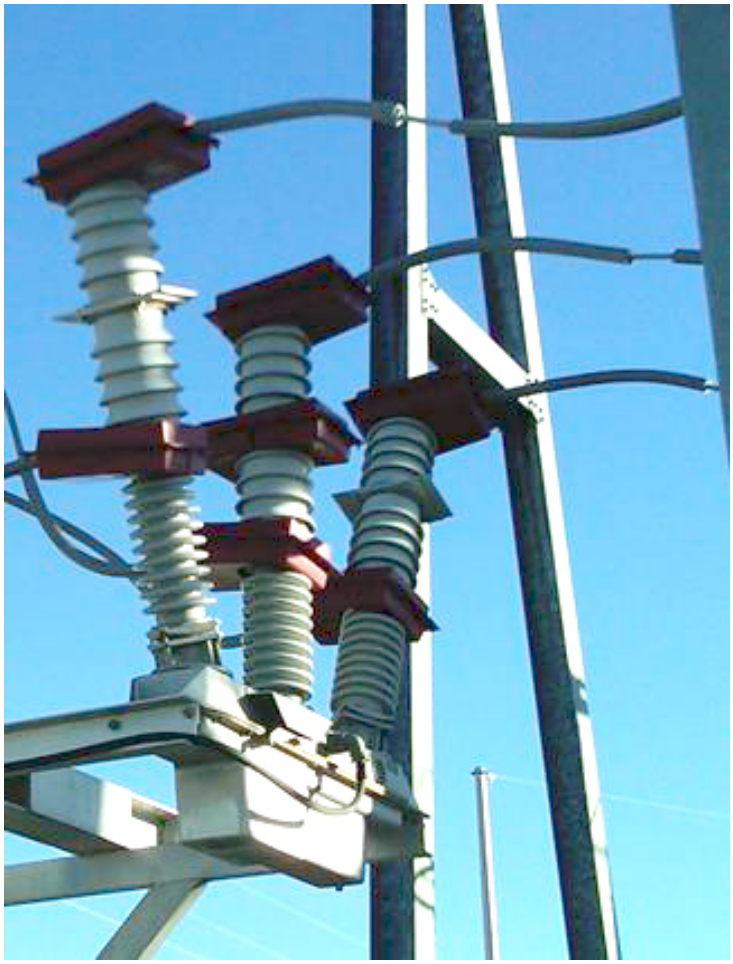

Figure 10—Vacuum Switch, with Bird and Animal Protection

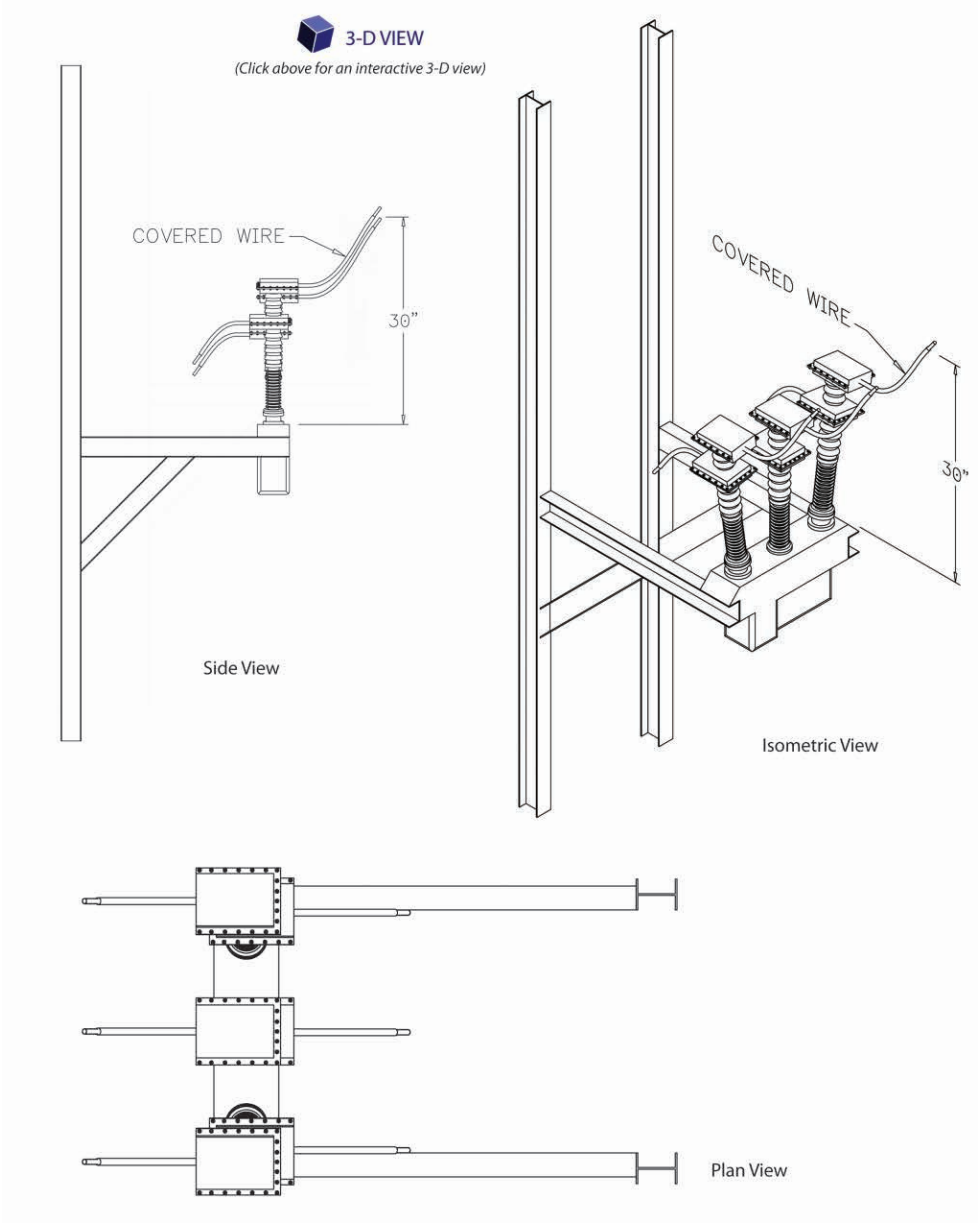

Figure 11—Vacuum Switch, with Bird and Animal Protection

9. Risers

Actual riser installations are shown in Figure 12. A riser is protected as shown in Figure 13. Jumper wire leads should be protected by either covered wire (EC 951/SV 611) or hose (SV 601). Do not cover bolted connections with tape. Covers may be trimmed in the field to fit snuggly. To prevent bird and insect access, ensure no large openings exist. See SV 002, *Bird and Animal Protection—General Installation Instructions* for additional information and photographs. See See SV 301, 311, 471- 483, 491- 602, and 611 for termination product options.

Note: The hose or covered wire should be installed at and adjacent to the riser where there is less than 30″ of vertical separation and/or less than 46″ of horizontal/diagonal separation between potential points of contact. Gaps in hose coverage for grounding should be left below disconnect switches. Termination covers should not cover the entire termination, only the top skirt(s).

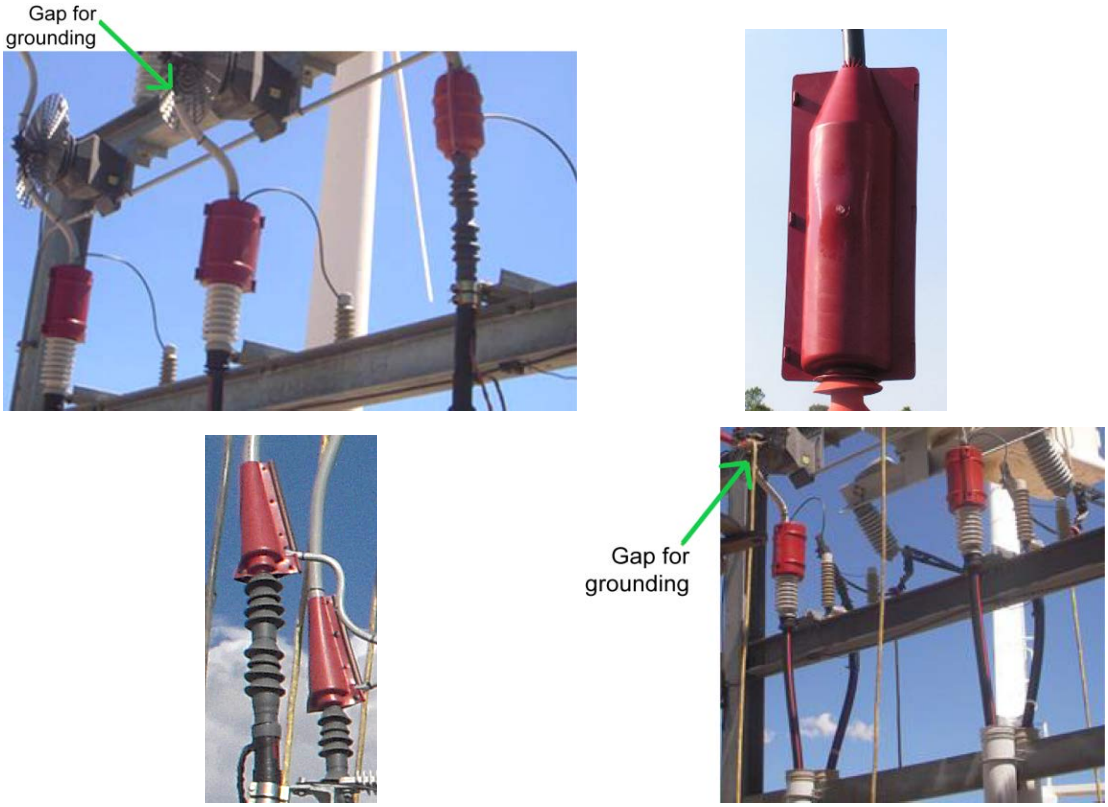

Figure 12—Riser, with Attached Ground, with Bird and Animal Protection

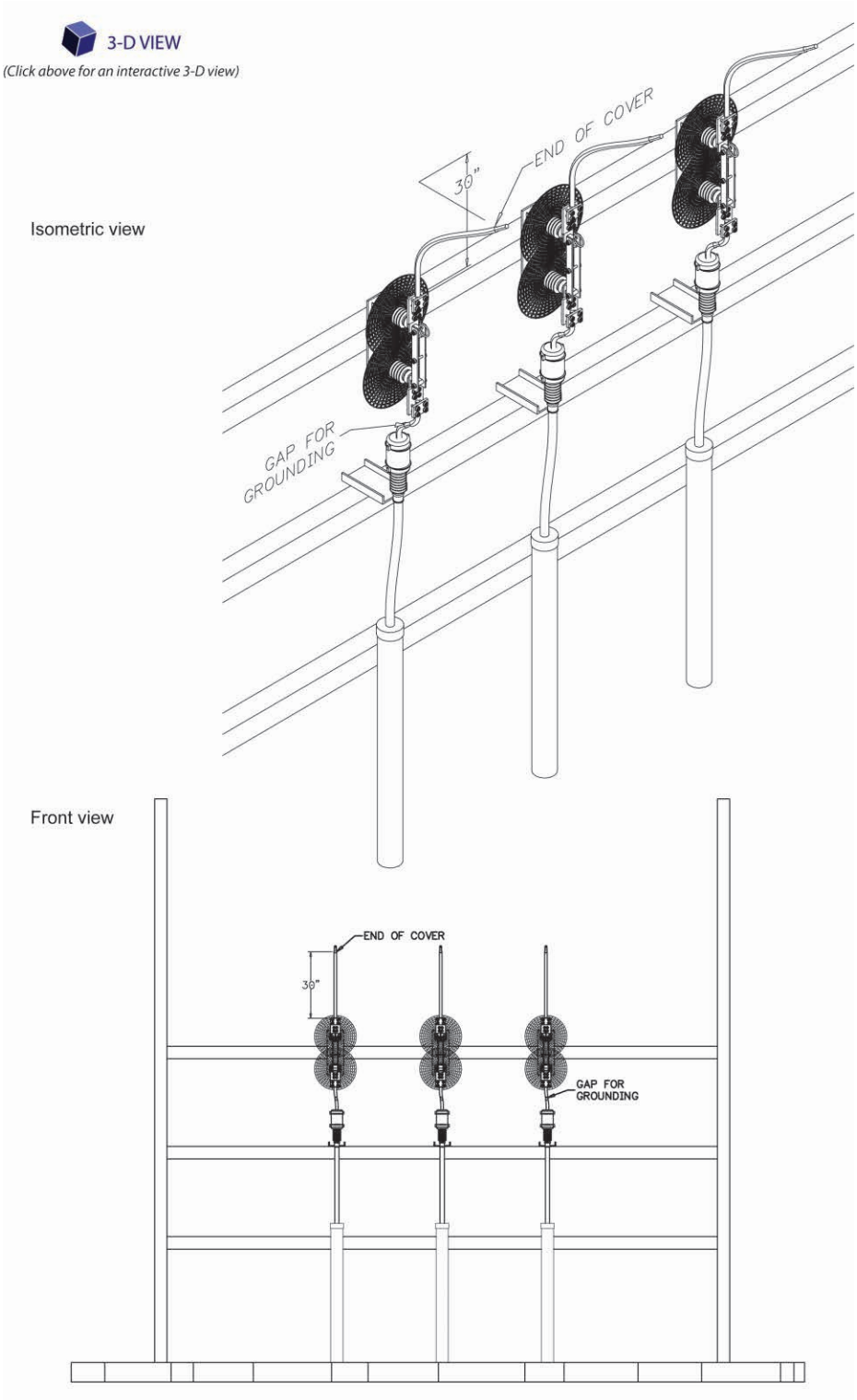

Figure 13—Riser, with Bird and Animal Protection