



Worker Safety

## Staying Grounded: Guidance For Electrical Safety

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An electrical worker has many best friends: loved ones to support them, crews that work with them, PPE that protects them and tools to keep them safe, including grounds. Grounds, or personal protective grounding equipment, are built to protect the electrical worker and are meant for heavy-duty use. However, if they are not cared for and maintained properly, they can take a lot of abuse. If they are left out in extreme weather at times, tossed in trucks to be bounced around as they travel from location to location and used so frequently that they are dirty by default, such treatment—without proper care and maintenance—could affect the life or performance of the grounds. Ground care, maintenance and testing is essential so they can provide the right protection for critical electric workers.

The U.S. Occupational Safety and Health Administration's OSHA 1910.269(n) and 1926.962 emphasize the employer's responsibility to ensure their personal protective grounding equipment and practices are adequate to protect employees from hazardous differences in electrical potential.<sup>1</sup> American Society for Testing and Materials Standard Specifications for Temporary Protective Grounds to Be Used on De-Energized Electric Power Lines and Equipment, ASTM F855-20, contains guidelines for protective grounding equipment. These standards specify the use and construction of grounding equipment, as well as how to care for and maintain this essential equipment.

### Visual inspection guidance

The test procedures below provide an objective means of determining if a grounding jumper assembly meets the minimum electrical requirements. To ensure worker safety, grounding jumper assemblies should be tested at regular intervals throughout their operational timeframe. The first part of proper care and maintenance for personal protective grounding equipment is to inspect and clean it before each use. Prior to electrical testing, grounding jumper assemblies should be visually and manually inspected for:

- Cracked or broken ferrules and clamps
- Exposed broken strands
- Cut / mashed / kinked or flattened cable
- Damaged cable jackets (cracked, swollen or soft spots)
- Cracked or damaged clamps and ferrules
- Any other conditions that could adversely affect performance<sup>2</sup>

Additionally, it is important to check clamps for smooth operation through the entire range, check torque of the pin type terminals and jam nuts on threaded ferrules and look for dirt, grease, oil, or oxidation on current carrying surfaces.

Personal protective grounding equipment with damaged or missing components should no longer be used until it can be repaired or replaced. The grounding jumper assembly should be rejected or repaired in accordance with the Corrective Maintenance and/or Repair section listed below:

- Disassemble the grounding jumper assembly
- Thoroughly clean all current carrying interfaces with isopropyl alcohol and a stiff wire brush

Loose connections should be tightened to the manufacturer's recommended torque values. If the grounding equipment has experienced a fault current, it should be permanently removed from service.

## Electrical testing of grounding equipment

Visual inspection is important to maintaining the reliability of your protective grounds, but it should be accompanied by electrical testing by a qualified third-party who can certify your cable sets. ASTM F2249<sup>3</sup> offers two test methods, DC or AC, based on the total resistance of the grounding assembly as measured end to end. The standard also provides a table containing the maximum pass/fail DC resistance values for copper grounding jumper assemblies<sup>4</sup>. To locate high-resistance areas, rated continuous current is circulated through the cable under test, creating heat. If there are no apparent "hot spots" on the clamp or ferrule, the high resistance is equally shared along the cable itself and cannot be corrected.

Grounding jumper assemblies that fail the electrical test may require additional maintenance and/or repairs including but not limited to:

- Additional cleaning of current carrying interfaces
- Tightening of physical connections
- Replacement of cable, clamps and/or ferrules

Grounding jumper assemblies that fail the electrical test after additional maintenance or repairs must be removed from service and permanently marked, tagged or destroyed so they are not reused.

Tested grounding jumper assemblies should be marked with the testing date, and test results should be entered into a record-keeping system. Grounding jumper assemblies that have been tested regularly and returned to the field still need to undergo inspection and maintenance in the field.

While there are no mandated testing intervals for grounding equipment, it is a best practice to submit your ground and jumper sets to an electrical test at least once per year. Factors such as work conditions, how often the equipment is used and crew care and maintenance of the equipment can influence testing intervals.

### Sources:

1 – <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.269>

2 – <https://www.utilityproducts.com/test-measurement/article/16021968/how-to-test-and-maintain-temporary-protective-grounds>

3 – <https://www.astm.org/f2249-20e01.html>

4 – ASTM F2249, Table 2 Section 7 - Electrical Testing

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