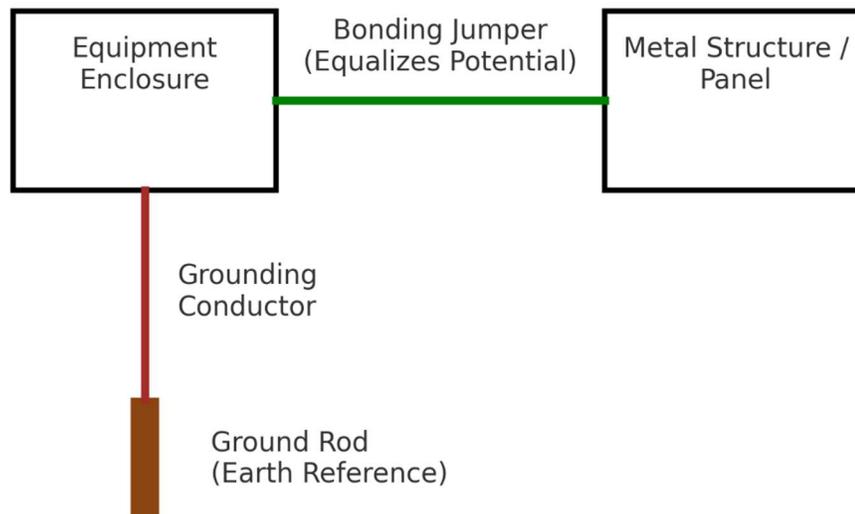


## TOOLBOX TALK: Grounding and Bonding Basics

*RATTLIR Safety Series – “Strike Before It Bites”*

### Purpose

Grounding and bonding are foundational principles of electrical safety. Proper grounding provides a low-impedance path to earth for fault current, while bonding equalizes potential between conductive parts to prevent shock hazards. This toolbox talk explains the difference, importance, and applications of grounding and bonding in industrial and high-voltage environments.



*Figure 1 – Conceptual difference between grounding (earth reference) and bonding (equalizing potential).*

### What Is Grounding?

Grounding connects an electrical system or equipment to the earth. Its purpose is to:

- Provide a reference point for system voltage.
- Safely dissipate fault currents into the earth.
- Stabilize voltage during normal operation.
- Reduce lightning and static discharge hazards.



# Grounding and Bonding Basics

In high-voltage systems, grounding grids, rods, and conductors must be properly sized and interconnected to handle fault energy and step/touch potential hazards.

## What Is Bonding?

Bonding is the intentional connection of conductive parts to eliminate voltage differences between them.

Bonding:

- Ensures metal parts stay at the same electrical potential.
- Reduces shock hazards during faults.
- Prevents arcing between equipment enclosures and structures.
- Supports proper clearing of overcurrent devices.

Bonding does NOT imply connection to earth—it is equipment-to-equipment or structure-to-structure equalization.

## Why Grounding and Bonding Must Work Together

Grounding alone cannot prevent shock hazards if equipment housings or structures become energized. Bonding alone cannot dissipate fault current safely. Together, grounding and bonding:

- Create low-impedance fault paths.
- Ensure breakers and protective devices operate quickly.
- Minimize step/touch voltage during faults.
- Reduce induced voltages near high-voltage lines.

## Common Grounding and Bonding Mistakes

- Loose or corroded bonding connections.
- Using the earth as a current-carrying conductor.
- Broken or missing equipment grounding conductors.
- Improperly sized grounding electrode conductors.
- Bonding only at one location (creates potential differences).
- Failure to bond fences, gates, and metallic structures in substations.



# Grounding and Bonding Basics

## High-Voltage Applications (Substations, Switchyards, Transmission)

- Ground grids are engineered to control fault current distribution and step/touch potential.
- All metallic structures, including fences, must be bonded to the grid.
- Portable grounds must be applied in the correct sequence: ground end first, line end last.
- Equipotential grounding reduces risk during maintenance on de-energized circuits.
- Induced voltages can energize conductors—bonding and grounding mitigate this risk.

## Emergency Response

- Do not touch a person in contact with energized equipment – de-energize first.
- Maintain safe clearance until power is confirmed off.
- For shock victims: call emergency services and begin CPR/AED if trained.
- For arc injuries: use dry, sterile dressings and avoid ointments.

## Discussion Questions

- Are grounding and bonding connections intact and properly sized?
- Are we using equipotential grounding for de-energized tasks?
- Do temporary grounds meet the correct sequence of application?

## RATTLIR Takeaway

Grounding protects equipment. Bonding protects people. Understanding and applying both ensures we strike before it bites – especially around high-voltage systems.