# SNS COLLEGE OF TECHNOLOGY

## (An Autonomous Institution)

# TYPES OF GROUNDING

# TYPES OF GROUNDING

- **Grounding**” refers to a low-resistance path that’s been constructed to carry an electrical flow into the ground, and a “grounded” connection refers to a connection between electrical equipment and the ground through a wire.

**Why are Electrical Grounding Systems Needed?**

- As we know that, grounded electrical systems are essential for operating a safe and secure data center.
- However, they are also necessary for large-scale residential and commercial projects.
- While installing and maintaining grounding systems are complicated and time-consuming process, it is essential to prevent dangerous situations that could lead to issues if an appliance’s internal wiring were to short circuit.
- There are several risks of utilizing ungrounded electrical systems, such as fire and electrical shocks, which may lead to fatal accidents.

# TYPES OF GROUNDING

**significant advantages of using a properly grounded system include**:

**Overload Protection**

- Excess power can surge for many reasons within an electrical workplace, producing massive voltages of electricity in systems and causing fires and shocks that can injure, if not outright kill, humans.
- Grounded systems offer overload protection by forcing that excess of surged energy into the earth, protecting people and electrical appliances, along with the critical data they may contain.

# TYPES OF GROUNDING

**Protection Against Electrical Hazards**

- In a worst-case scenario, ungrounded systems can lead to shocks and fires that damage and destroy equipment, resulting in significant data loss as well as injury and death of nearby individuals.
- Grounded systems eliminate these electrical hazards and protect the equipment from sudden voltage surges, preventing electrical fires and reducing the chances of equipment damage.

**Voltage Stabilization**

Grounded systems are **designed to ensure that circuits aren't easily overloaded and distribute the correct amount of power between specific data sources.** This ground provides a common point of reference for critical voltage stabilization.

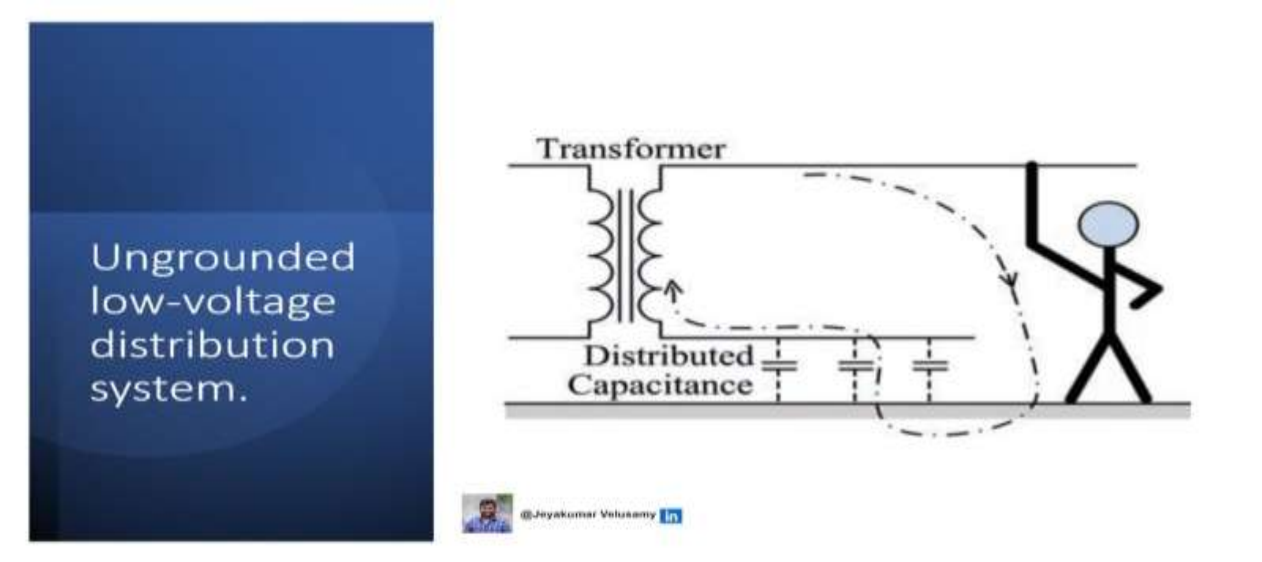
# TYPES OF GROUNDING

**There are three types of grounding systems**

- Ungrounded Systems
- Resistance Grounded Systems
- Solidly Grounded Systems

**Ungrounded Systems**

This section may be confusing for some readers since we just went through several paragraphs detailing the importance of not having ungrounded electrical systems. While that’s true, and **ungrounded systems are inherently riskier, they do exist and do serve specific purposes**, though they were much more common back in the ’40s and ’50s.



# Ungrounded Systems

The first thing to understand about ungrounded systems is that they're not *actually* ungrounded. **Electrically speaking, your system is connected to the ground through the capacitance between the lines and the earth. Meaning it's more correct to call it a capacitance-grounded system.** It's simply referred to as an ungrounded system because of convention and because there isn't an intended physical connection between the involved powerlines and the ground.

Put simply**, in an ungrounded system, the ground-fault current is negligible and can be utilized to reduce the risk of shock to people.** When a fault occurs, two wires are needed to carry some of the currents to avoid excess voltage that will cause excessive heat and damage the equipment involved. Because ground fault is negligible, finding faults can be very difficult and time-consuming, making the cost of ungrounded systems extremely high.

# Ungrounded Systems

**Advantages of Ungrounded Systems**

•They offer a relatively low value of current flow for lint-to-line ground faults.

•There is a low probability of line-to-ground acting faults escalating to a phase-to-phase or 3-phase fault.

•They assure a continuous operation of processes on the first occurrence of a lint-to-ground fault.

•They present no flash hazards to personnel in the event of an accidental line-to-ground fault.

•They minimize shock risks to people.

# Ungrounded Systems

## Disadvantages of Ungrounded Systems

Some of the **inherent disadvantages of ungrounded systems** are;

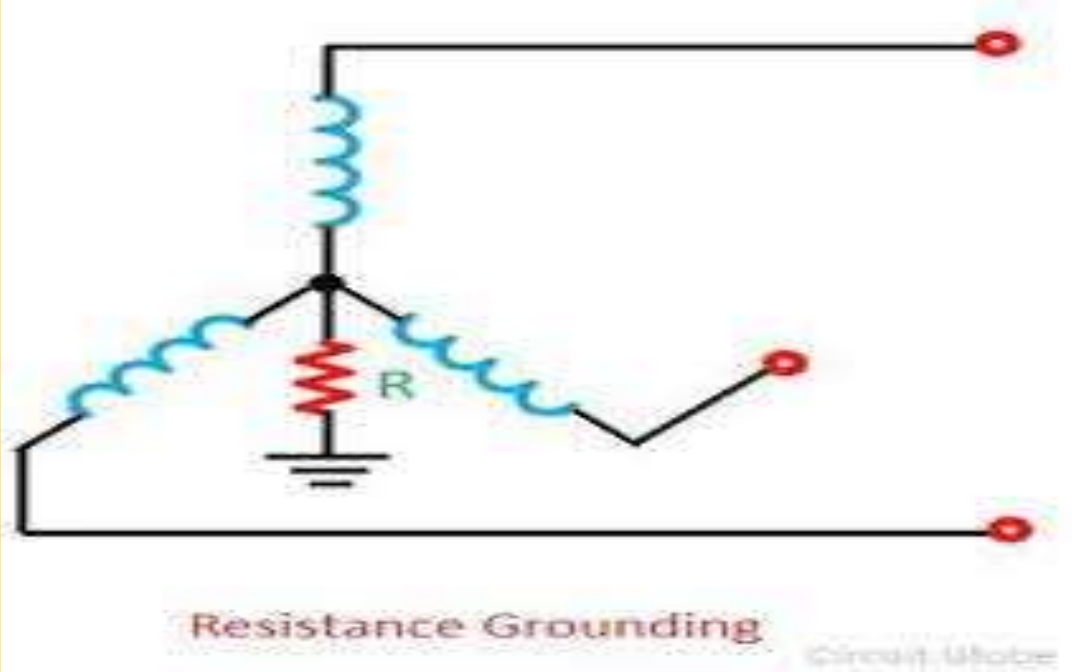
- They use two wires to carry an amount of current intended for three wires in the case of a fault, increasing heat and the potential for damaging equipment and insolation.
- They make it relatively difficult and time-consuming to locate any faults.
- All lines need to be individually tested.
- They carry very high operational and maintenance costs.
- They don't control for transient overvoltages.
- A second ground fault on another phase will trigger a phase-to-phase short circuit of the system.

# Resistance Grounded Systems

Resistance Grounded Systems

**Resistance grounding, in short, is when electrical power systems have connections between a neutral line and the ground through a resistor.** Resistor is used to limit the fault current through the natural line. If your voltage doesn’t change, your electrical current will depend on the size of the resistor involved, according to Ohm’s law (V=IR).

There are **two distinct types of resistance grounding systems; high resistance grounding and low resistance grounding.**



# Resistance Grounded Systems

**High Resistance Grounding**

High resistance grounding (HRG) systems **actively limit ground fault currents to <10 amps** and are commonly used in mills and plants wherever an ongoing operation of processes is intervening with the event of a particular fault.

**Low Resistance Grounding**

Low resistance grounding (LRG) systems **actively limit ground-fault current to between 100-1000 amps.** These systems are typically utilized in medium voltage systems of 15kV or less and are designed to trip protective devices once a fault occurs.

# Resistance Grounded Systems

## Advantages of Resistance Grounding

- Reduced currents also reduce the risk of shock and blast/arc flash.
- The systems limit the ground-fault current to a low level.
- They control transient over voltages.
- They reduce electrical shock hazards.
- They maintain continuity of service.
- They reduce mechanical stresses in equipment and their circuits.
- They reduce the line voltage drops caused by the cleaning and occurrence of a ground fault.

## Disadvantages of Resistance Grounding

- High frequencies can appear as a type of nuisance alarm.
- A ground fault may be left on the system for an extended period.

# Solidly Grounded Systems

**Solid grounding refers to a grounding system in which an electrical power system is directly connected to the ground, and there is no intentional independence included in the circuit.**

Solidly grounded systems can utilize large amounts of ground-fault current and thus make faults much easier to locate compared to ungrounded systems. These systems are most commonly used in industrial or commercial power systems, and backup generators are typically kept on standby if a fault shuts down particular production methods.

Much like resistance grounding, **solid grounding can significantly reduce the potential for over voltages within an electrical system.** However, these systems can have massive amounts of ground-fault current. Because of this, solidly grounded systems cannot operate with a ground fault- since all of the currents in the system run from fault to ground.

# Solidly Grounded Systems

**Advantages of Solidly Grounded Systems**

Some of the **primary advantages of solidly grounded systems** include;

•They provide reasonable control over transient overvoltage from neutral to ground.

•They allow users to locate faults quickly and easily.

•They can supply line-neutral loads.

Disadvantages of Solidly Grounded Systems

**Disadvantages**

- Solidly grounded systems possess a severe arc flash hazard.
- They can create problems in the primary system.
- They require the purchase, installation, and maintenance of an expensive and complex main breaker.
- They provide high values of fault current.
- They have the potential to cause unplanned interruptions in production processes.
- They can potentially cause severe equipment damage in the event of a fault.

# THANK YOU