

Electrical Safety Practices

Electrical Safety Practices – Study Notes

1. Why Electrical Safety Matters

- **Prevent injuries & fatalities** – electric shock, burns, arc flash, falls.
- **Protect equipment** – avoid costly damage, downtime, and data loss.
- **Legal compliance** – OSHA 1910.331, NFPA 70E, IEC 60364, local codes.

2. Basic Concepts & Terminology

Term	Definition	Typical Value
Voltage (V)	Electrical potential difference	120V (U.S. residential), 230V (EU)
Current (I)	Flow of electrons; the “dangerous” part of shock	10mA can cause muscle contraction; >30mA can be lethal
Resistance (R)	Opposition to current flow	Skin resistance 1kΩ (dry) – 100Ω (wet)
Ground (Earth)	Reference point for safety; a low impedance path for fault current	–
Arc Flash	High-energy release from an electric arc; can cause burns & blast pressure	Energy >4cal/cm² is hazardous
Lockout/Tagout (LOTO)	Procedure to isolate energy sources before work	–

3. General Safety Principles (The “Five S”)

Principle	What to Do	Example
1. Stop	De-energize equipment before work whenever possible.	Shut off breaker, verify with a tester.
2. Secure	Apply lockout/tagout devices; verify isolation.	Place a lock on the circuit breaker.

Electrical Safety Practices

Principle	What to Do	Example
3. Survey	Perform a risk assessment; identify hazards.	Check for exposed conductors, wet conditions.
4. Suit Up	Use appropriate PPE (gloves, goggles, flame?resistant clothing).	Arc?rated (AR) clothing for high?voltage work.
5. Stay Aware	Keep a safe distance, maintain clear communication.	Use a “buddy system” and hand signals.

4. Personal Protective Equipment (PPE)

PPE Item	When Required	Key Specs
Insulated Gloves	Working on live parts >1000V	Class 0 (0–1kV), Class 1 (1–7kV)
Arc?Rated Clothing	Arc?flash potential >4cal/cm ²	NFPA?70E Category 1–4 rating
Safety Footwear	General site work; may be dielectric	Non?conductive soles, steel toe optional
Face Shield / Safety Glasses	Protection from arc flash, flying debris	ANSI Z87.1 approved
Hard Hat	Overhead hazards + electrical shock risk	Non?conductive (e.g., fiberglass)

Inspect PPE before each use; replace if damaged.

5. Lockout/Tagout (LOTO) Procedure – Step?by?Step

1. **Prepare** – Identify all energy sources, obtain required lockout devices.
2. **Notify** – Inform affected personnel of the upcoming shutdown.
3. **Shutdown** – Operate normal stopping controls to turn off equipment.
4. **Isolate** – Open disconnecting devices (breakers, switches, valves).
5. **Apply Locks/Tags** – Secure each isolation point with a lock; attach a tag with name, date, and reason.
6. **Release Stored Energy** – Bleed capacitors,