

Semiconductor Insider

Safety Matters

May 2007



Identifying Potential Hazards with Stored Energy: LOTO Basics

While we all deal with different forms of energy every day, we probably don't think about the possible dangers associated with its unintentional release. There are many forms of energy including kinetic energy (motion), potential energy (stored), chemical energy (usually occurs when two chemicals are combined), and heat energy. There are many other forms, but these are the most commonly encountered in manufacturing.

Energy can easily change forms, locations, and states. Stored energy may become virtually invisible, or may be later released to produce motion. An example of this is when you eat food, the chemical energy in it gives your body the energy to move. Another example of potential energy is the energy stored in batteries, which stores electrical energy until the battery is used.

Kinetic, potential, and chemical energy are the forms of energy that we commonly encounter while we perform our jobs. Unintentional release of stored energy can present dangerous hazards. It is important to recognize the hazards presented by potential (stored) energy.

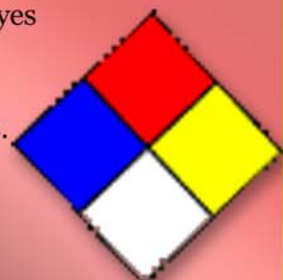
Lock-Out Tag-Out (LOTO) is one of the safety procedures used in manufacturing to control energy and avoid hazards associated with it. You should refresh your LOTO knowledge prior to handling or working with stored energy. Here is a brief LOTO overview to get you started.

Capacitors and Capacitor Banks

- A capacitor or capacitor bank presents a potentially serious electrical hazard. They are capable discharging 25 J in less than 3 seconds, or 10 J in less than 0.5 seconds, and can be lethal.
- Hazards involving Capacitors and Capacitor Banks:
 - Excessive heating or explosion that may result if a capacitor is subjected to high currents.
 - Internal failure of one capacitor in a bank, which frequently results in an explosion when all of the other capacitors in the bank discharge into the fault. (10J is the approximate threshold energy for explosive failure of metal cans)
 - The liquid dielectric, which in many capacitors may be toxic.
 - Internal faults, which may rupture capacitor containers. Rupture of a capacitor container may create a fire hazard.
 - The combustion products of liquid dielectric in capacitors, which may be toxic. Polychlorinated biphenyl (PCB) dielectric fluids can release toxic gases when decomposed by fire or the heat of an electric arc.
- **Tips to Remember:**
 - Greater than 10 Joules is considered hazardous
 - Greater than 50 Joules is a lethal level
 - Relatively small capacitors can store potentially lethal charges
 - Discharging a capacitor or capacitor bank by means of a grounding hook can cause an electric arc at the point of contact.
 - Safety glasses should be worn during this procedure.

Batteries and Battery Banks

- Batteries present potential hazard from both stored energy and recharge characteristics.
- Accidental shorting of exposed terminals or cables of a battery can result in an electrical arc (blast), causing burns and / or electrical shocks which are potentially fatal.
- **Tips to Remember:**
 - The guidance below applies to all voltages and energy ratings because the nature of the electrical hazards is similar for any battery size. The severity of the hazard will increase with an increased battery rating.
 - Use insulated hand tools when working on or near exposed battery terminals.
 - Do not repair battery connections while there is an electrical load on the circuit.
 - Always wear eye protection, long sleeves, and rubber gloves when handling electrolytes or non-sealed batteries containing electrolytes.
 - Do not charge or discharge batteries in excess of their rated specifications.
 - Ground conductive battery storage racks.
 - Provide adequate ventilation to prevent hazardous or toxic fumes from accumulating during recharge or discharge activities.
 - Before beginning work, identify locations of eyewash and shower stations near the battery facilities for quick drenching of eyes and body.
 - Provide spill kits for containing and neutralizing electrolyte spills.



Remember... Safety Matters

Comments and suggestions are always welcome and encouraged.



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