Technical Safety Authority of Saskatchewan

SAFETY Bulletin

TRAPPED OR CAPTIVE KEY INTERLOCKING SYSTEMS (IE. KIRK KEY SYSTEMS)

Trapped or Captive Key Interlocking Systems (Kirk Key) are mechanical, lock and key, sequential isolation systems. They use a metal key (the only one specific to the system) that can only be removed when the equipment is in a safe zero-energy state. Once in a secure state, the key is removed and used to unlock the next step in the process. For example, the key is used to access an isolated, de-energized hazardous area, which prevents unplanned or accidental contact with energized equipment. Trapped or captive key systems are commonly used on electrical equipment but are also used on mechanical equipment.

Lock-out and tag-out procedures often incorporate the use of trapped or captive key systems. However, **trapped or captive key systems DO NOT guarantee that the area or equipment being protected has reached a zero-energy state.** Several factors can affect the correct application or effectiveness of a trapped or captive key system:

- **New electrical systems** using trapped or captive key systems must be verified to ensure the design aligns with the as-built installation prior to the system being energized.
- **Unknown or unexpectedly accessible live electrical equipment or connections** may not have been accounted for in the original design.
- **Field modifications,** planned or unplanned, may alter the intended isolation sequence or introduce new hazards.
- **Energy-storing devices** such as capacitors and inductors may retain hazardous energy even after isolation.
- **Multiple energy sources** (electrical, mechanical, hydraulic, pneumatic, thermal, chemical, or gravitational) all require independent verification to ensure de-energization.

This is why field level verification must not be overlooked to ensure the equipment is de-energized and safe to work on. Furthermore, proper system audits or reviews must be completed to understand new equipment, modifications, and all possible energy sources and paths. All energy sources with the potential to harm workers must be isolated; however, **until the equipment is confirmed in a zero-energy state, it should be considered energized**.

Considerations:

- Do your lock-out and tag-out procedures rely on a trapped or captive key system?
- As per the Saskatchewan Interpretations, have your site plans and line diagrams been updated and confirmed in the last 4 months?
- Do your policies and procedures meet the **Z-462 and Z-463** standards?
- Do your policies and procedures contain a **zero-energy verification step**, such as using a multi-meter, proximity detector, or other suitable instruments to verify de-energization?
- Do you rely on manufacturer-specific procedures, without manual field verification?
- Do you identify all energy sources, (electrical, Mechanical or other) in your safe work plans?
- Do you routinely audit safe work plans and lock-out or tag-out procedures to confirm zero-energy verification procedures?

Key Takeaways:

- Procedures **MUST NOT** rely solely on the trapped or captive key system to guarantee isolation.
- **All energy sources** relevant to the operation or procedure must be identified and verified de-energized using a **'Prove - Test - Prove'** method to significantly reduce exposure to energy-related hazards.
- Drawings of the **electrical systems SHALL BE kept up to date**, and reviewed **a minimum of every 4 months**, including the history of all modifications, changes, alterations, and deviations from the original design to ensure all possible sources of energy are understood.
- **Mechanical protection** after verifying equipment is de-energized **SHALL BE INSTALLED** for an extra level of protection, such as shorting bars for current transformer, or grounding chains for High-Voltage, **and** dog bones for articulating machinery, hydraulic locking pins, locking collars, piping blanks etc. **for all other sources identified in the procedure**.