



ELECTRICAL TRADE–ELECTRICAL DETAIL MISTAKES

VFD LINE VS. LOAD VERIFICATION

ELECTRICAL DETAIL MISTAKES PROJECT BACKGROUND

Motors are often powered through and controlled by a Variable Frequency Drive (VFD).

A VFD has specific termination points for motor (load) and power (line) connections.

If these connections are not adhered to, the result will cause catastrophic failure of the VFD.

VFD LINE VS. LOAD VERIFICATION ISSUE

A large motor's load and line wires were swapped at the VFD, terminated, and energized.

A VFD's connection points are not always in the same place between models and sizes. In this case, the wire installer and terminator were different people.

- Different individuals can have unique methods of identifying wire.
- The circuit was energized without confirming line and load conductors.
- **The incorrectly terminated and energized VFD caused irreversible damage to the VFD.**

Actual Loss: Approximately \$35 K and a significant delay in the schedule occurred due to the VFD replacement lead times.

How To Avoid This Failure

Pulling and terminating parallel conductors is a base task for many electricians, yet this mistake happens often.

- This type of failure creates increased material and labor.
- Often, this mistake happens during critical schedule times.

Best Practice

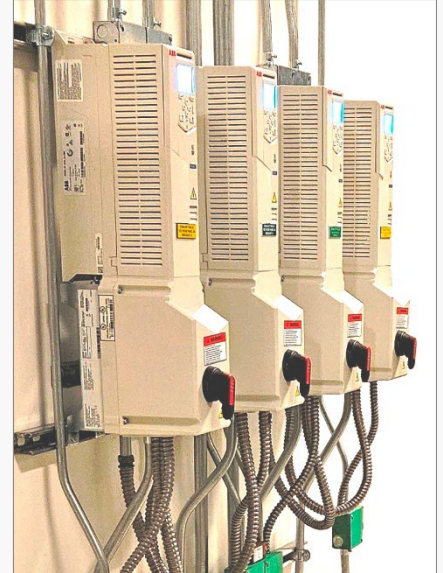
Know and understand each VFD's connection points.

- Confirm line and load conductors with continuity meter before termination.
- Read and understand the termination points of each VFD.
- Use standard labeling practices for VFDs and motors to identify line and load.

VFD LINE VS LOAD VERIFICATION: SUPERVISOR AND WORKERS Q & A

1. Has a continuity meter been used for all applicable wires?
2. Has all approved submittal information been adhered to for the VFD you are working on?
3. What is our process for identifying line and load conductors?

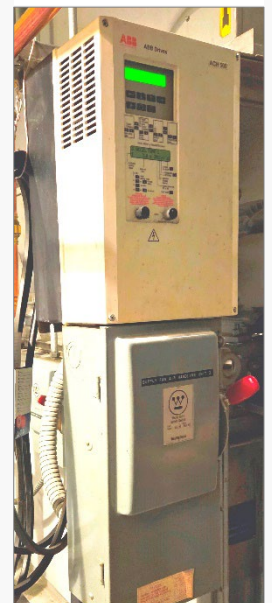
VFD #1 with a Unique Size and Connection Points



VFD #2 with a Unique Size and Connection Points



VFD #3 with a Unique Size and Connection Points



Quality Safety Times wants to present your industry professional, real-life work stories and scenarios. Your stories are learning tools to improve the industry to help reduce rework and improper installation. Consider sharing your stories via our website. www.qualitysafetytimes.com, at *Tell Your Story*.

It is the contractor's responsibility to follow all directions in project documents, architect's instructions, and local jurisdictional code requirements. Contractors need to seek clarity from design professionals and jurisdictional authorities prior to proceeding if there is any discrepancy. Information in this document is for reference and general knowledge only. Quality Safety Times takes no liability for the information provided.

Q1-11 v1.0 Final 11-10-2023



ELECTRICAL TRADE–BREAKER LOCKOUT/TAGOUT SAFETY, TOOLBOX TALK

Discussion Leader:

Date Administered:

BREAKER LOCKOUT/TAGOUT SAFETY OVERVIEW

Lockout and tagout (lockout/tagout) (LO/TO) refer to safeguard methods employers and employees use to protect workers from hazardous machinery energy releases. LO/TO are safety practices or procedures to disable machinery or equipment from being energized or activated to prevent unaware employees and the public from harming themselves or others.

BREAKER LOCKOUT/TAGOUT SAFETY TIPS

Any trade must deal with equipment or machinery that is potentially dangerous, especially shut-down equipment.

Many accidents happen when a worker turns ON a machine that others are repairing.

- LO/TO procedures are one way to ensure these types of accidents do not happen by ensuring power cannot reach the machinery while workers are near it or repairing it.
- LO/TO methods are only effective if workers are intentional and consistent with LO/TO methods.
Simply turning off a machine is not an acceptable practice.

Lockout: LO means a lock or other device is placed that prevents the release of energy.

- LO examples are electric circuit breakers, line valves, disconnect switches, or blocks.

Tagout: TO means attaching a tag on the shutoff device, switch, or circuit breaker that warns other employees and the public not to touch, energize, or start the equipment.

- TO must be used in addition to LO to maximize effectiveness unless LO of the equipment is not possible.

Training: The effectiveness of lockout or tagout is entirely up to the employee.

- Ask to see and become familiar with your company's LO/TO procedures for the equipment you will work near or with.
- Make sure you are adequately trained in LO/TO procedures.

Electrical Trade–Breaker Lockout/Tagout Procedures

For electrical workers in construction or the general industry, lockout/tagout procedures can absolutely protect workers against accidents caused by the release of hazardous energy.

A. **Circuit breaker lockout/tagout devices are practical tools for keeping breakers in the OFF position while specific electrical equipment is serviced.**

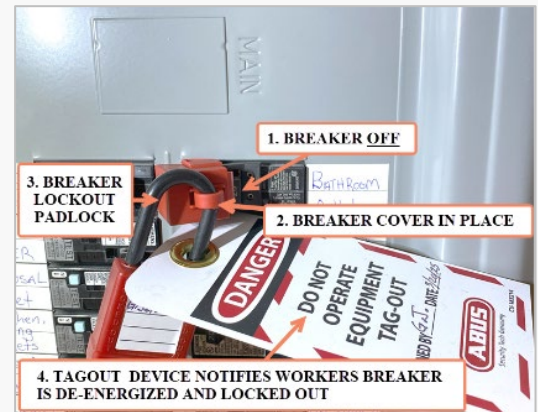
- 1) Move the breaker to the OFF position. Refer to **Figure 1**.
- 2) Place a Breaker Cover over the OFF circuit breaker.
- 3) Padlock the Breaker Cover to ensure the lockout is not changed by other workers.
- 4) Attach a Tagout device to notify workers the breaker is de-energized and locked out.
- 5) Before working on electrical equipment or components, you must verify that it is in a zero-energy state.
It is recommended to test components with a meter and verify isolation.
- 6) After completing electrical work, remove all LO/TO devices, move the breaker to ON, and bring all electrical equipment back online.

B. **Decide how many stations, electrical components, and machinery need lock out/tag out devices and be consistent with inventory and taking stock.**

LOCKOUT/TAGOUT: SUPERVISOR AND WORKERS Q & A

1. What are the electrical trade lockout/tagout safety devices used on this site?
2. Are there ever any circumstances where “working hot” is allowed?
3. Are there General Contractor or Building Owner specific rules that apply to Electrical Trade–Breaker Lockout/Tagout work that are above OSHA Lockout/Tagout standards?

Figure 1 Beaker LO/TO



Tailgate Meeting Sign-in
Supervisor:
Craft: