Alerting Techniques

NFPA 70 - 2009 Article 130.7(E)(4)

“Look-Alike Equipment”

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WORK ZONES/BARRICADES

Use Work Zones/Barricades around “look-alike” equipment.

“Alerting Techniques”

See 130.7 (E)(4)

Is This Look-Alike Equipment?

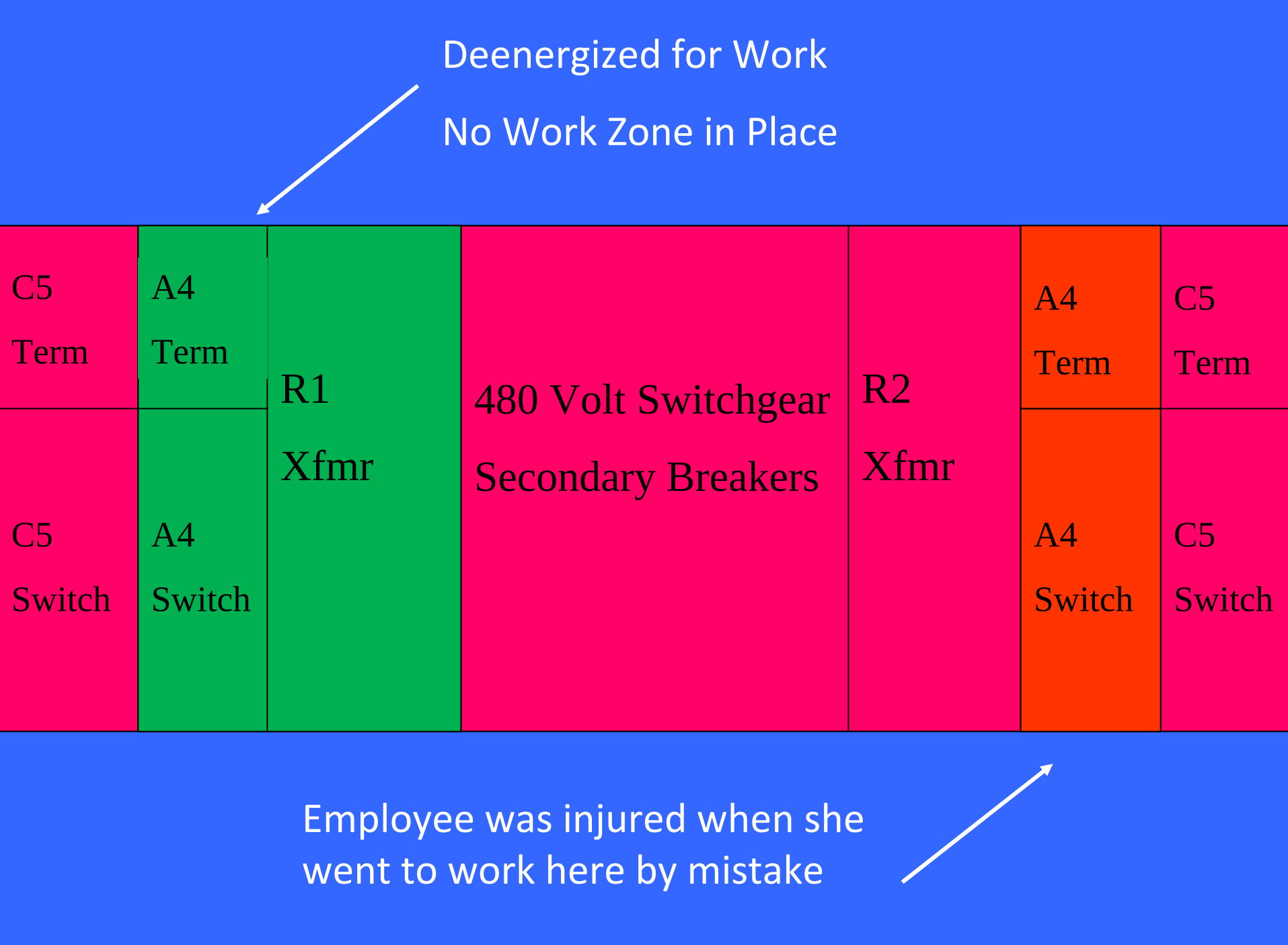
LOOK-ALIKE EQUIPMENT

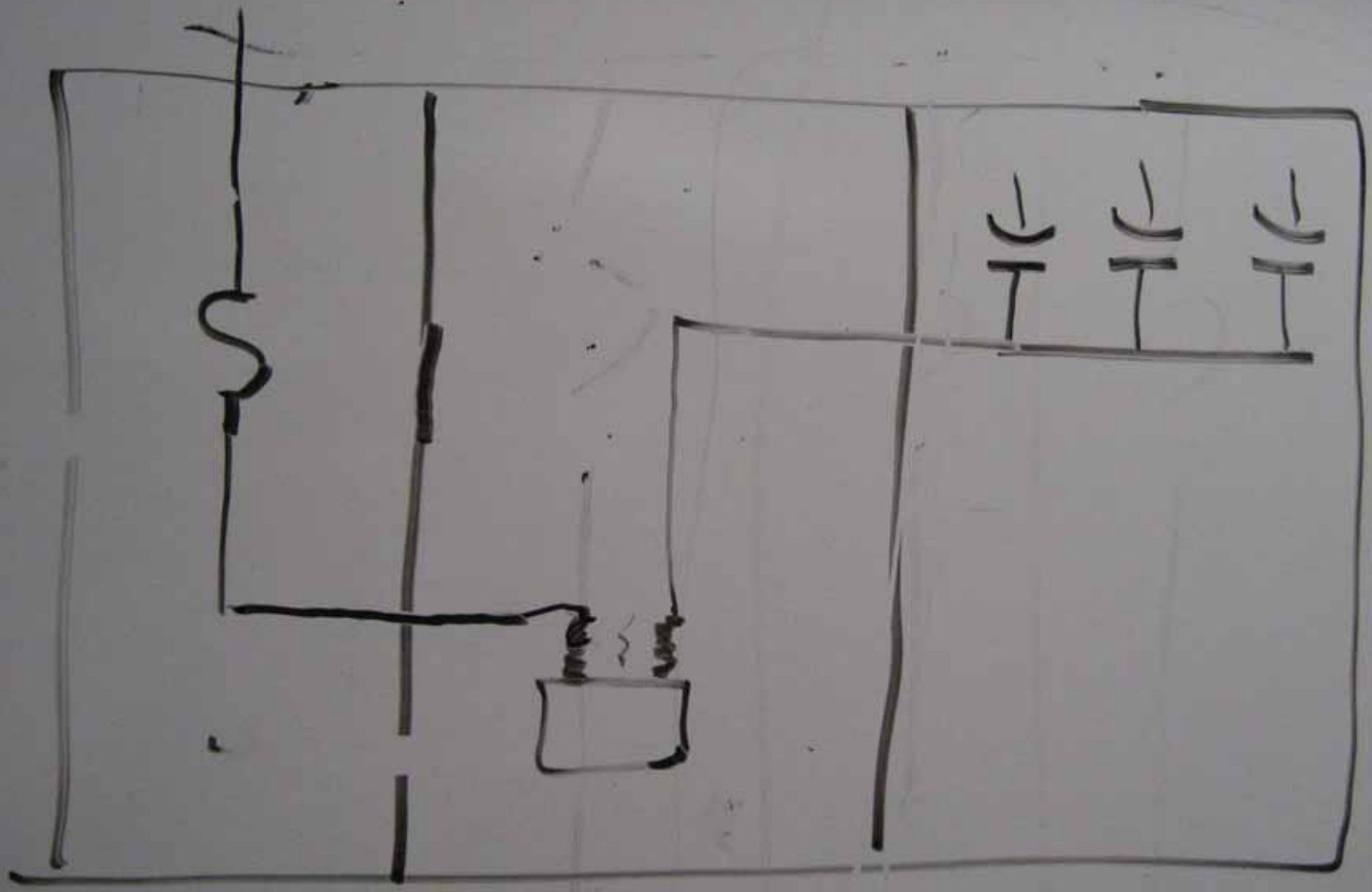
“Look-alike” equipment can be a killer. This is a real hazard. This type of injury or death continues to happen in industry.

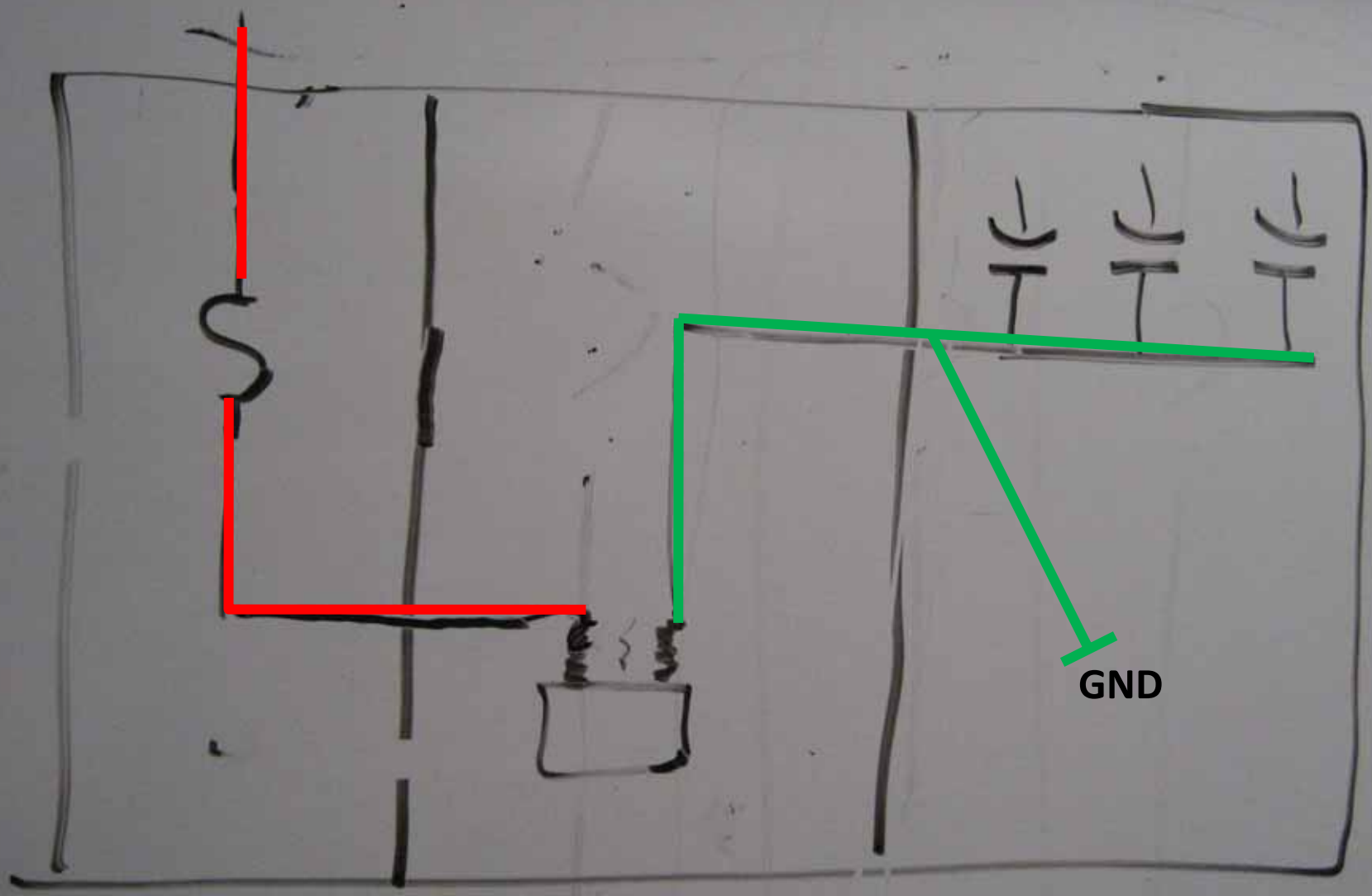
IT COULD HAPPEN TO YOU!!!

CASE HISTORIES

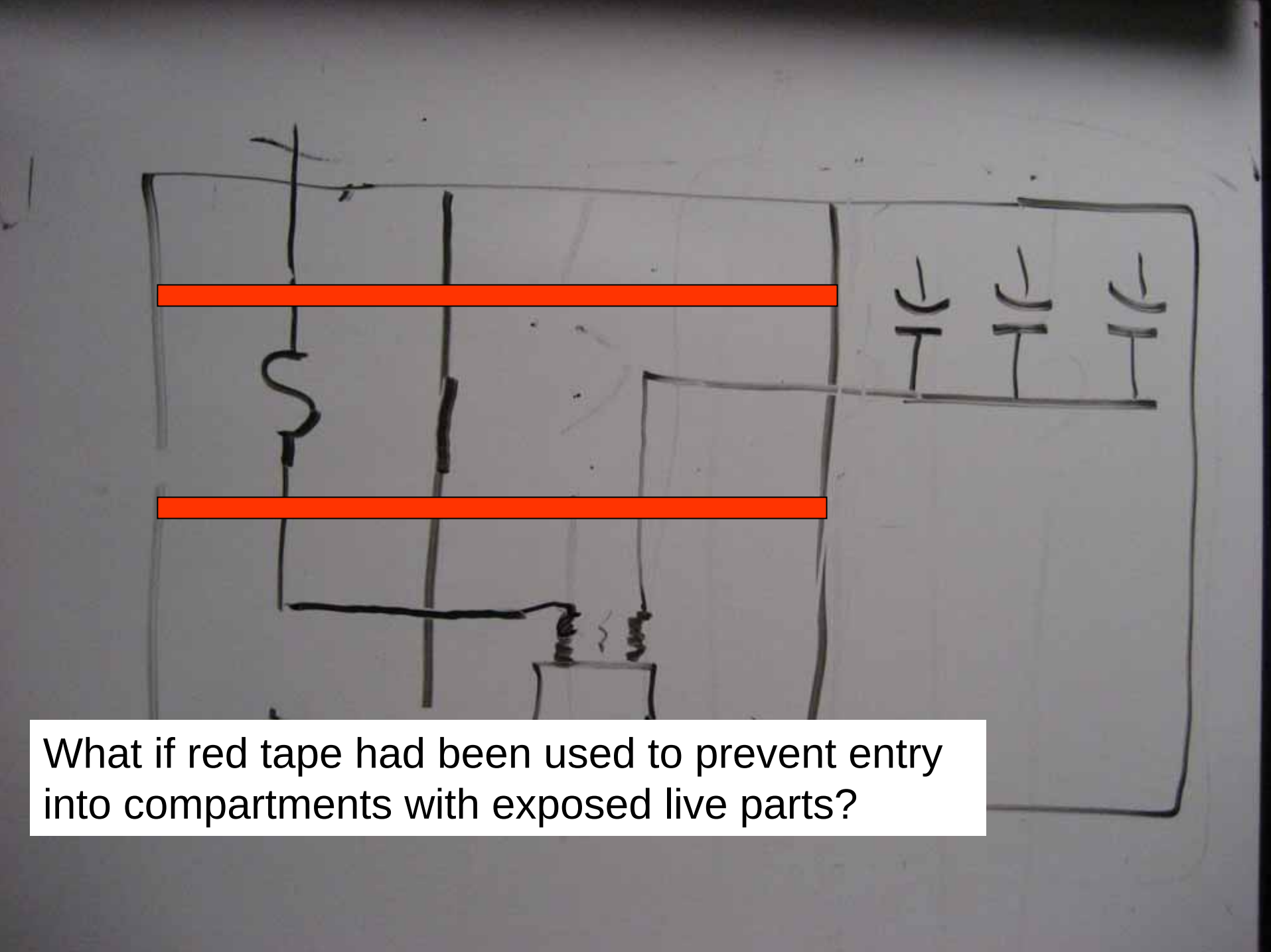
Problem found In These Two Locations


Deenergized for Work
No Work Zone in Place
C5 Term
A4 Term
R1 Xfmr
480 Volt Switchgear Secondary Breakers
R2 Xfmr
A4 Term
C5 Term
C5 Switch
A4 Switch
A4 Switch
C5 Switch
Employee was injured when she went to work here by mistake

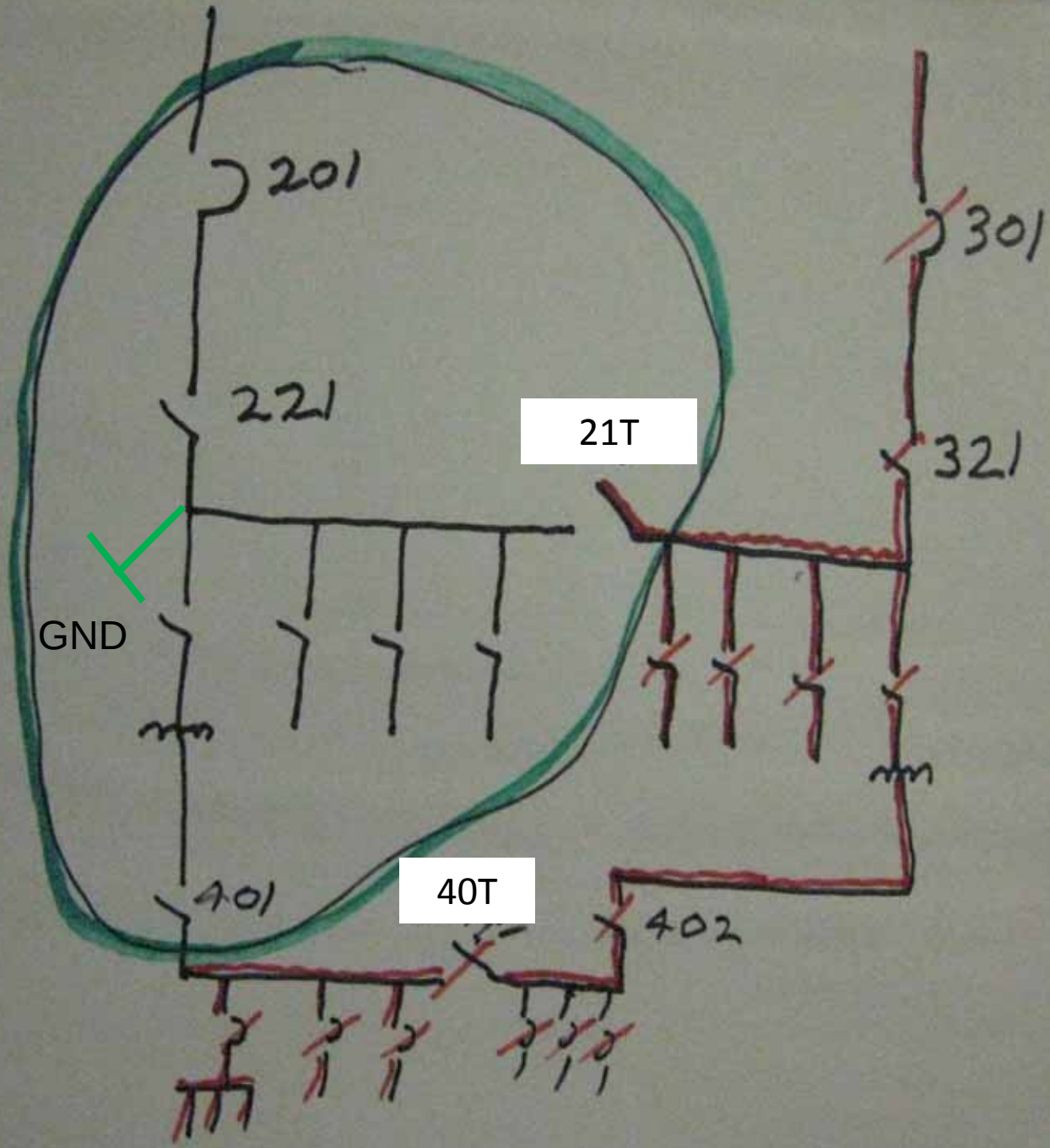


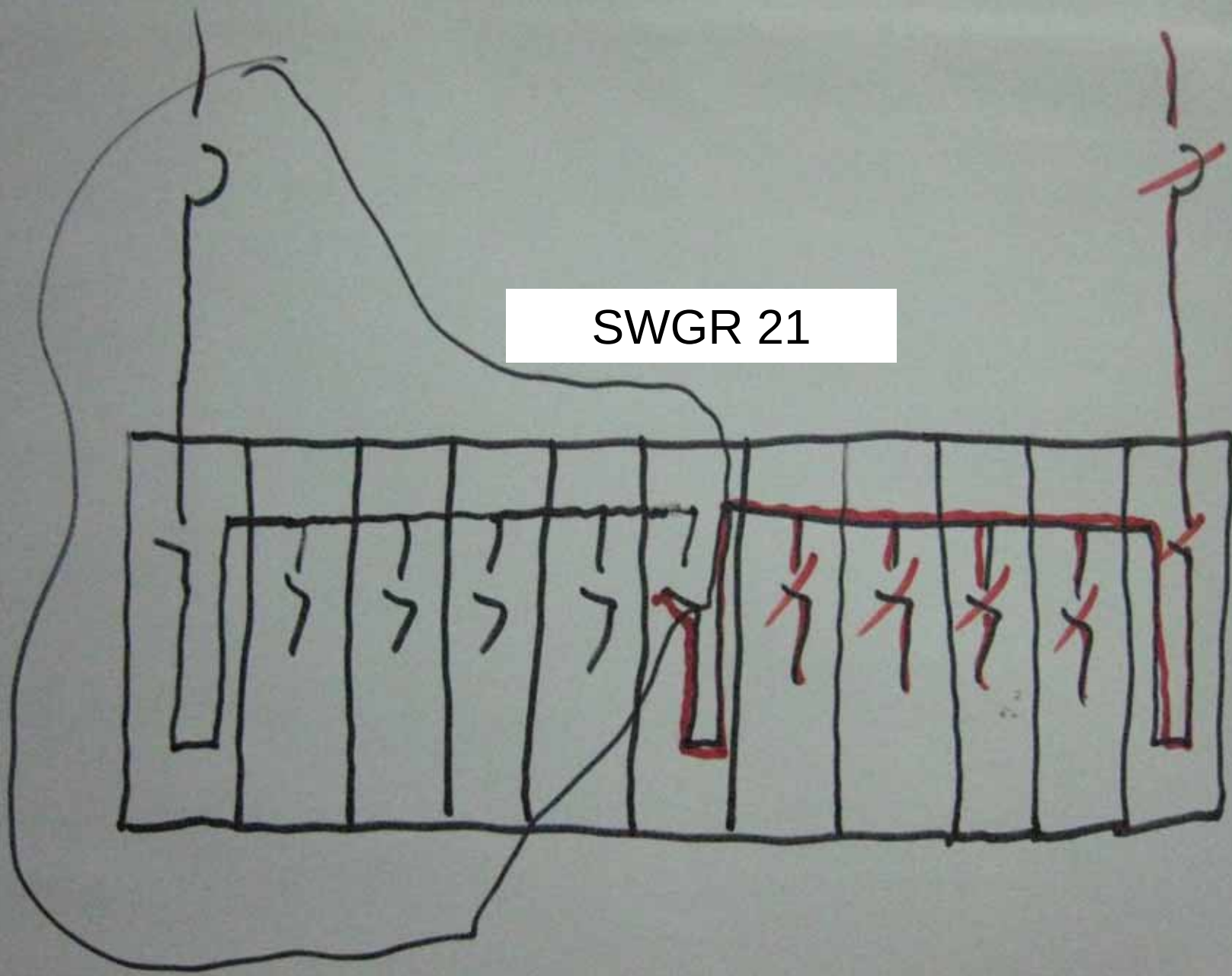

GND

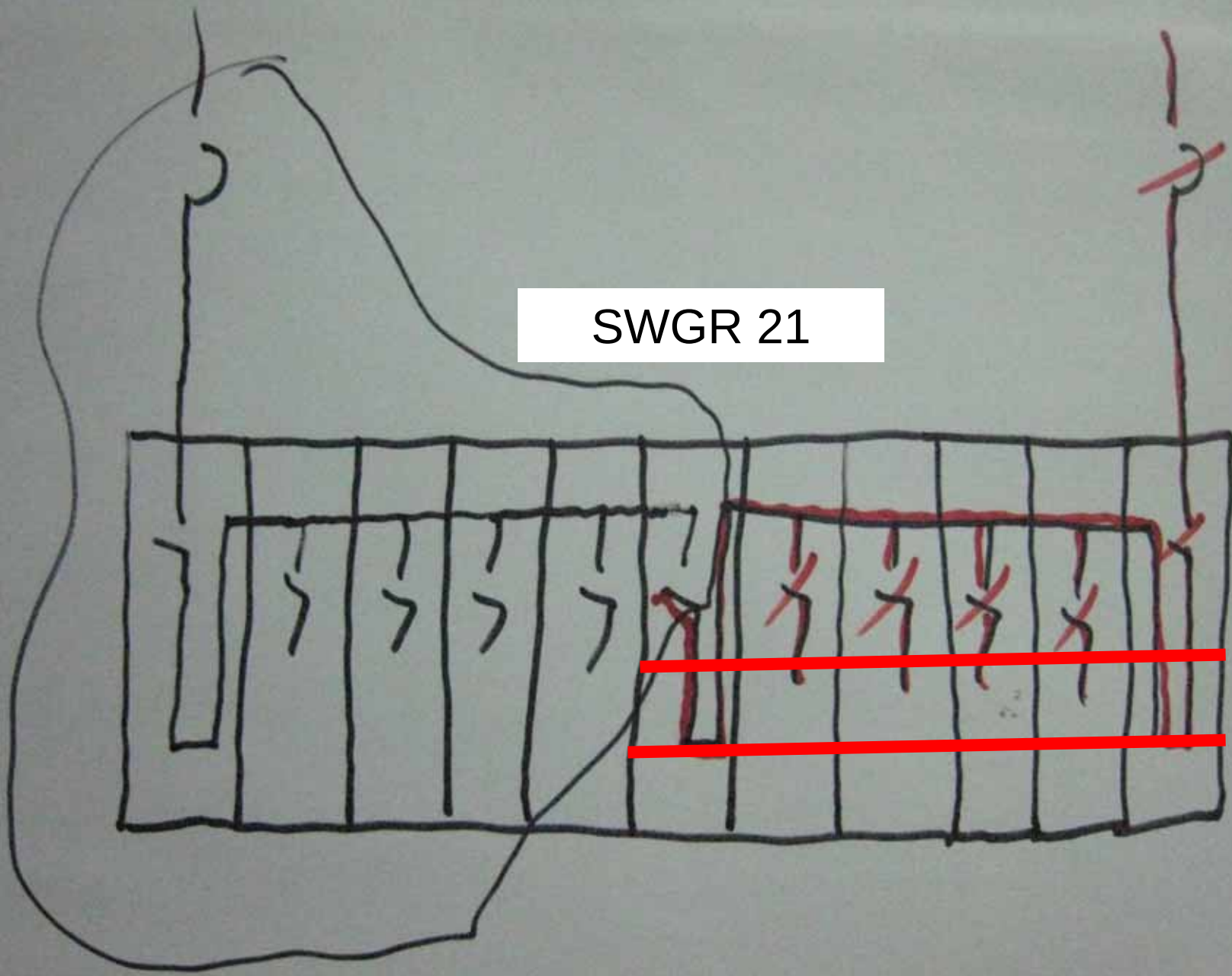
2006



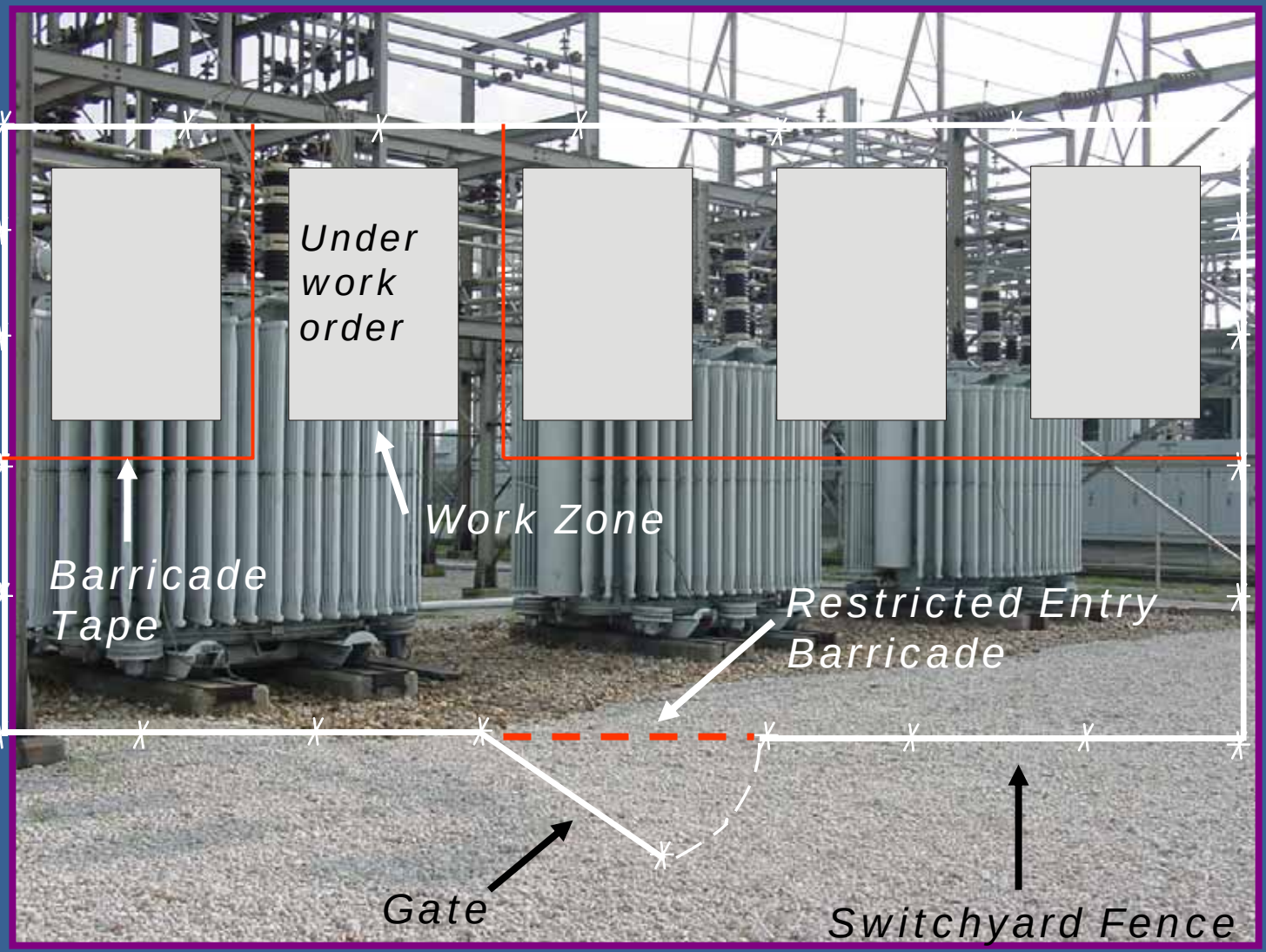
What if red tape had been used to prevent entry into compartments with exposed live parts?


201
221
21T
GND
301
321
401
40T
402

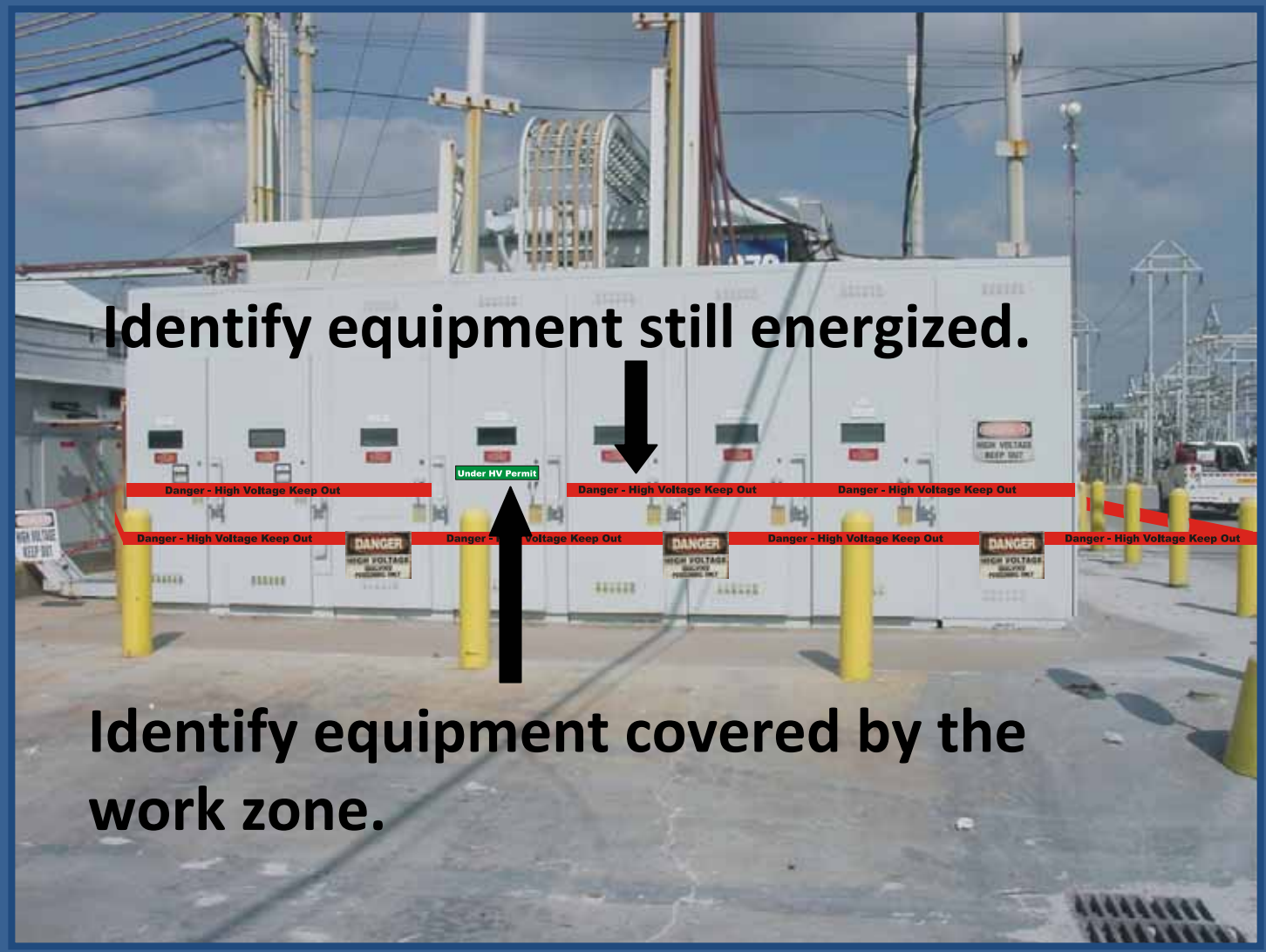

SWGR 21


SWGR 21

Barricaded Work Zone



Barricaded Work Zone




SS13Z
SS13
DANGER
6,600 VOLTS
UNDER H.V. PERMIT
ALCOA KW
DANGER
SS 13
DANGER
DANGER

WORK ZONES

Sometimes the right tool is a roll of red tape

Case History

Improper Labeling and Look Alike Equipment
A Dangerous Combination

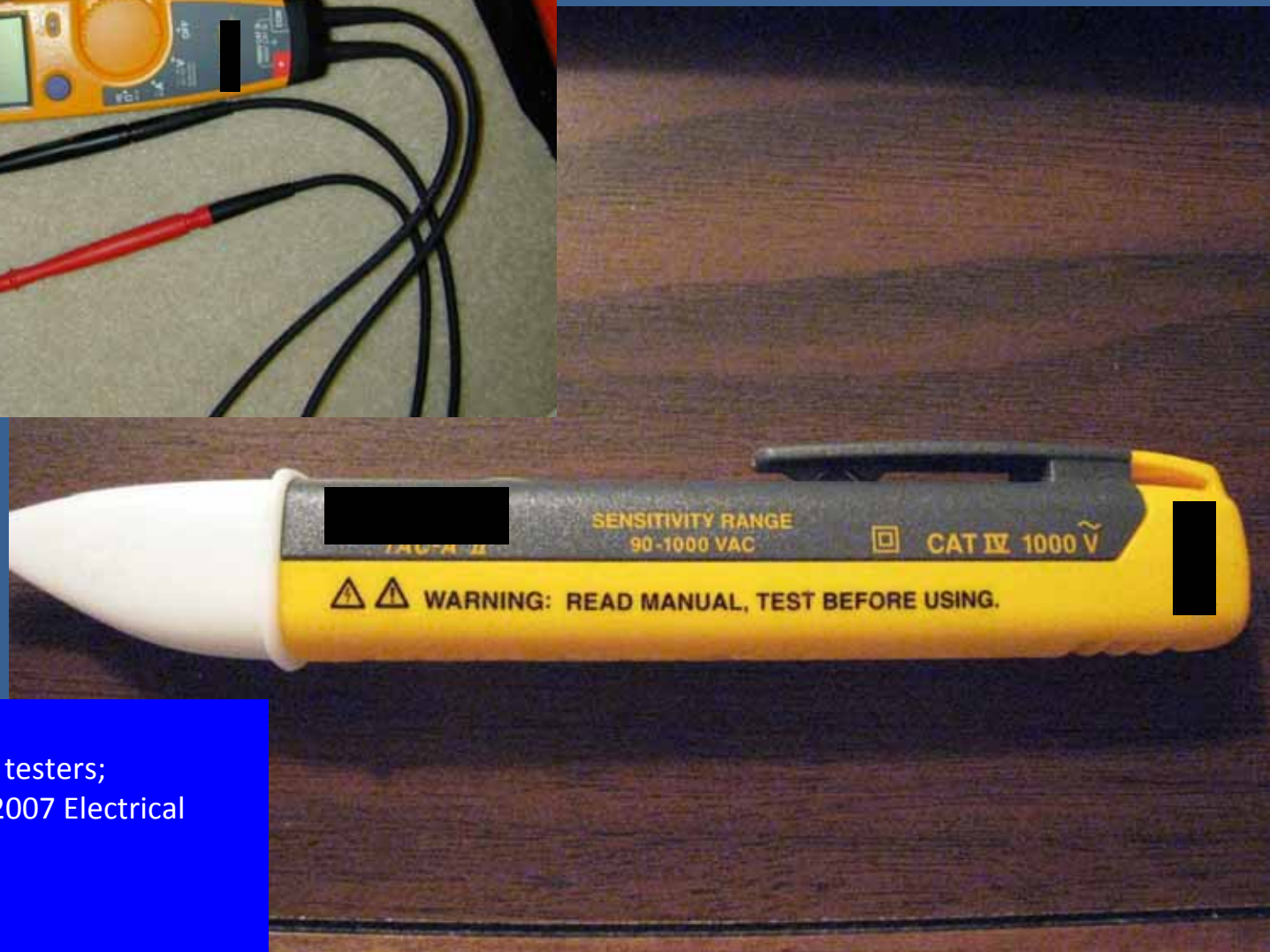
Qualified People Make Mistakes

- Traps Exist In The Work Place!
- Do You “Bet Your Life” That The Labeling On The Equipment Is Correct?
- Do You Test for Voltage Before You Touch Exposed Electrical Conductors or Circuit Parts That Might Be Energized?

Testing for the Absence of Voltage

- Are You Sure You Made a Valid Test?
- What Type of Voltmeter Should You Use?

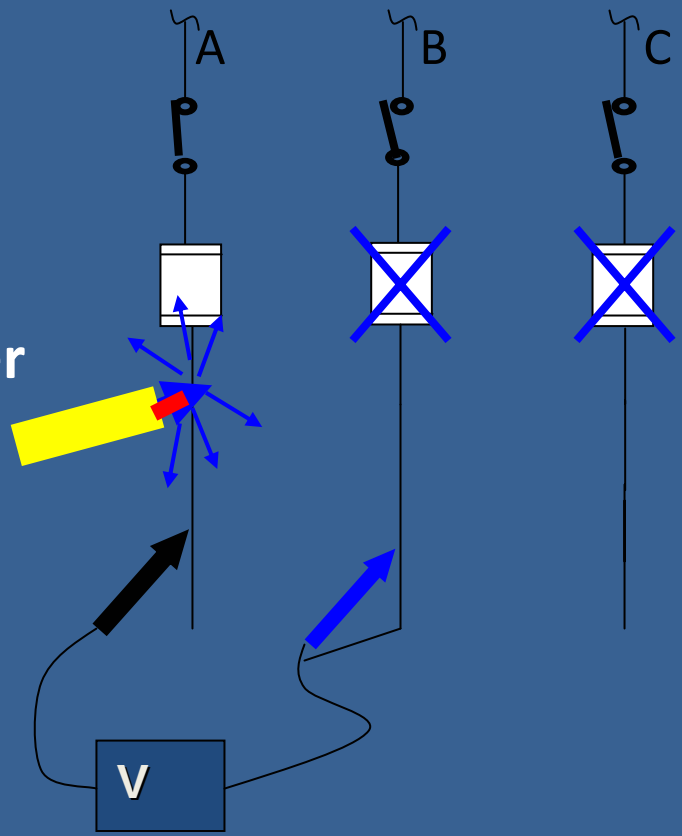
Know your Instrument
What will it do?
What will it not do?



Use of non-contact voltage testers; Cadick & Liggett; IEEE IAS 2007 Electrical Safety Workshop

Phase-to-Phase Test Limitations

Proximity Tester
<u>Does</u> Indicate
Voltage



Blown
Fuses or
faulty
switch

Meter <u>Does Not</u> Indicate Voltage

Testing for the Absence of Voltage

- Are You Sure You Made a Valid Test?
- What Type of Voltmeter Should You Use?
- How Do You Test for Voltage Where Contact Is Not Possible?

The Task

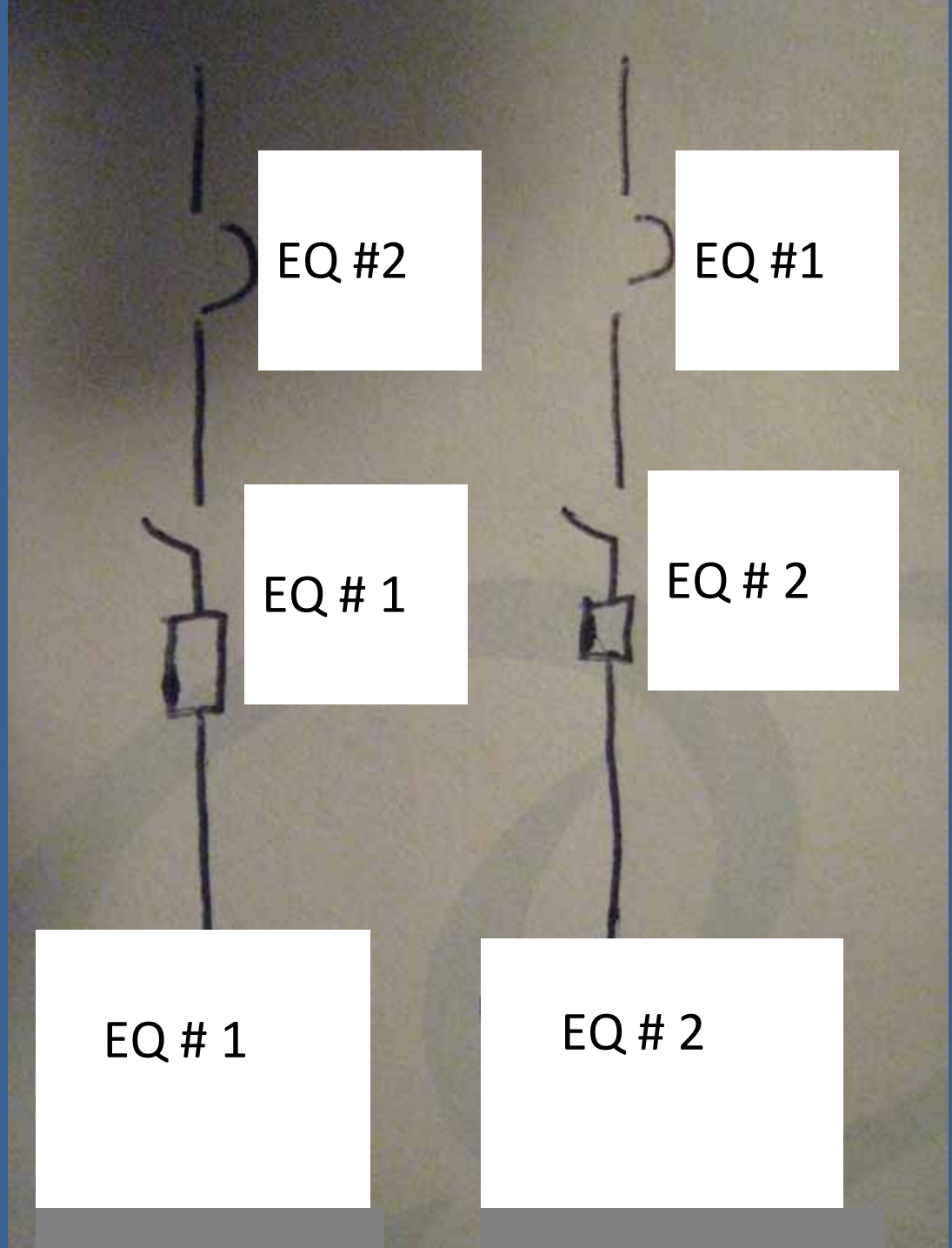
- Two pieces of identical equipment existed in the field. A problem existed with one of them.
- Equipment # 2 would not start. A work order was placed to have an electrician find and correct the problem.

Note: Before the work order was placed, the disconnect switch for equipment # 2 had been opened and a problem was found inside the disconnect switch.

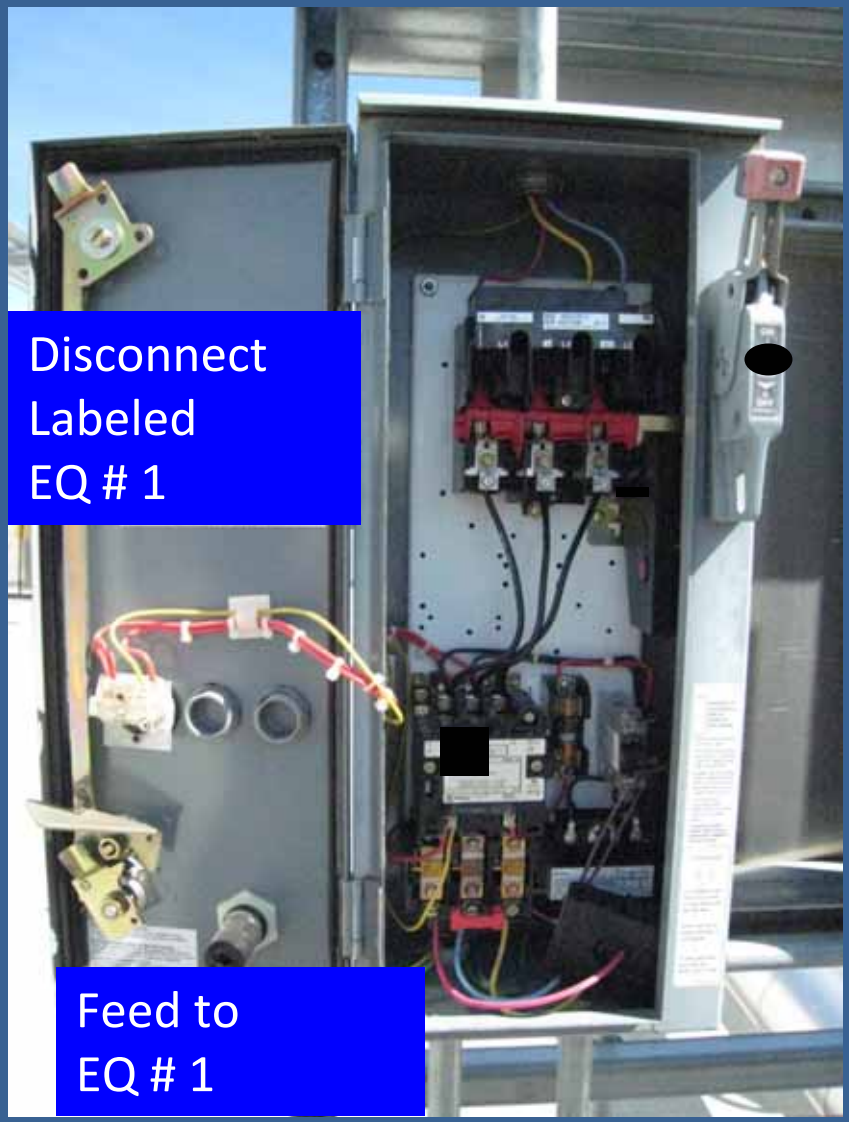
Warning

- Traps exist in the workplace.

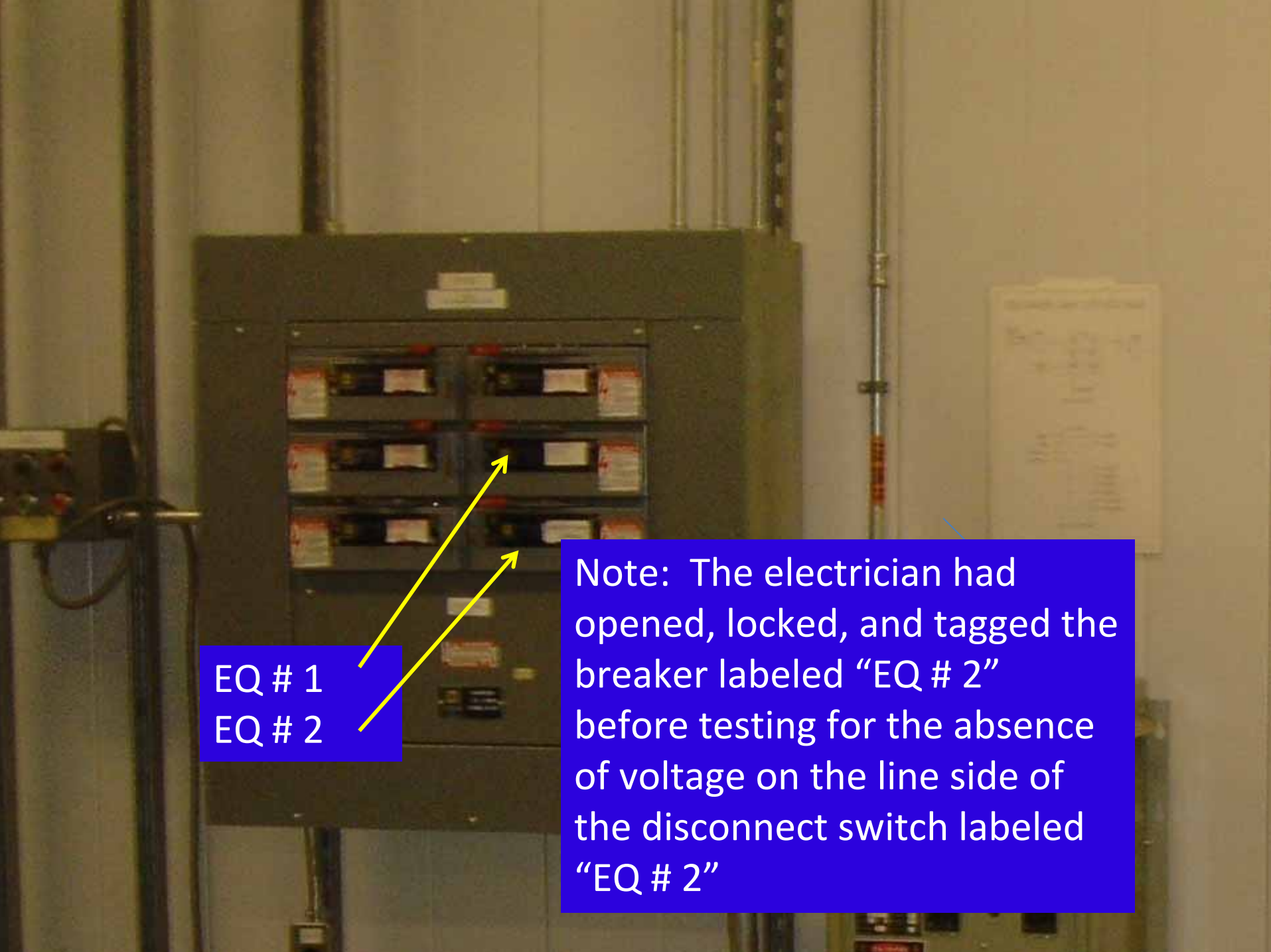
  The labeling on the breakers feeding the two pieces of equipment were reversed.


EQ #2
EQ # 1
EQ # 1
EQ #1
EQ # 2
EQ # 2

Fed from Bkr
Labeled EQ #2



Fed from Bkr
Labeled EQ #1


EQ # 1
EQ # 2
Note: The electrician had opened, locked, and tagged the breaker labeled “EQ # 2” before testing for the absence of voltage on the line side of the disconnect switch labeled “EQ # 2”

A Trap

- Equipment # 1 stopped running when the breaker labeled equipment # 2 was opened.

- The electrician did not think it was abnormal for equipment # 1 to not be running because this equipment automatically starts and stops based on the need for cooling.

During testing the arc suppressor prevented the voltmeter leads from making positive contact with exposed energized conductors on the line side of the disconnect switch.

The Incident

- An arc occurred when work took place inside the disconnect switch feeding equipment # 2
  - A part that was removed made contact with an energized 480 volt conductor and ground
- No injury occurred because of the Electrician's PPE
  - HRC 1 clothing
  - Class 0 rubber insulating gloves with leather protectors
  - Used insulated tools

HRC 1 Dress
Note the Arc-Rated Face Shield

Root Causes of Incident

- The labeling was not correct.
- No contact was made with an exposed part during testing for the absence of voltage with a voltmeter that required contact with an exposed part.
- The arc suppressor on the disconnect switch prevented the voltmeter leads from making contact with the exposed energized conductors.
- The electrician thought that he had checked for the absence of voltage.

Lessons Learned

- The use of a non-contact voltage tester may have prevented the incident.
- When you use a voltmeter that requires contact with exposed parts make sure you do.
- Don’t “bet your life” that the labels on equipment are correct.


Bad things happen when you do not pay attention to details

An Independent Question

- What safeguards do you have in place to help prevent a person from using a voltmeter rated for 1000 volts to check for voltage on a high voltage system?


Can you tell that this is 4160 Volt Equipment?
PANEL HFG
DANGER

Warning
4160 Volts

PANEL
HFG

DANGER


Warning
4160 Volts
DANGER

What do you have in place to prevent this from happening?

- Results of using a voltmeter rated for 1000 volts on 4160 volt equipment

4160 Voltage fault due to improper meter being used

- PPE of the tech doing the measurement
- What if no PPE had been used?


Use an adequately rated voltage detector when testing for voltage

Qualified People Make Mistakes

- Questions?

For More Information, Contact:

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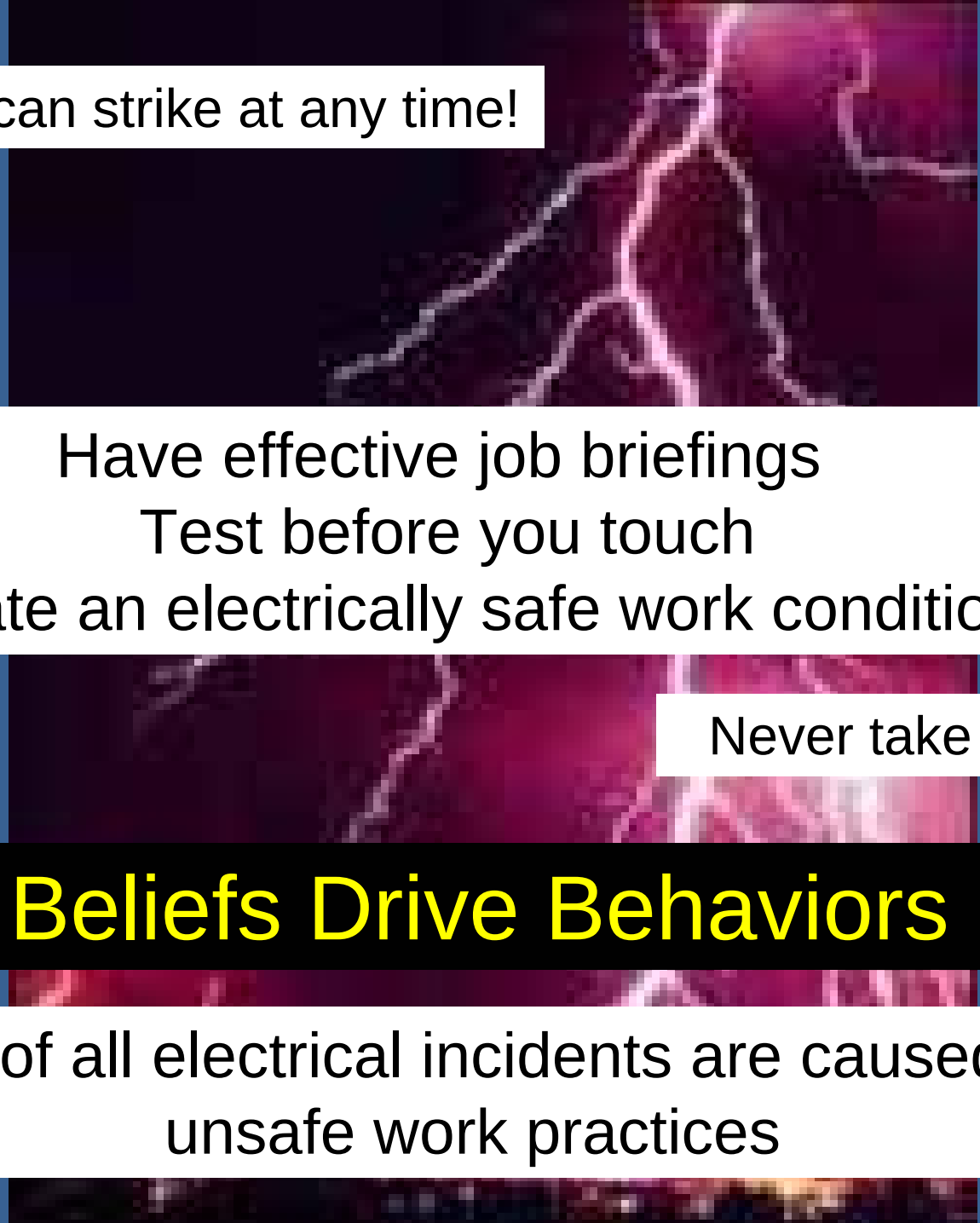

Lightning can strike at any time!

Have effective job briefings
Test before you touch
Create an electrically safe work condition

Never take short cuts!

Beliefs Drive Behaviors

91% of all electrical incidents are caused by unsafe work practices