

CONTROL OF HAZARDOUS ENERGY 29 CFR 1910.147

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Get Ready!

Kahoot!

**Get your cell phone or OTHER device.
Go to your web browser (Chrome, Safari, Firefox) and
type in “play kahoot” (or use the APP).**

So what will we talk about?

- How to recognize sources and types of hazardous energy.
- Basic safety rules when working around hazardous energy sources.



What won't we talk about?

- Specific hazardous energy control techniques.
- Details of lockout procedures.
- Group lockouts.
- Shift change lockout protection.



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Now we will play.

Kahoot!

**Get your cell phone or OTHER device.
Go to your web browser (Chrome, Safari, Firefox) and
type in “play kahoot” (or use the APP).**

Why should I be concerned about hazardous energy?

- Hazardous energy can injure or kill.
- Many sources of hazardous energy are found in water treatment facilities.
- You may encounter a source of hazardous energy and NOT recognize it.
- You may not know how to control hazardous energy.

How can uncontrolled hazardous energy injure?



Electrical shock, burn or arc flash.

5) Verify that the distance from each hand control to the closest hazard point is not less than the calculated safety distance (see Instruction Manual).

WARNING



If all of the above checks cannot be verified, the two hand control system must not be used until the problem has been corrected. Injury or death to personnel may result from attempts to use the machine under such conditions.

⚠ WARNING



Hazardous voltage.
Will shock, burn,
or cause death.
Only qualified
personnel totally
familiar with
electrical circuits
and operation
manual should
work inside this
enclosure.

POWER



HYDRAULIC
PUMP



HOME
POSITION



CONTROL
CIRCUIT
OFF ON



ON



HOME POSITION
RETURN



LX F

Entanglement.

! WARNING

ROTATING SHAFTS ARE DANGEROUS

YOU CAN SNAG CLOTHES, SKIN, HAIR, HANDS, ETC
THIS CAN CAUSE SERIOUS INJURY OR DEATH.

- EXPOSED ROTATING SHAFTS MUST BE GUARDED.
- DO NOT WORK ON OR NEAR AN EXPOSED SHAFT WHEN ENGINE IS RUNNING.
- SHUT OFF ENGINE BEFORE WORKING ON POWER TAKE-OFF OR DRIVEN EQUIPMENT.

DO NOT PAINT OVER THIS LABEL!



READ P.T.O. OWNERS MANUAL
FOR MORE SAFETY INFORMATION

379274 6/93

! WARNING

Release of pressurized fluid.

Pressure relief set at
600 P.S.I.

DO NOT ADJUST.

Handgun or handgun
hose may burst or
become uncoupled
from handgun under
higher pressure.



WARNING



47047HC

MADE IN



DANGER

SECURE DEBRIS BOX IN

Explosion from chemical reaction.

! DANGER



Crushing from effects of gravity.



Keep out from
under loader and all
attached equipment
when moving
release handle.
Keep others clear.

Crushing under equipment.



**EXPLOSION HAZARD
RUN OVER HAZARD**
Read procedure in Operator's
Manual before jump start or
service to avoid injury.



4269A1

Amputation by mechanical forces.



⚠ WARNING

**ENTANGLEMENT
HAZARD**
Keep clear or stop
engine before
servicing.

⚠ WARNING

CRUSH HAZARD

Squashing by a moving part.



How many problems do you see in this video?



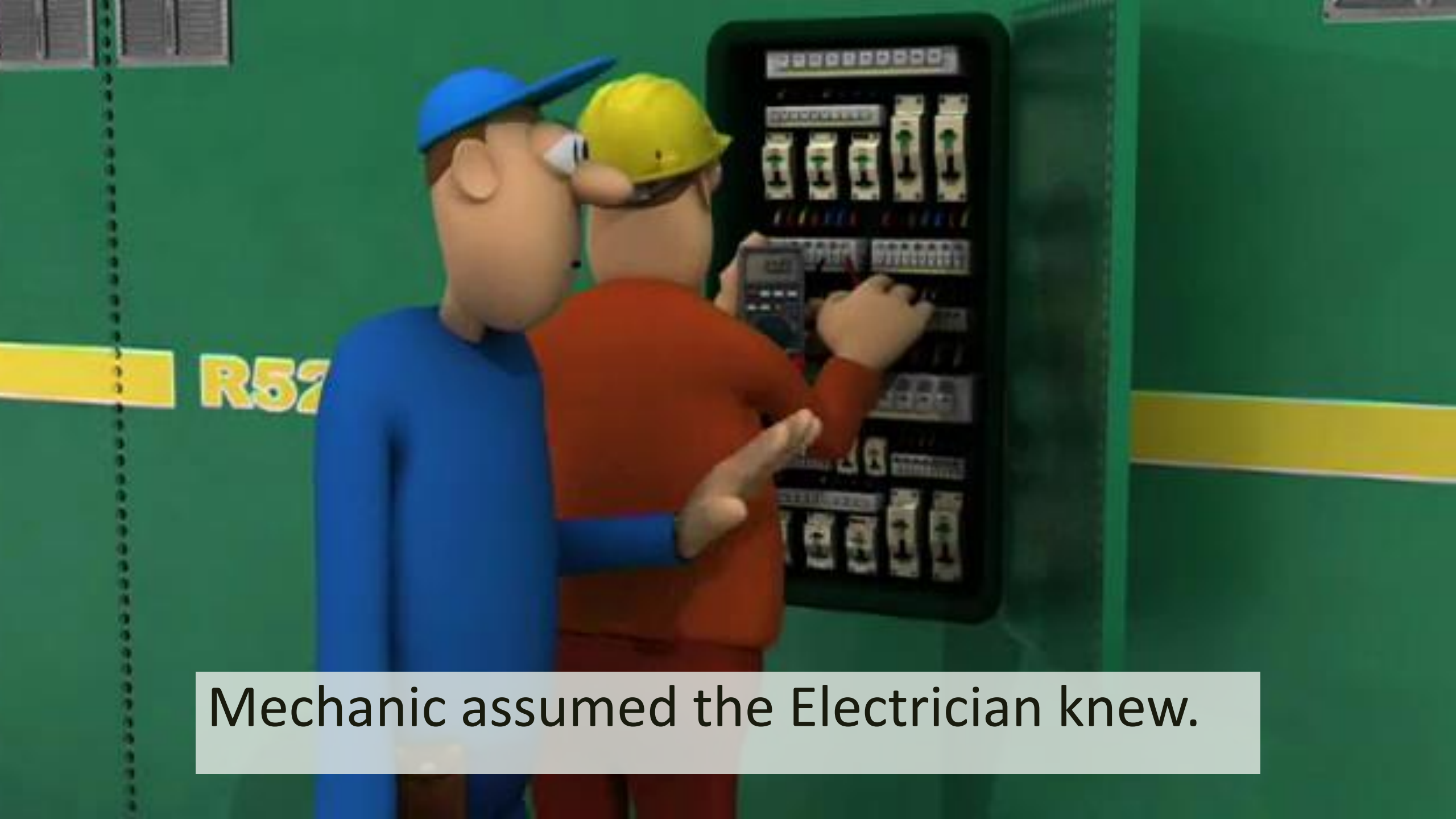
What happened in the
video?

Electrician locked out the electrical power.





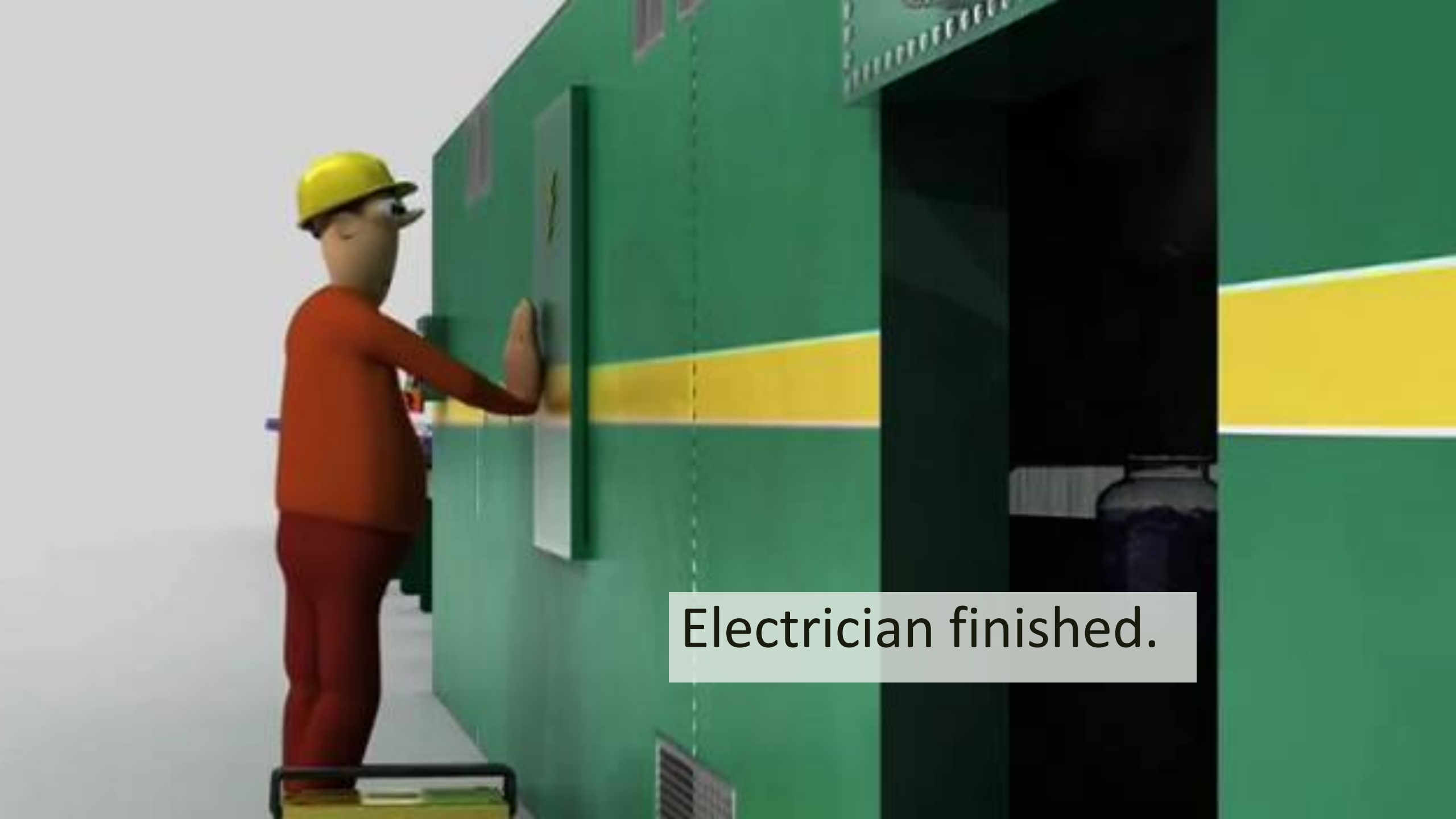
Mechanic relied on Electrician's lockout.



Mechanic assumed the Electrician knew.

Mechanic entered machine.





Electrician finished.

Electrician took his lock off.

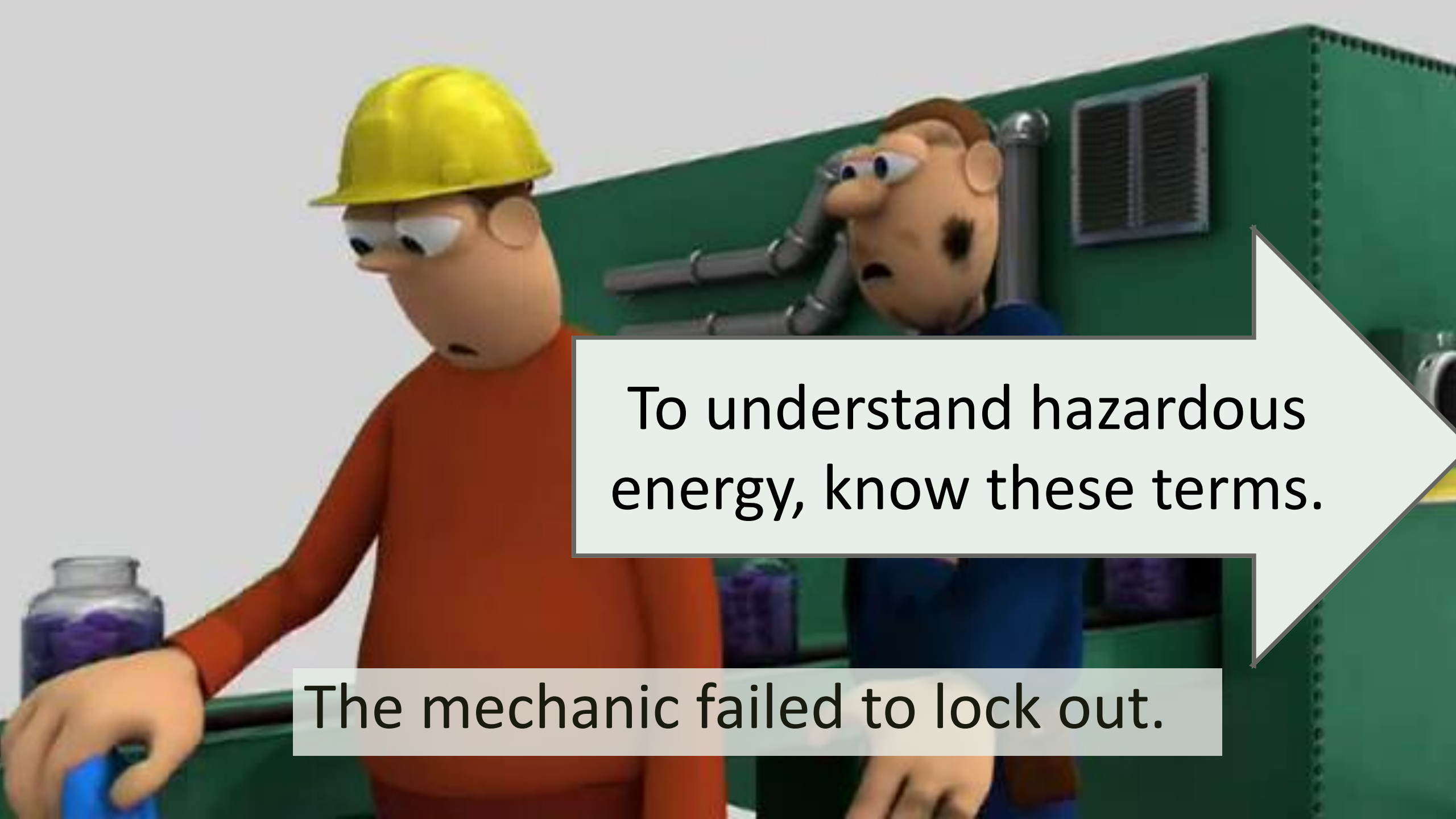


And he restarted the machine.



Mechanic was caught inside the moving machine.





To understand hazardous energy, know these terms.

The mechanic failed to lock out.

“Energized”: connected to an energy source that can cause Material Movement.



De-energized means “OFF”.

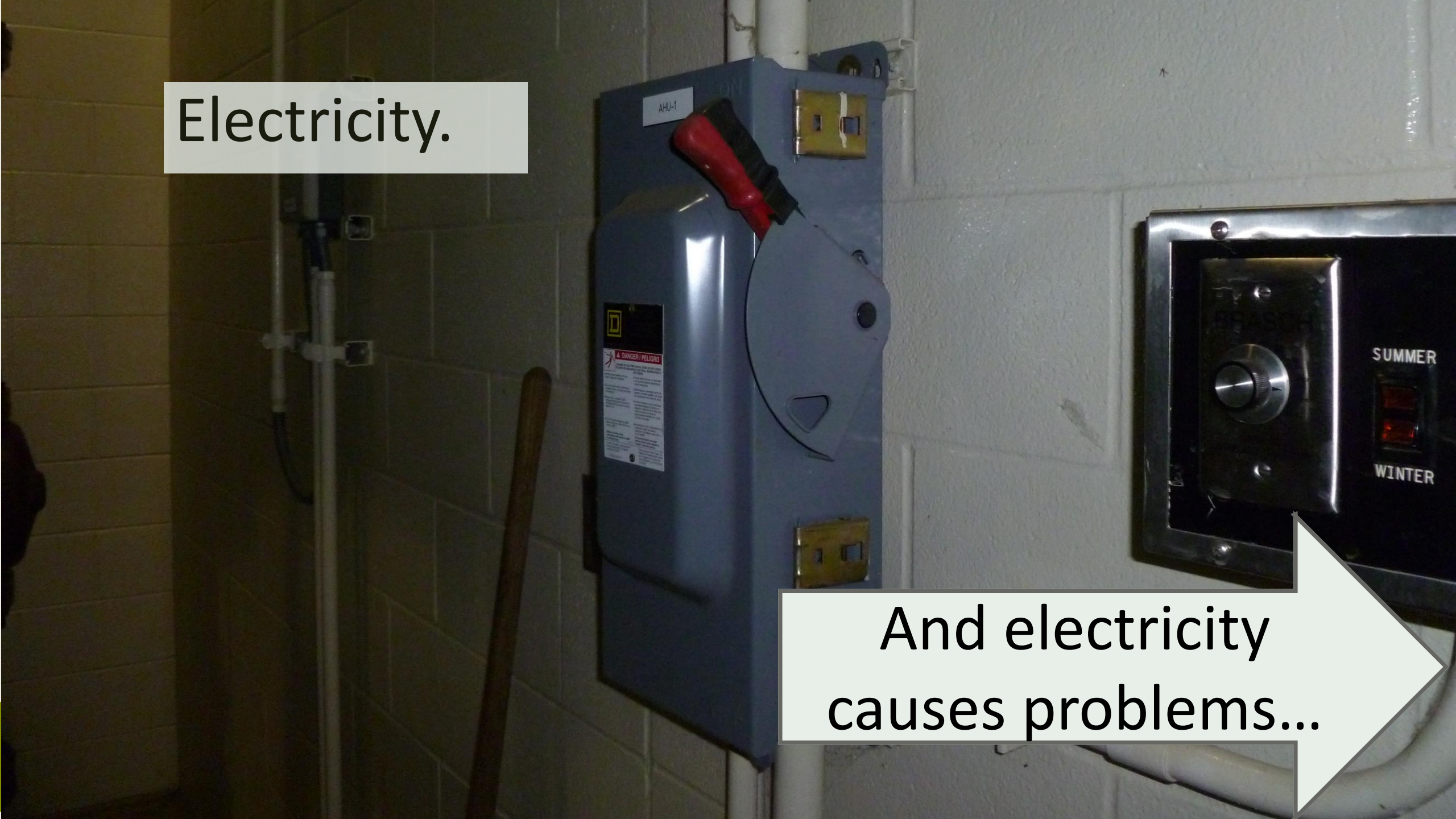
What are those sources of hazardous energy that can be “energized”?

OFF

A photograph of an electrical control panel. The panel is white and has a red emergency stop button. Above the button is a switch labeled 'OFF'. There are also some warning labels on the panel, including one that says 'VOLT DISC 480' and another that says 'Caution-High Voltage'. The background is dark and out of focus.

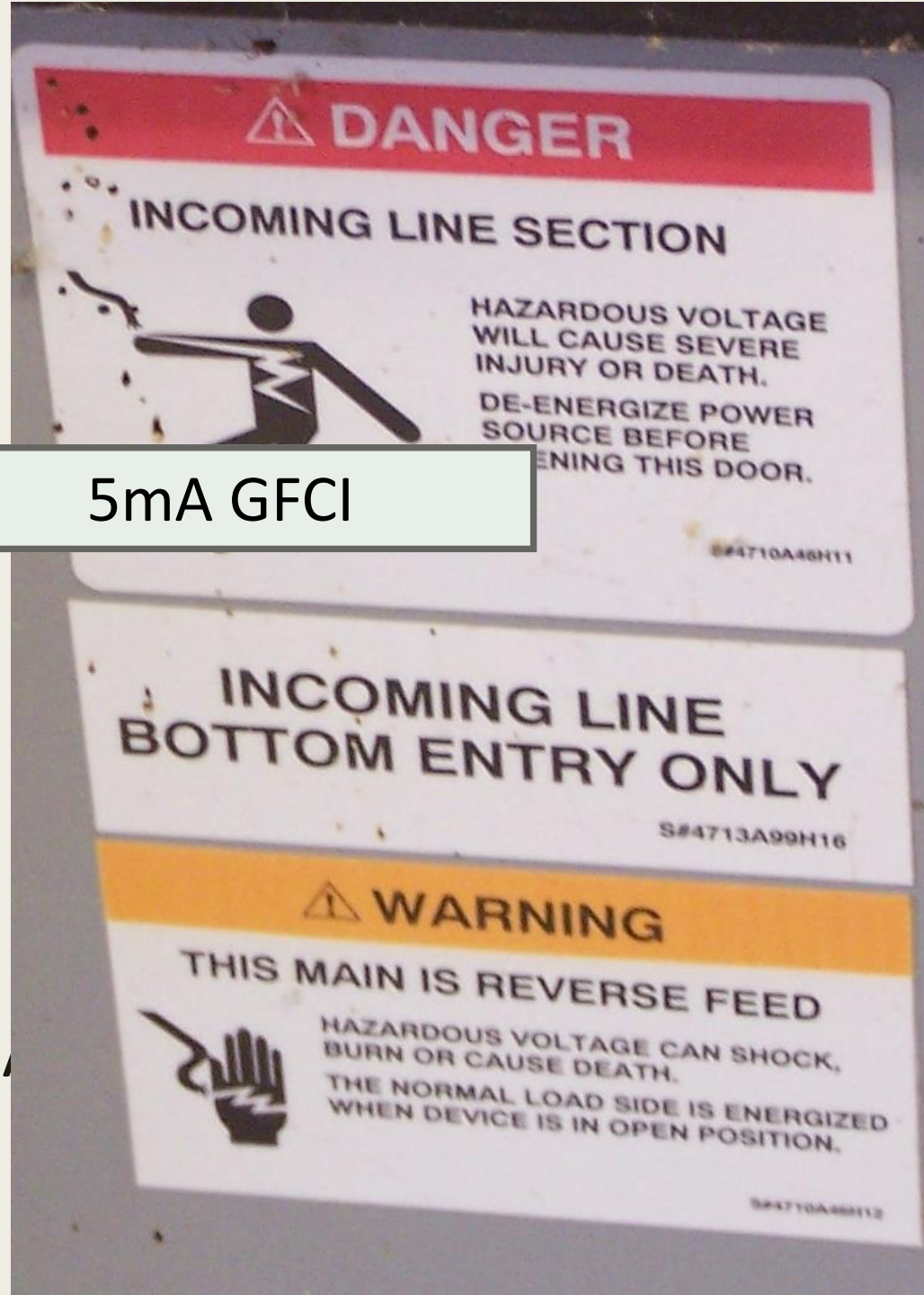
Electricity.

And electricity
causes problems...



Shock

- ~1mA:
- >3mA:
- >10mA:
- >30mA:
- >50mA:
- 100mA - 4A:



use

t-go”

tion.

on



GFCI (ground-fault circuit interrupter)

- 5mA_±1mA
- Protects you from shock injury.
- Test them.



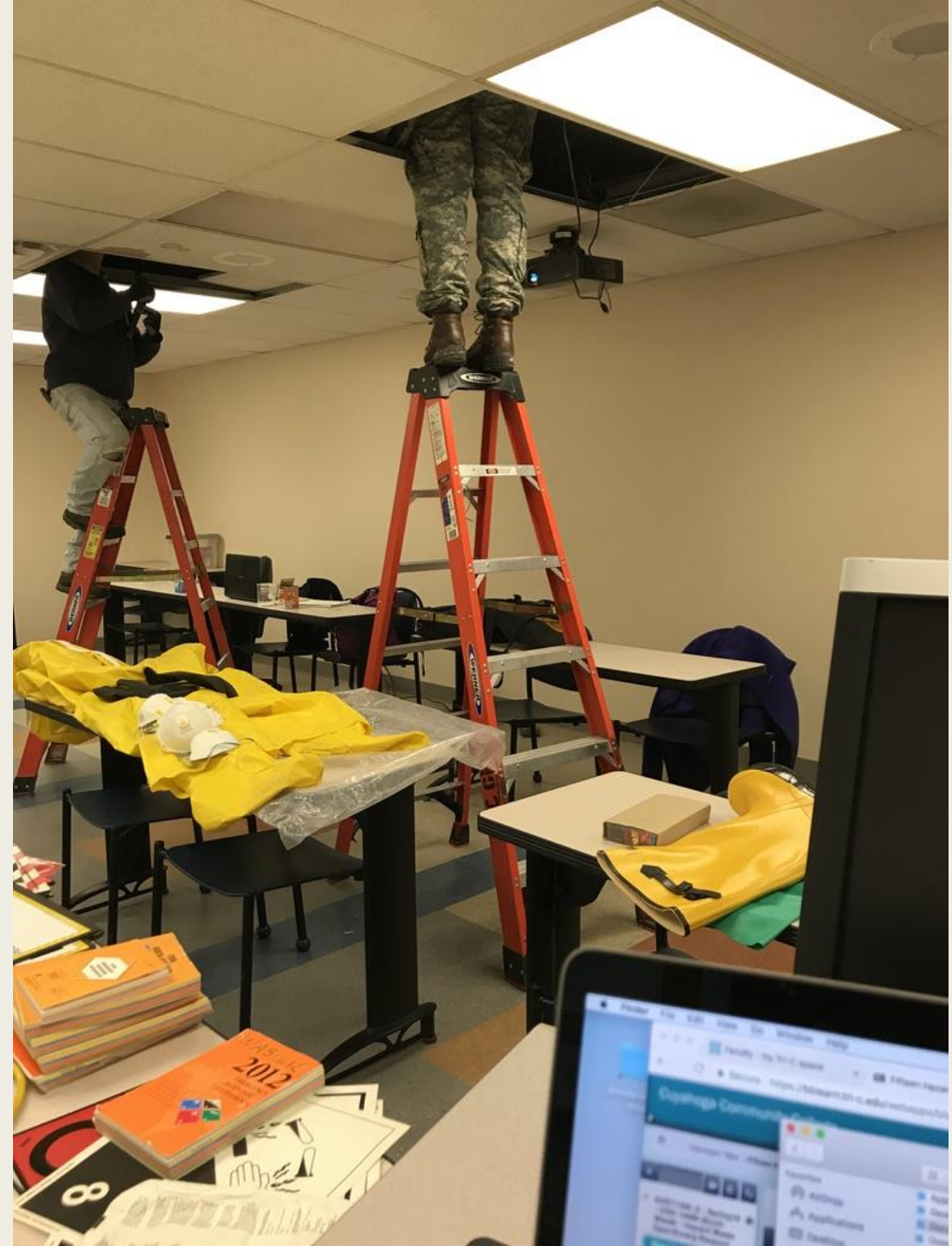
Burns

- Most common shock-related injury
- Typically occurs on hands
- Serious
- Need immediate attention



Falls

- An indirect cause of injuries.
- Electricity can cause a fall.
- Falls can injure or kill.



Arc Flash: Intense heat, light, and pressure wave (blast).



How do we minimize the problems with electricity?



Take electricity out of the equation by keeping away.

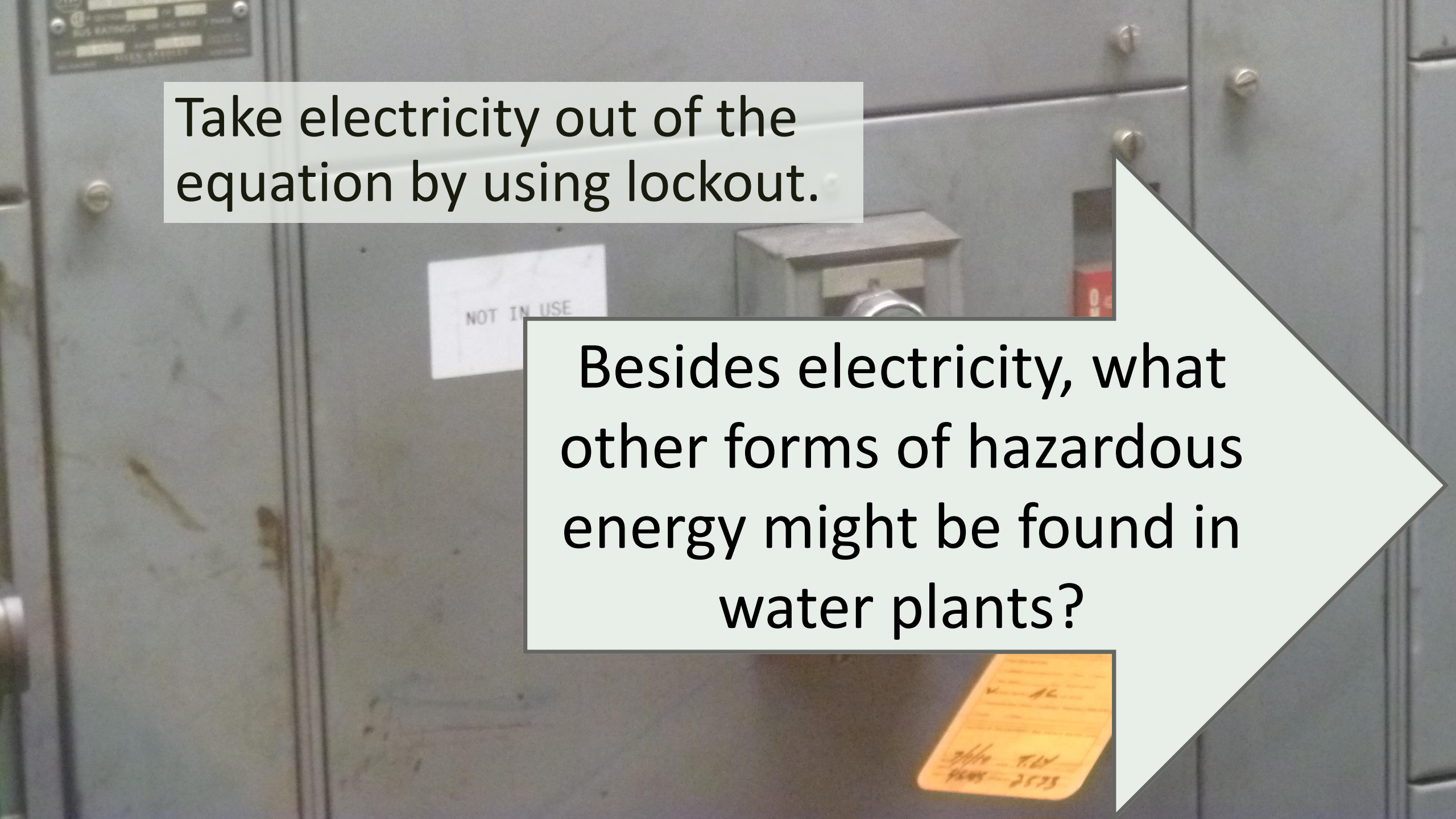
- Keep 3-ft clearance
 - *Equipment*
 - *Stored materials*



Take electricity out of the equation by keeping away.

- Keep 3-ft clearance from
 - *Equipment*
 - *Stored materials*
- Keep 10-foot minimum distance from wires





Take electricity out of the equation by using lockout.

Besides electricity, what other forms of hazardous energy might be found in water plants?

Fluids under pressure – pneumatics and hydraulics

CAUTION
PRESSURIZED VESSEL

USE DRY NITROGEN GAS ONLY
SEE OPERATION INSTRUCTIONS

PRIOR TO OPERATING - CHECK PRECHARGE PRESSURE

Minimum:	25%	of maximum	working	pressure
Maximum:	90%	of minimum	working	pressure

HYDAC

HYDAC **CAUTION**

PRECHARGED DRY NITROGEN GAS

AT	1200	PSI
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Water and wastewater flow



Chemicals





Mechanical energy

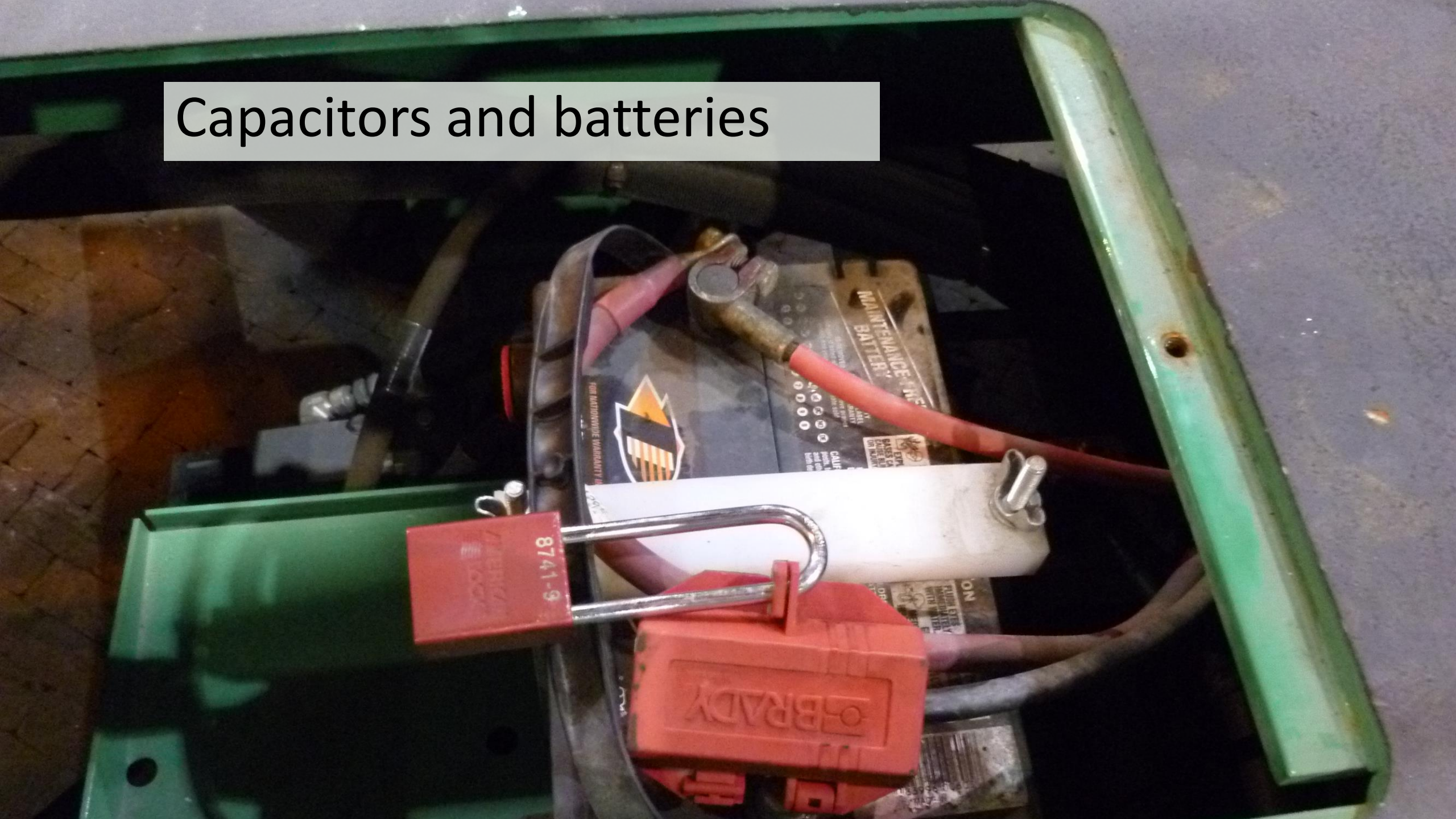
Stored or residual energy must be found and dissipated.

Heat

CAUTION

**HOT SURFACE WILL
BURN SKIN
-DO NOT TOUCH-**

Capacitors and batteries



Accumulators



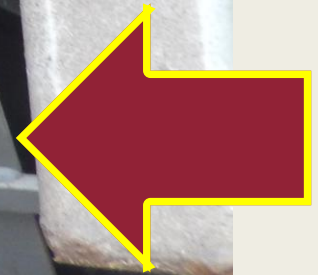


Gravity effects from elevated equipment



Springs under a dockplate.

Controlling this energy begins with lockout?



Lockout is the placement of a **lockout device** on an **energy isolating device** to keep it in the safe (**off**) position.



What is a
lockout device?

A safety lock



There are some good rules for safety locks.



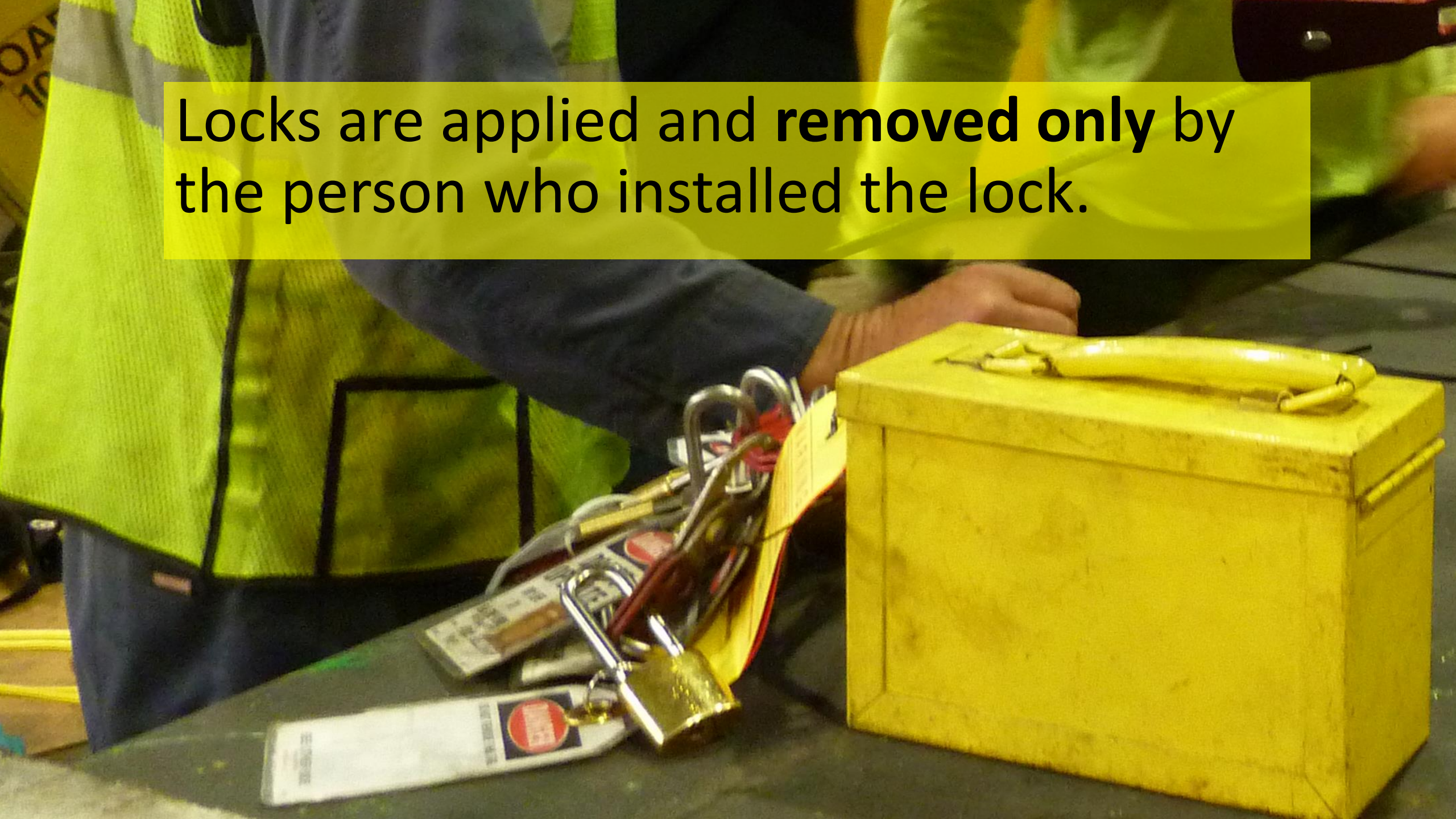
One lock, one key.

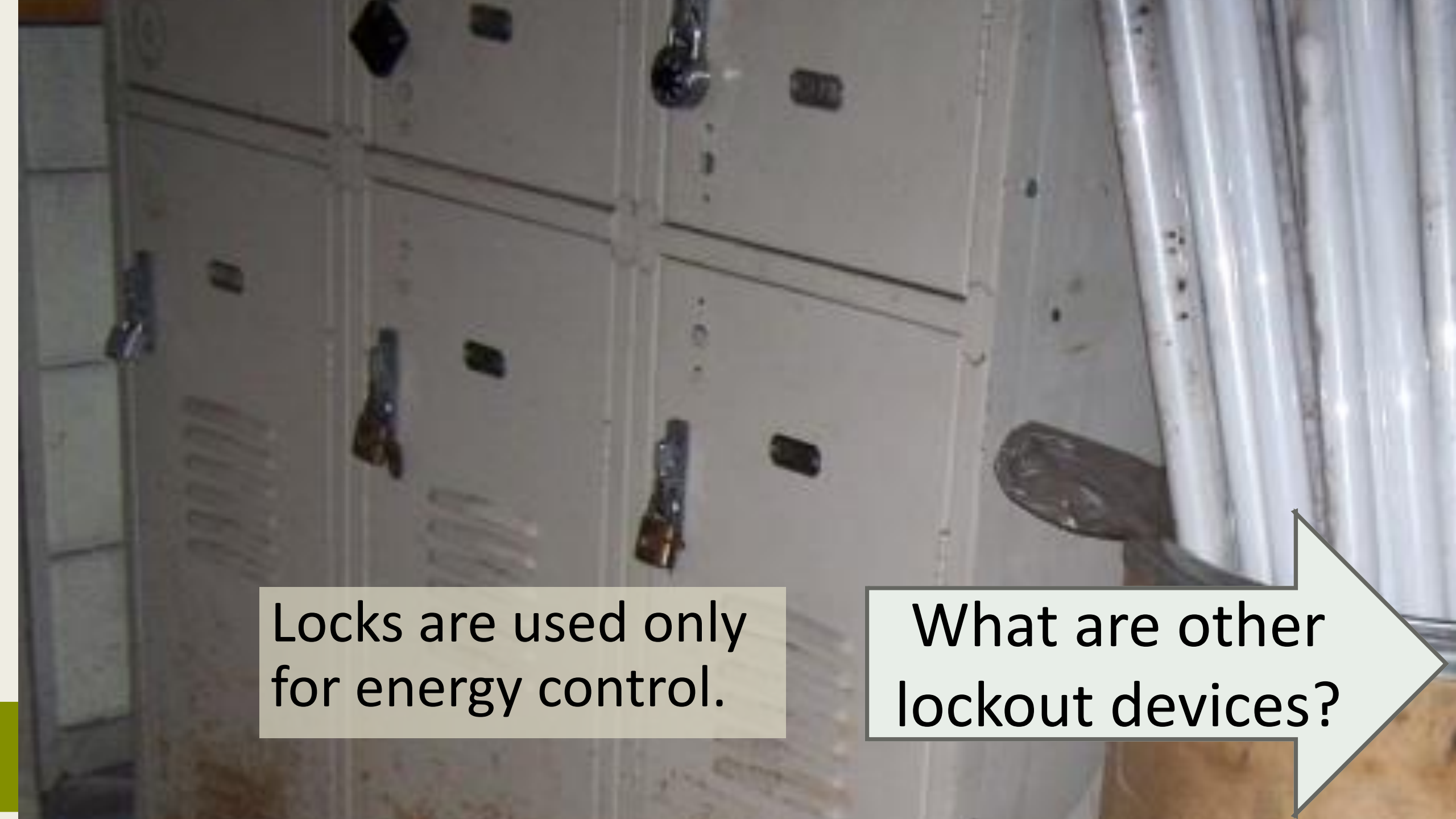


The worker keeps that key on his person.



Locks are applied and **removed only** by the person who installed the lock.

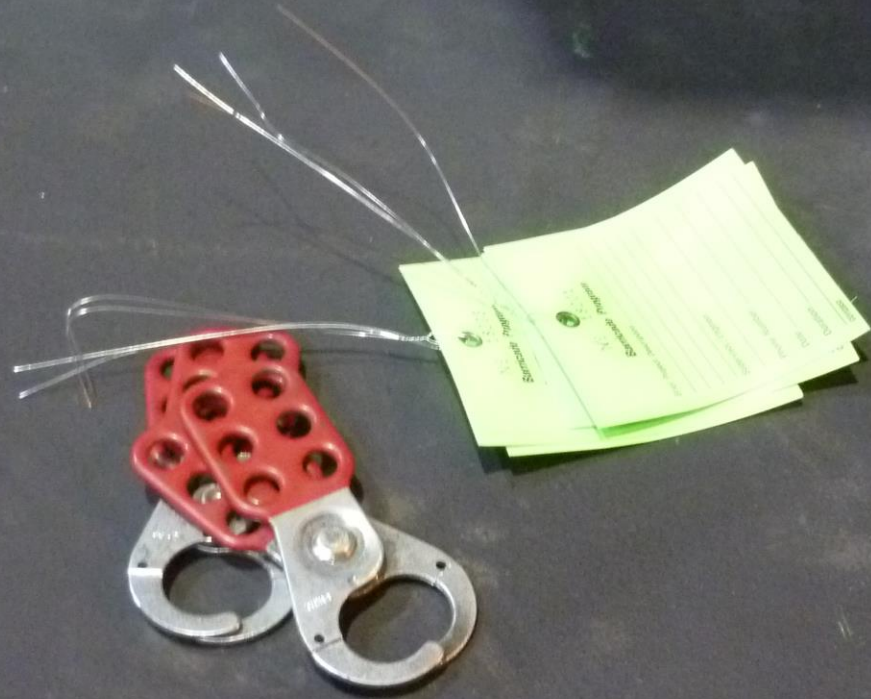




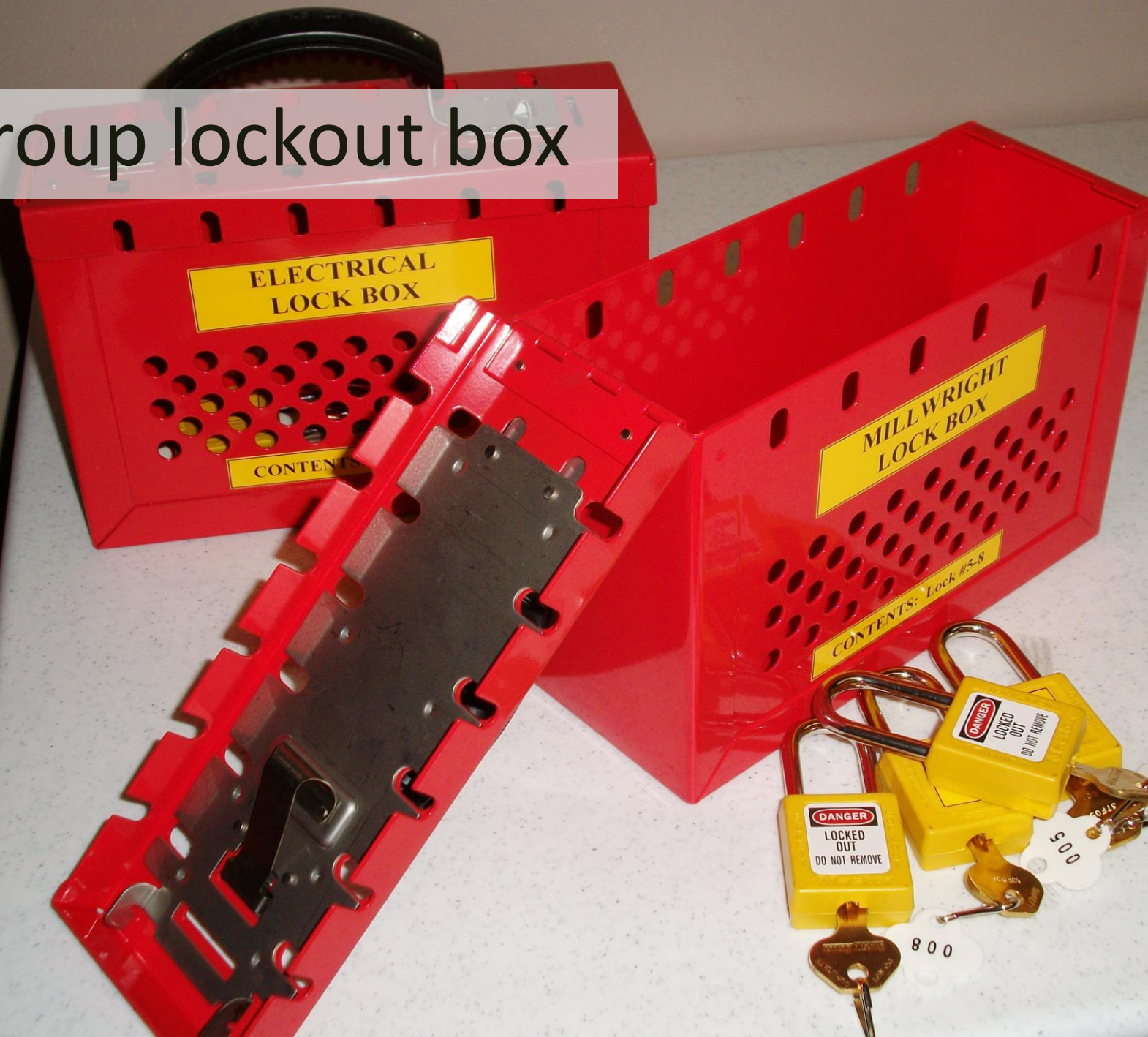
Locks are used only for energy control.

What are other lockout devices?

A hasp holds several safety locks.



A group lockout box



Specialty Equipment Lockout Devices.

For circuit breakers

For Gate Vales

For Cord and Plug Devices

Remember.





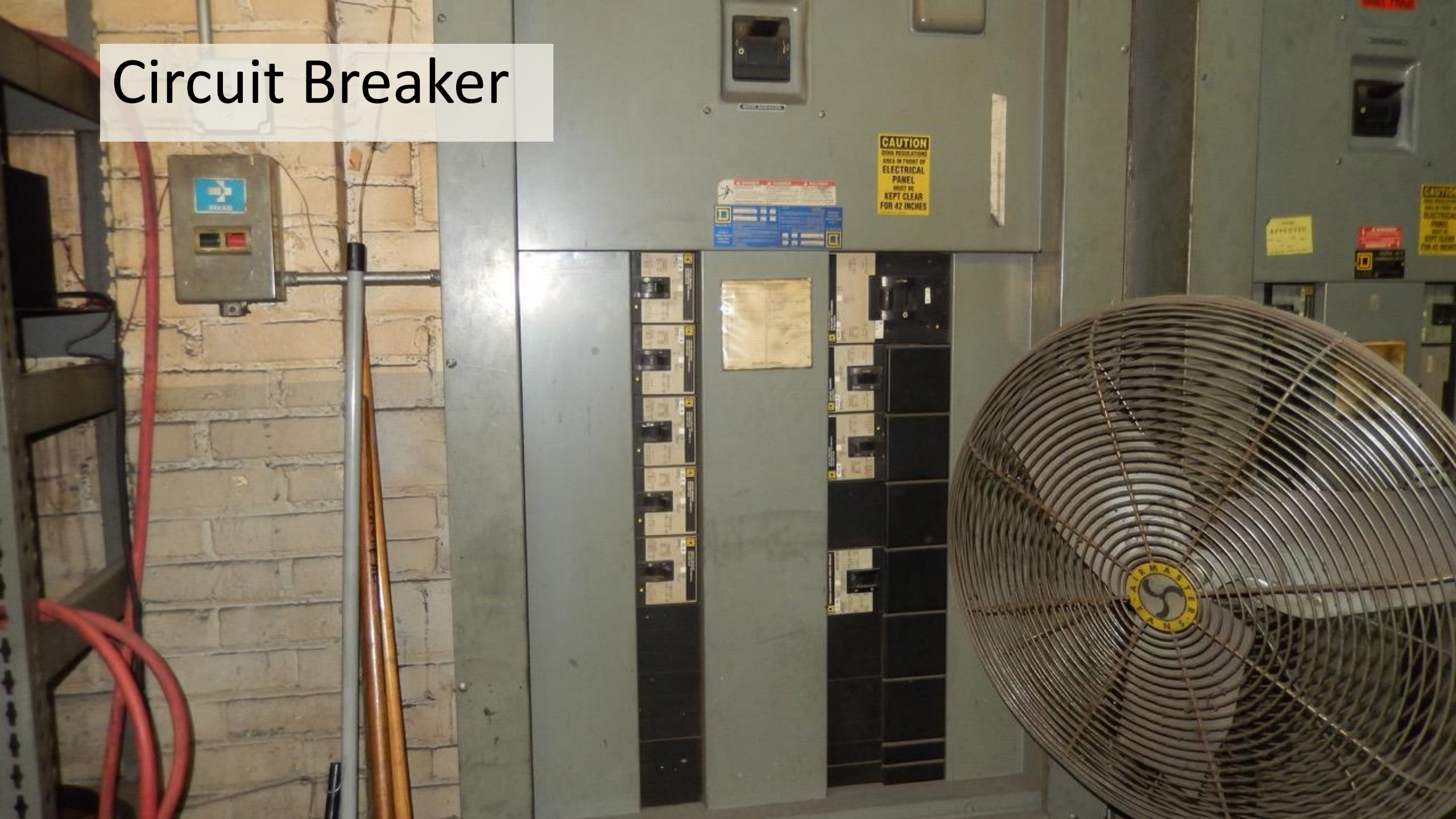
What is an energy isolating device?

Group lockouts require individual locks.

Disconnect switch



Circuit Breaker



CAUTION
HIGH VOLTAGE
AREA IN FRONT OF
ELECTRICAL
PANEL
MUST BE
KEPT CLEAR
FOR 42 INCHES

WARNING
ELECTRICAL
PANEL
MUST BE
KEPT CLEAR
FOR 42 INCHES

APPROVED

CAUTION
HIGH VOLTAGE
ELECTRICAL
PANEL
MUST BE
KEPT CLEAR
FOR 42 INCHES





Line Valve

What is NOT an energy isolating device?

Emergency Stop

EMERGENCY

S

T

Z

LUBRICANT
ISO. VG 32



35	LT8X	1.4	LR8X	1.4	HR2Z	54	LA2R	18	LB2S	5	HB3S	1.5	HS6Z	20	HB3S	.15	LCR1	.006
4	LS1X	1.75	LS6Z	10	HR3Z	48	LB6R	16	LB2S	5	HB6S	1.25	HS3Z	24	HB6S	.20	LCR3	.008
45	LS2X	2	LR1Z	12	HR4Z	44								22	HB4S	.25	LCR6	.010
5	LS3X	2.5	LR3Z	13	HR6Z									19	HC8S	.30	LCR8	.012
6	LS6X	3	LR6Z	14										18	HB2S	.35	HCS2	.014
7	LS8X	3.5	LR8Z	14										16	HB1S	.40	HCS4	.016
75	LT6Z	4	HS											15	HA3T	.50	HCS8	.020
8	LR1X	4.5												14	HB8T	.75	HCR3	.030
9	LR2X	5												13		1.00	HCR8	.040
10	LS4Z																	
	LR4X																	



RESET

RAM ONE

A control panel featuring a small rectangular screen at the top. Below the screen is a central directional pad with four arrows. To the left of the pad is a red button, and to the right is a green button. Below these is a numeric keypad with buttons for digits 1 through 0.

IF FAULTED
OPEN DOORS AND PRESS RESET
CHECK DOOR

Selector Switch



ON

OFF



Caution
40 A,
Type 4,
HAZARDOUS V
Will cause death, b

UPPER

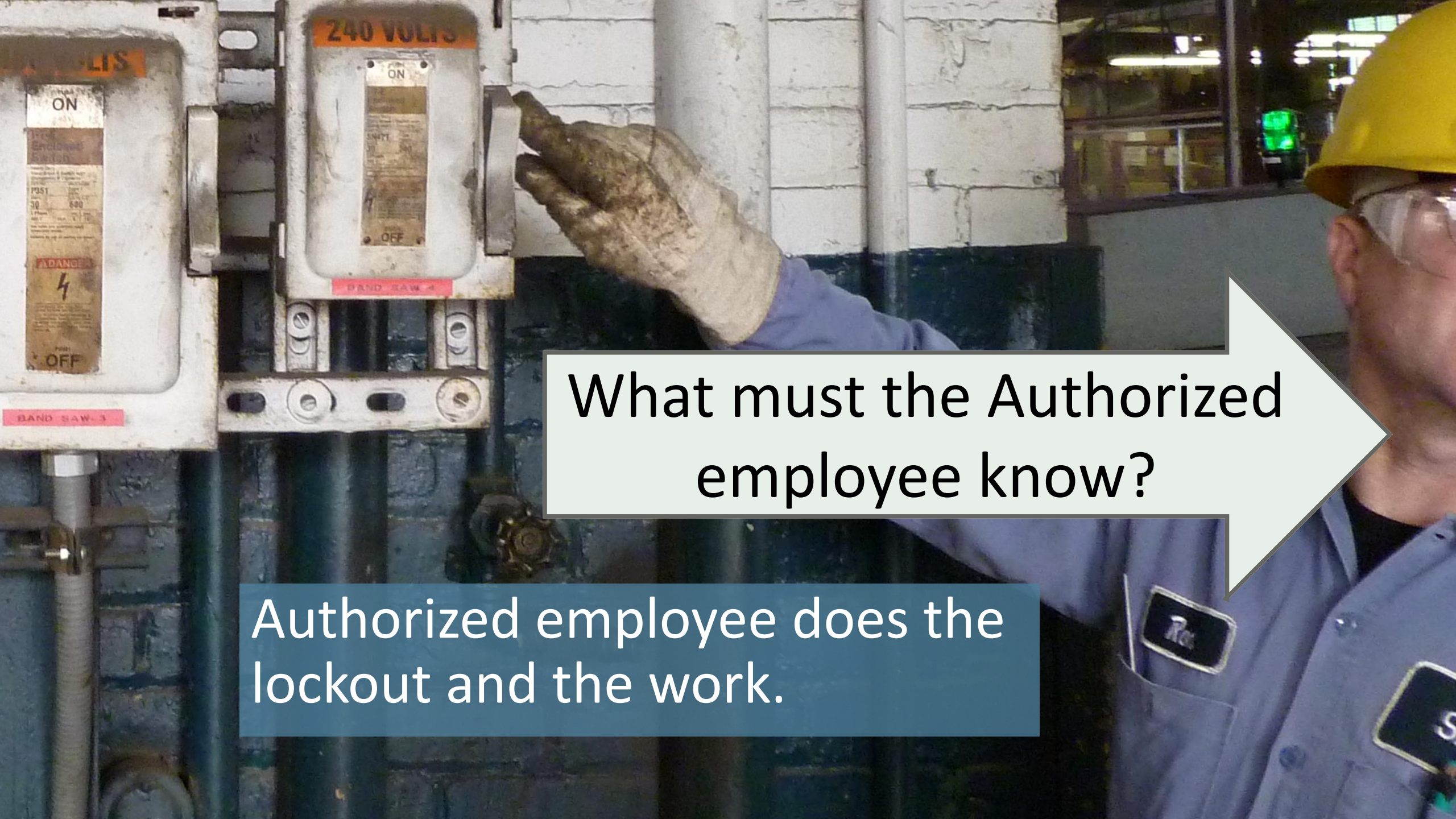
Control Circuit



FAULT
RESET

Who participates
in a Lockout?

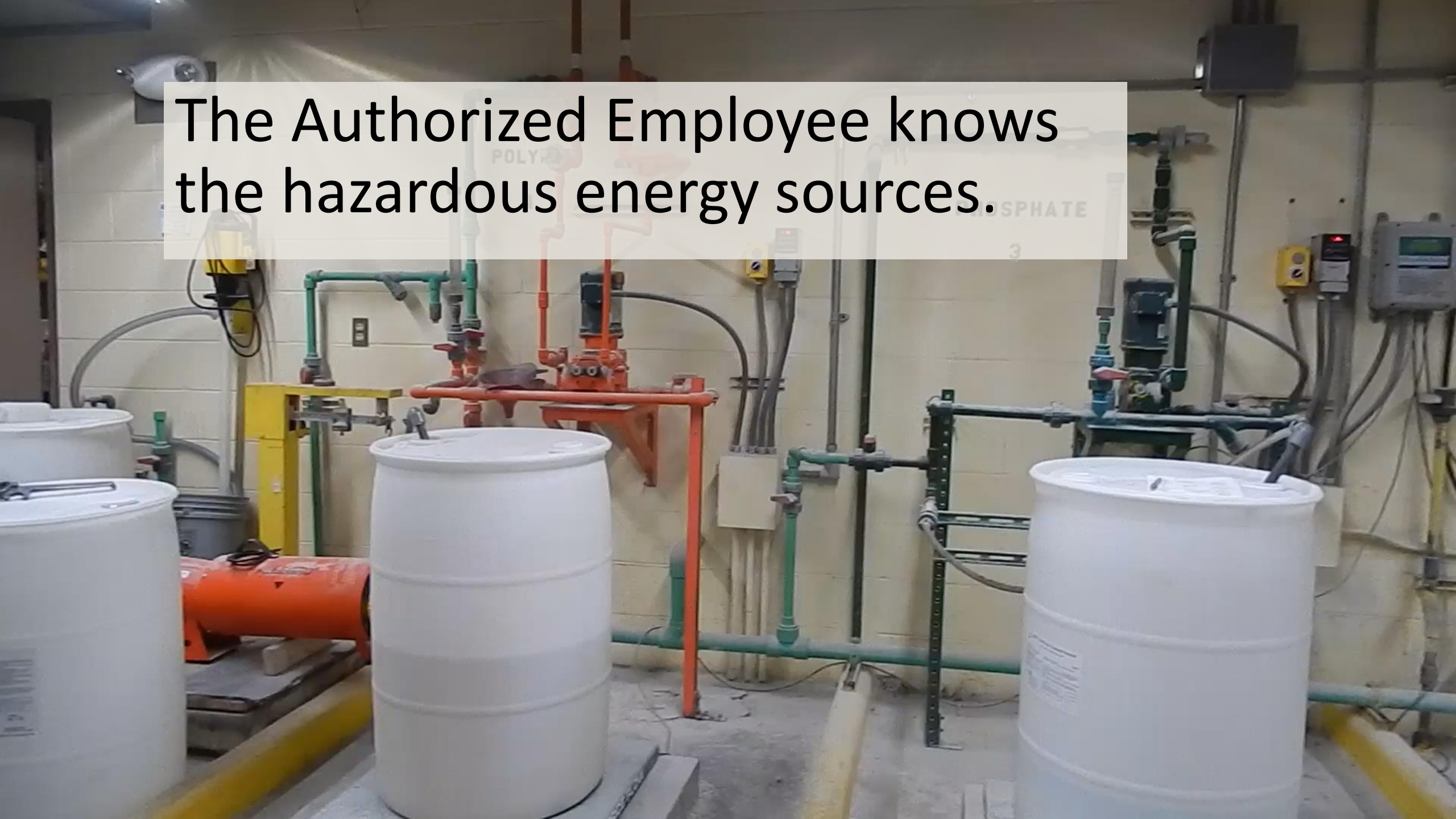
IF FAULT
OPEN DOORS ARE



What must the Authorized employee know?

Authorized employee does the lockout and the work.

The Authorized Employee knows the hazardous energy sources.



Authorized employee knows the type and magnitude of the energy.



LOCKOUT STATION

Authorized employee knows the methods for energy isolation and control.



 **WARNING**

ARC-FLASH
Appropriate
equipment
Turn off and
power before

Authorized employee is “Qualified”
to perform electrical work.

SLUDGE FEED
PUMP 1

ON

I

AB

QUALITY

OFF

(RESET)

Affected and Other Employees

- Don't participate in the lockout.
- Recognize a lockout.
- Don't touch it.
- Report problems.

What are the steps in lockout?

First, consult the written
Lockout procedure.

WARNING
All Tools & Parts Heavy
Maintenance Only Equipment

CAUTION
TURN OFF POWER
BEFORE GREASING

NO!!!!



Notify Affected Employees.
Check that everyone is in the clear.



Shut down machine by normal procedures.





Isolate the equipment from the energy sources.

Put the lock on.





CAUTION

HOSE DISCHARGE
IS UNDER HIGH
PRESSURE

L-012

How is transmission or release of
stored energy prevented?

Release stored energy.

Bleed down hydraulics
and pneumatics.

 **CAUTION**

Open accumulator
ball valve **PRIOR** to
removing accumulator
ball valve drain plug.

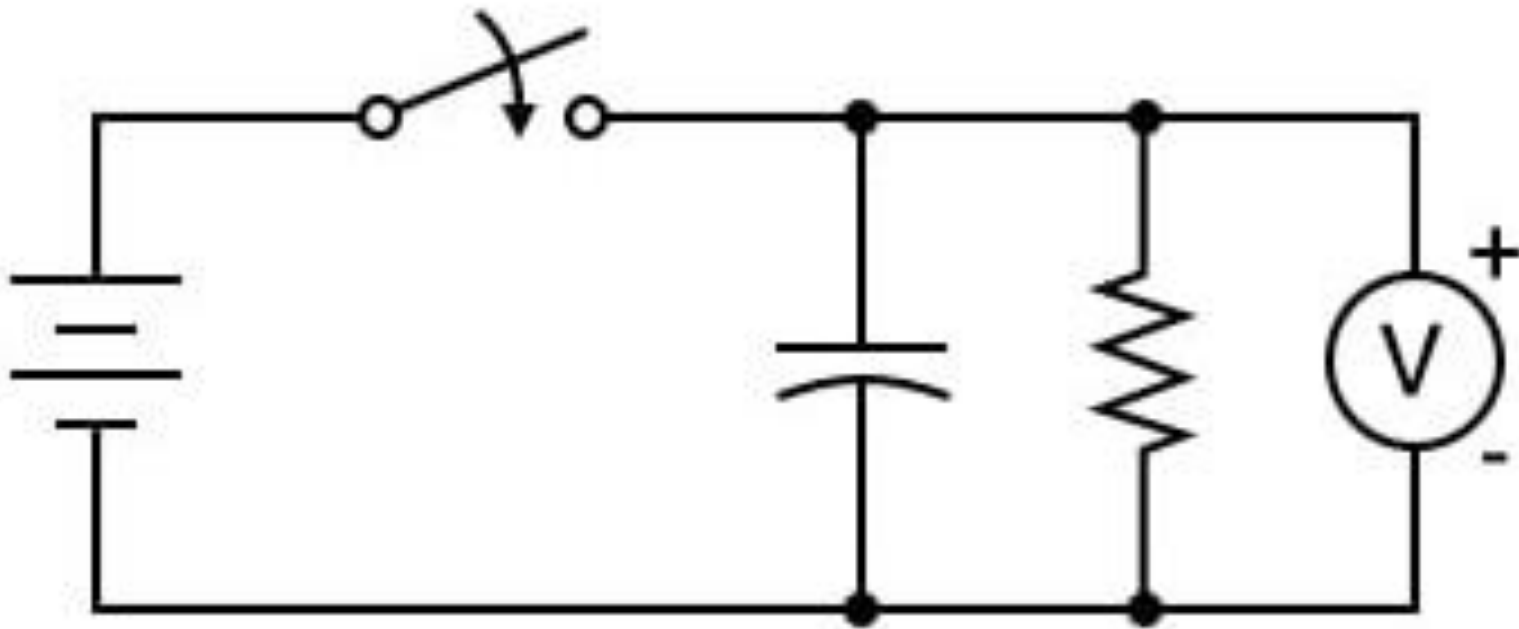
L-773



Block equipment that may move.



Qualified person properly uses grounding equipment to discharge electrical capacitors, electrostatic precipitators and batteries.



Discharging circuit

Do Tryout.



The steps to lockout equipment are:

- Notify Affected Employees.
- Check that everyone is in the clear.
- Shut down machine by normal procedures.
- Isolate the equipment from the energy sources.
- Put on the lock devices.
- Release stored energy.
- Do Tryout.
- Equipment is now locked out.



Restoring equipment to normal operation is just as complicated as lockout

- Check that all people and tools are in the clear.
- Remove locks and tags.
- Restore power to the equipment.
- Turn the equipment back on.



What haven't we talked about that also needs to be addressed?

- Contractors
- Removing an absentee's lock
- Group Lockouts
- Work across a shift



The image features the Kahoot! logo in a large, white, rounded font. The logo is centered horizontally and spans across a background that is a stylized world map. The map is divided into four quadrants by a vertical line down the center and a horizontal line across the middle. The top-left quadrant is red, the top-right is blue, the bottom-left is yellow, and the bottom-right is green. The map's landmasses are rendered in a darker shade of the quadrant's color, creating a textured effect.

Kahoot!

BE CAREFUL

**THIS MACHINE
HAS NO BRAIN
USE YOUR OWN**

Lab Safety Supply Inc.

Reorder No. 27181

SELF TIGHTENING
RUBBER GRIPS

200# LOAD CELL

Find the sources of hazardous energy.
Control them.

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Thank you

