

IESALC

Illuminating Engineering Society
of North America
Aviation Lighting Committee

ESTABLISHING AN ELECTRICALLY SAFE WORK CONDITION

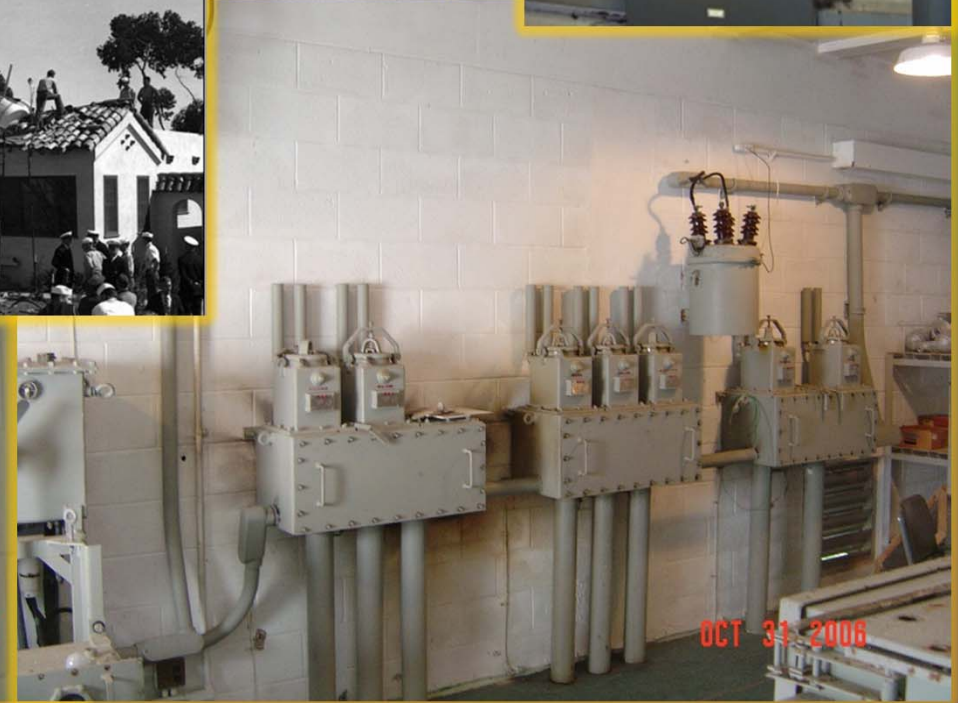
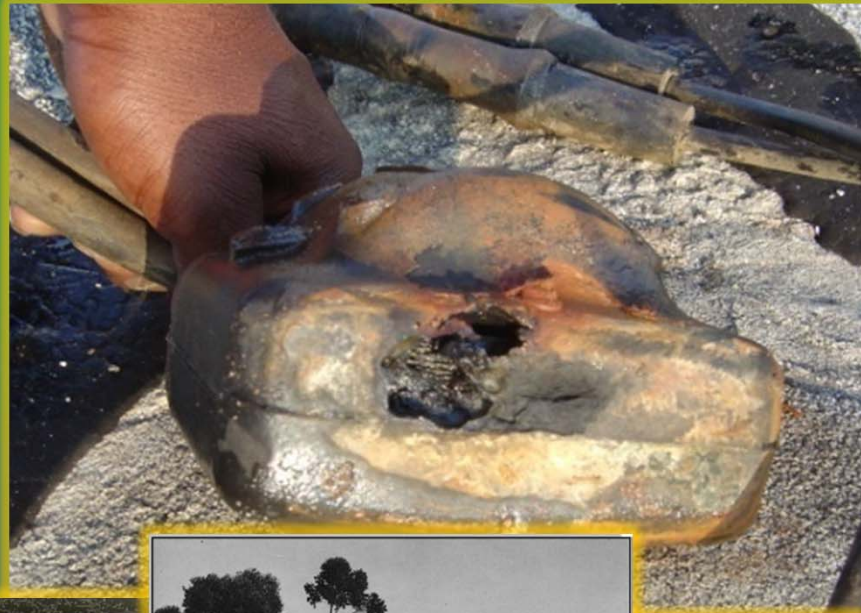


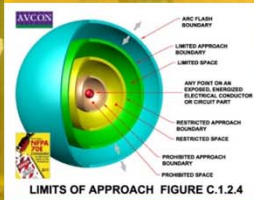
2011-IESALC
Wilmington, NC

Presented to:
IES ALC Fall Conference 2011

Presented by:
Carl Johnson © 2011







SHORTCUTS

SHORTCUT

a) Noun:

- 1) a path between two points that is faster than the commonly used path;
- 2) a method to accomplish something that omits one or more steps.

b) Verb:

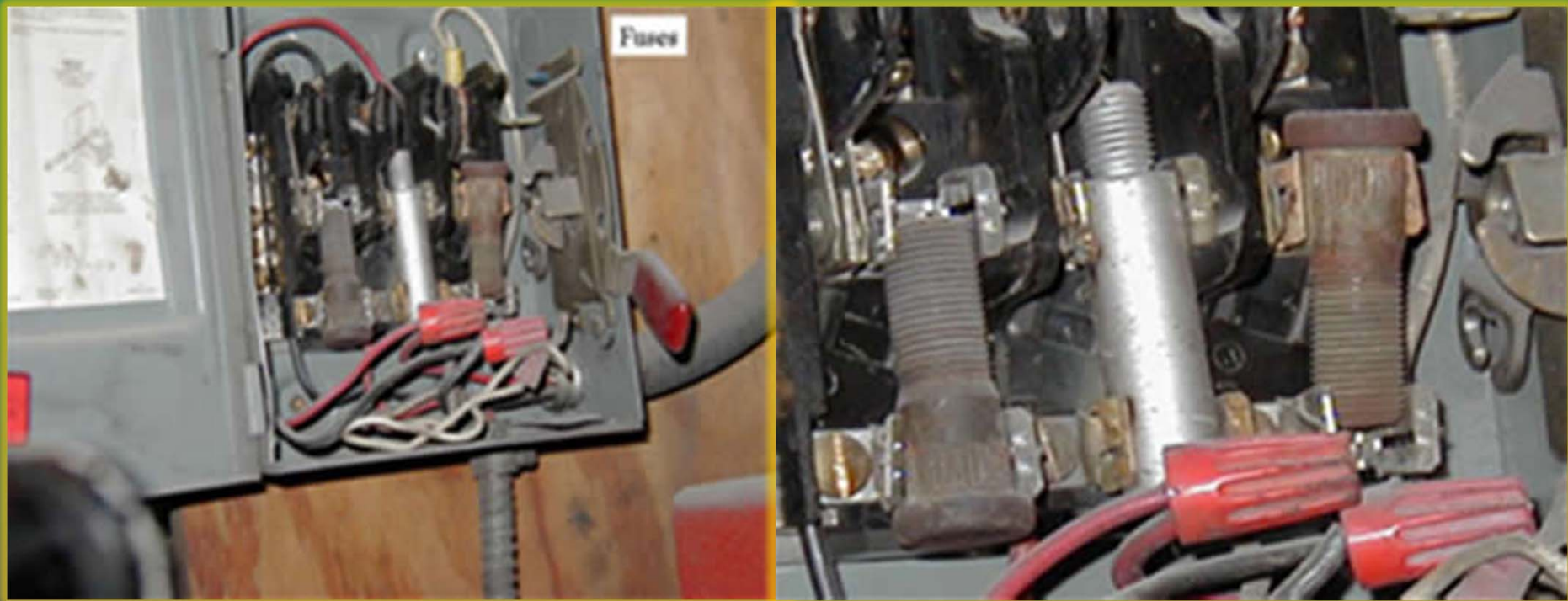
- 1) to shorten a route or procedure – circumvent.



ACCIDENTS HAVE TWO FUNDAMENTAL CAUSES:

- 1. UNSAFE ACTS OR PRACTICES.***
- 2. UNSAFE CONDITIONS.***





How Not to Keep From Blowing a Fuse

Have you ever gotten frustrated when, for some arcane electrical reason, a circuit keeps popping, and-since you aren't an electrician-you can't figure out the problem?

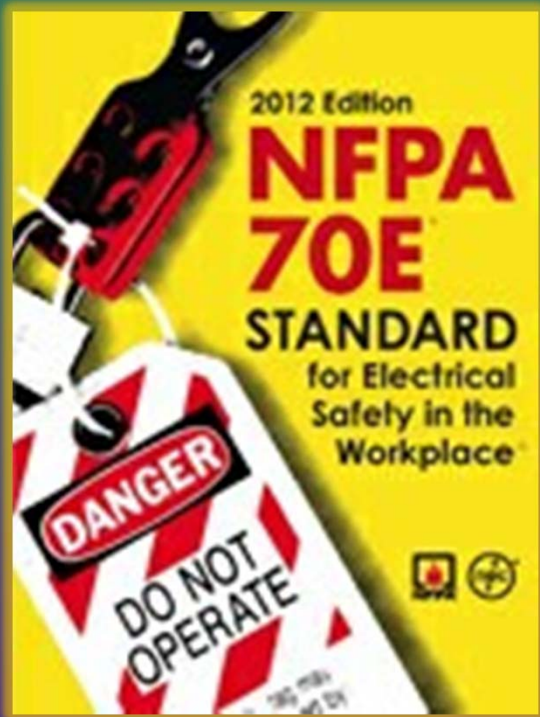
What a pain in the posterior. I mean, you're just trying to get your job done. All you need is a steady flow of current, for goodness sake. But everything keeps going dead, and you've got to go back to that dadblamed circuit box, open the cover, and fool around some more.

OSHA inspectors in Maryland found this example of a serious solution. I'm not saying we recommend it, though, because this will make safety specialists and inspectors blow their fuses. Unless the reason for the original problem gets a lot more dramatic and a fire or electrocution is the result. Then the real pain will have started, the kind that makes an inconvenience seem awfully minor.



National Fire Protection Association

The authority on fire, electrical, and building safety



NFPA 70E;

STANDARD FOR
ELECTRICAL
SAFETY IN THE
WORKPLACE

DEFINITIONS

ARTICLE 100 - DEFINITIONS:

- “**Electrical Hazard.** *A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast. (70E)*”
- “**Electrical Safety.** *Recognizing hazards associated with the use of electrical energy and taking precautions so that hazards do not cause injury or death. (70E)*”



DEFINITIONS

ARTICLE 100 - DEFINITIONS:

- **“Electrically Safe Work Condition.** *A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to ensure the absence of voltage, and grounded if determined necessary. (70E)”*

DEFINITIONS

ARTICLE 100 - DEFINITIONS:

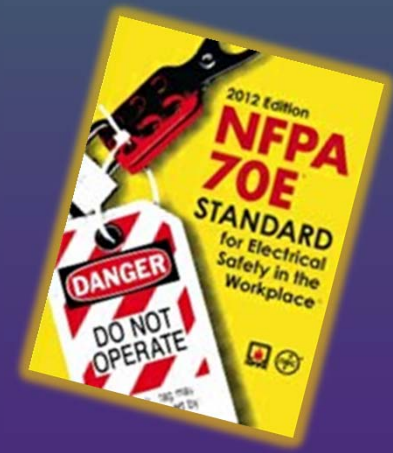
- “**Qualified Person.** *One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved. [70, 2011]”*



DEFINITIONS

ARTICLE 110 - DEFINITIONS:

- “**110.2(D)(1) - Qualified Person.** A *qualified person shall be trained and knowledgeable of the construction and operation of equipment or a specific work method and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.*”



DEFINITIONS

ARTICLE 110 - DEFINITIONS:

ADDITIONALLY IN 110.2(D)(1) :

- *Also familiar with proper use of precautionary techniques – PPE, insulated tools, etc.*
- *Trained in skills and techniques to distinguish exposed energized conductors from other parts.*
- *Be able to determine nominal system voltage.*
- *Determine approach distances from Table 130.*
- *Determine the degree and extent of the hazard, application of PPE and job planning.*

DEFINITIONS

OSHA - DEFINITIONS:

Subpart: S

Subpart Title: Electrical

PART 1910.399

- “**Qualified person.** *One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.*”

NFPA 70E

ARTICLE 100 - DEFINITIONS:

- “**Unqualified Person.** *A person who is not a qualified person. (70E)*”



POP QUIZ

ARTICLE 100:



1. Define a “SHOCK ABSORBER”.

A careless electrician.

2. How to determine if you are working with AC or DC.

If it's AC, your teeth chatter.

If it's DC, they just clamp together.

5 MOST COMMON CAUSES OF NON-FATAL ELECTRICAL WORKER INJURIES

5 YEARS - 2005 TO 2009

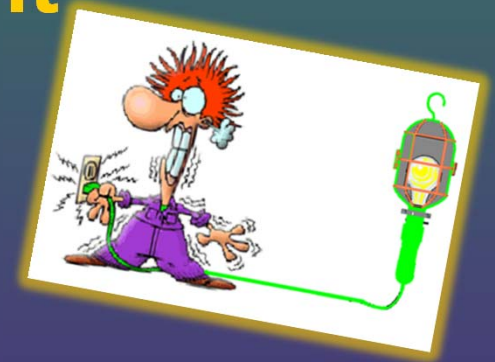
1. Contact with Objects and Equipment
2. Overexertion, Lifting
3. Falls
4. All Others
5. Transportation



5 MOST COMMON CAUSES OF FATAL ELECTRICAL WORKER INJURIES

5 YEARS - 2005 TO 2009

1. **Contact with Electric Current**
2. **Falls**
3. **Transportation**
4. **Contact with Objects and Equipment**
5. **Fire and Explosions**



The number one cause of fatal injuries to Electrical Workers in 2008:

*CONTACT WITH

ELECTRIC CURRENT*

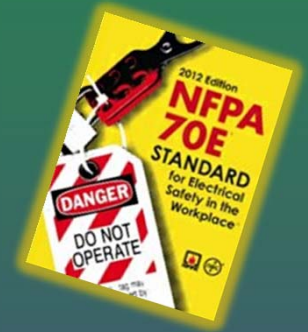
Electrical Workers = 55

All Occupations = 181

WORKER DEATHS BY ELECTROCUTION

- Between 1982 and 1994 NIOSH investigated 224 electrocution incidents resulting in 244 fatalities.
- Victims 243 men & 1 woman.
- Age from 17 to 70, average age - 34 yr.
- Total loss of years of potential life 7,903 years.
- Average of 33 years lost per victim.
- 64% died before age 35.

REQUIREMENT FOR AN ELECTRICALLY SAFE WORK CONDITION



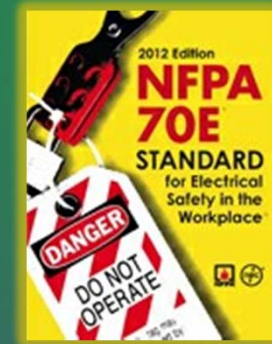
Art. 130.2:

“... Energized electrical conductors and circuit parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee performs work if either of the following conditions exist:

- (1) The employee is within the limited approach boundary.*
- (2) The employee interacts with equipment where conductors or circuit parts are not exposed, but an increased risk of injury from an exposure to an arc flash hazard exists.”*

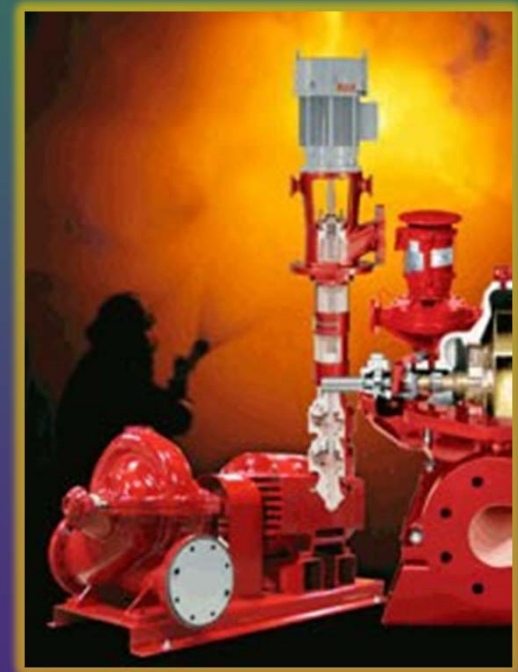
NFPA 70E

Requirement for an Electrically Safe Work Condition



EXCEPTIONS:

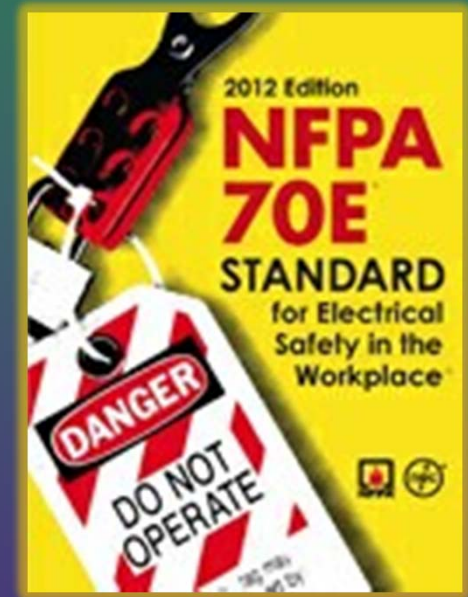
1. *GREATER HAZARD – Life Safety*
2. *INFEASIBILITY – Voltage Testing*
3. *LESS THAN 50 VOLTS*



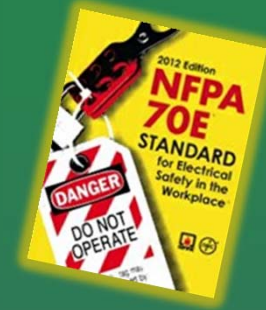
NFPA 70E

Electrically Safe Work Condition 120.1

“An electrically safe work condition shall be achieved when performed in accordance with the procedures of 120.2 and verified by the following process.”



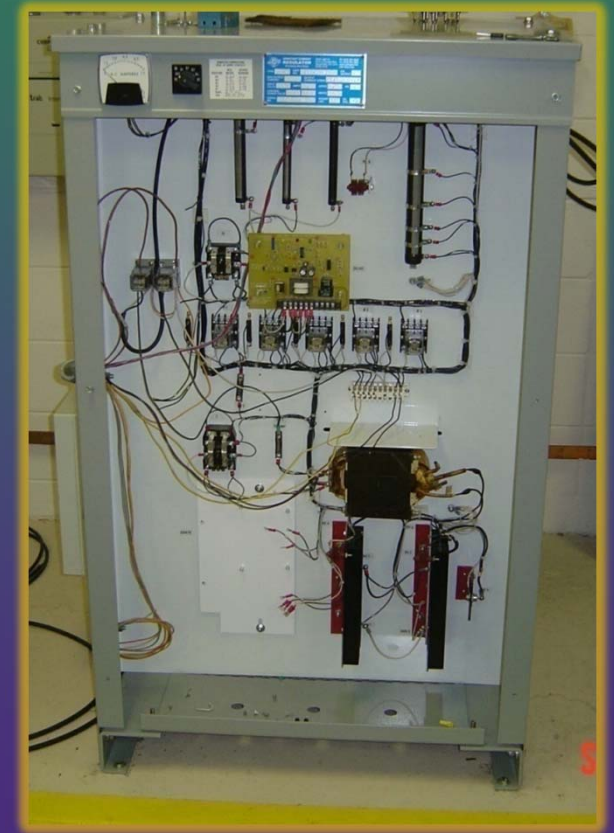
NFPA 70E



Electrically Safe Work Condition 120.1

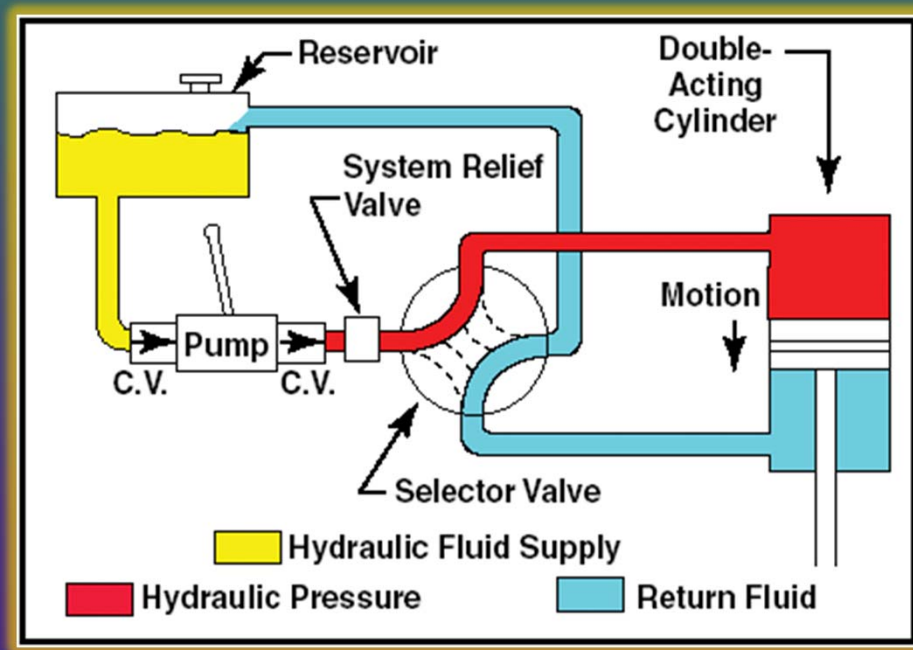
Step 1 Determine all sources of electrical energy to the equipment.

Step 2 Turn off the equipment using proper controls, open the disconnecting means for each electrical source.



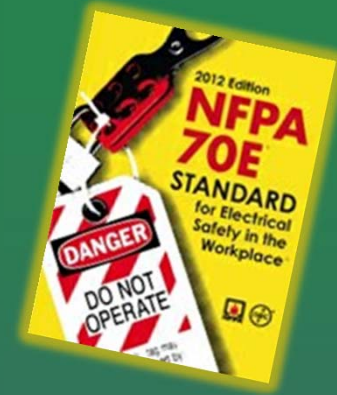
SAFETY NOTE

Remember to remove all other energy sources & lockout / tagout the other energy sources or stored energy – capacitors, pneumatic, steam, chemical, ETC.



NFPA 70E

Electrically Safe Work Condition 120.1



Step 3 When possible, visually verify all blades of the disconnecting device are fully open and / or draw out type circuit breakers are withdrawn to the fully disconnected position.



NFPA 70E

Electrically Safe Work Condition 120.1

Step 4 Apply lockout / tagout devices in accordance with documented and established policy.



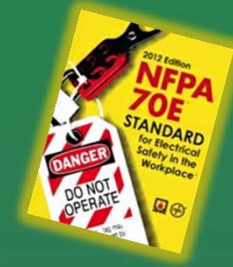
NFPA 70E

Electrically Safe Work Condition 120.1



Step 5 Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are de-energized. Test phase to phase and phase to ground for voltage. Before and after each test verify proper operation of the voltage tester.

NFPA 70E



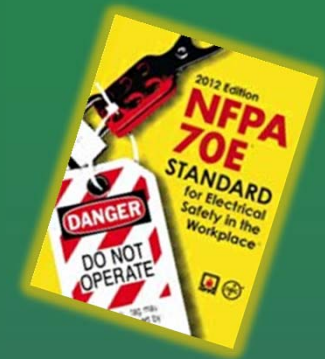
Electrically Safe Work Condition 120.2(B)(6)



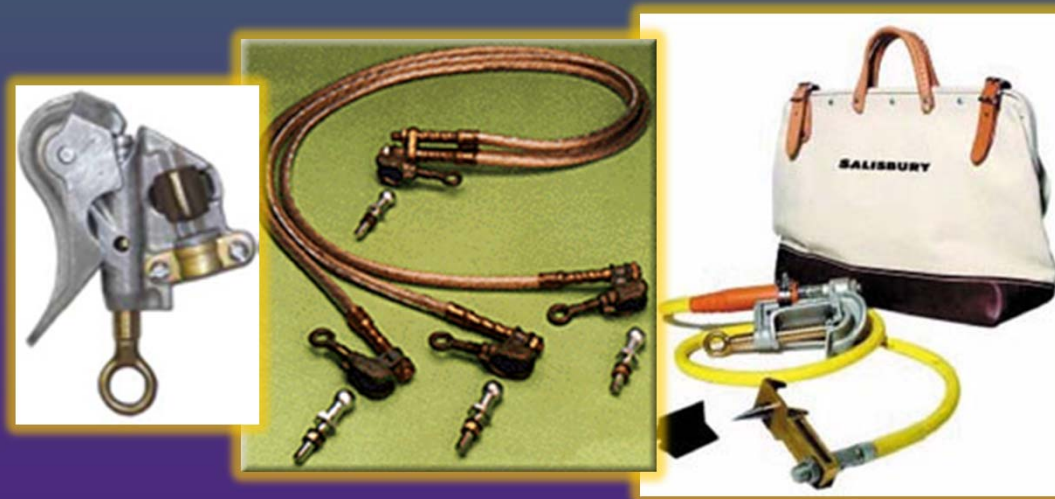
STEP 5 - THE ABSENCE OF VOLTAGE SHALL BE VERIFIED!

NFPA 70E

Electrically Safe Work Condition 120.1



Step 6 Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts. If components could be re-energized use grounds that can withstand fault conditions.



NFPA 70E

Electrically Safe Work Condition 120.1

Until we have completed the previous 6 steps - we must treat the condition as an:

***“ELECTRICALLY UNSAFE
WORK CONDITION”.***



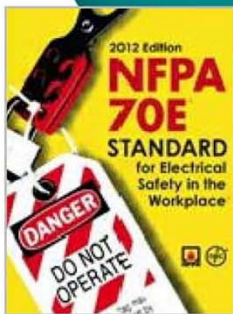
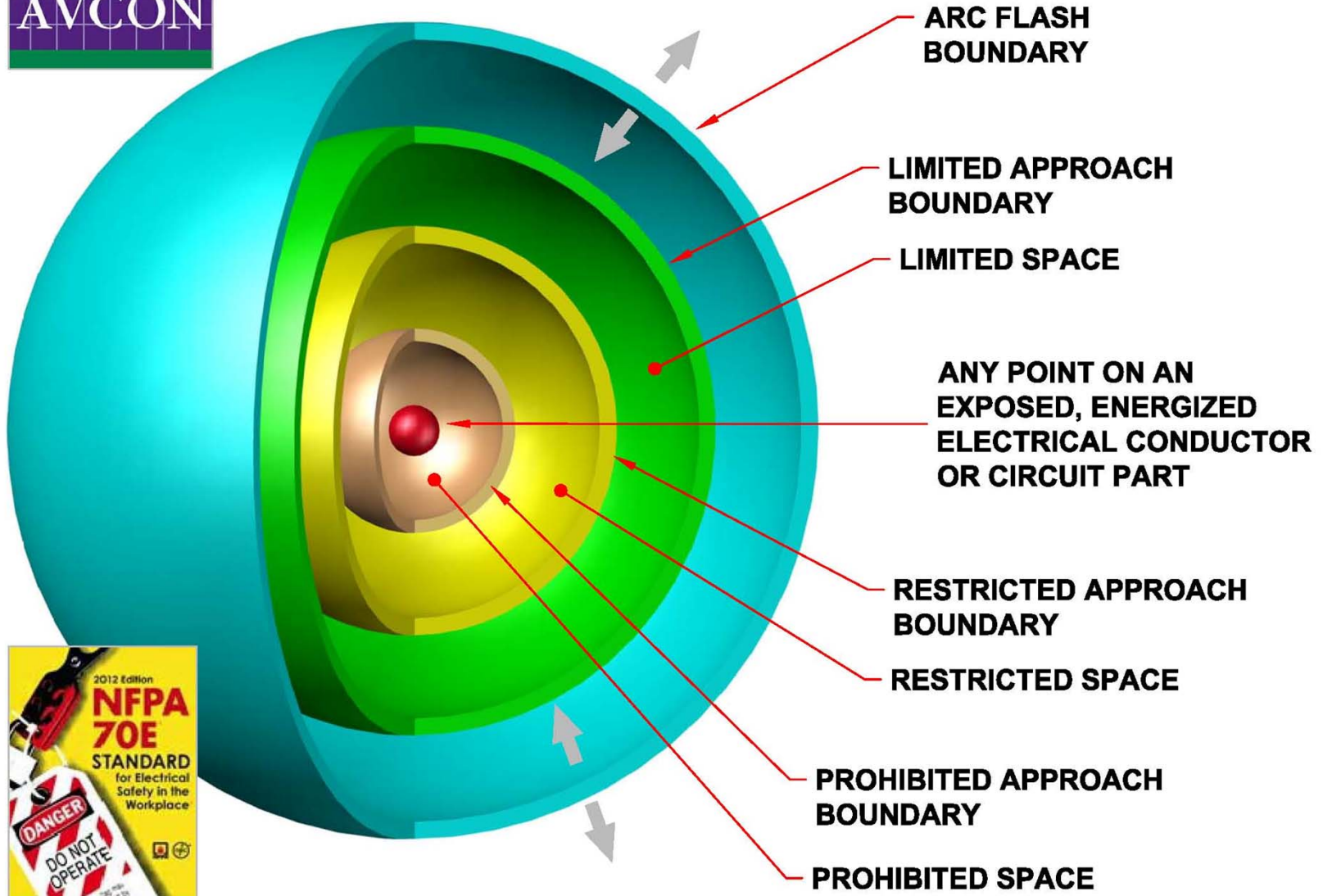
NFPA 70E

Electrically Safe Work Condition 120.1

Once we have satisfactorily completed the previous six steps we have an ***“ELECTRICALLY SAFE WORK CONDITION”***.

Remember to identify, remove & lockout / tagout all other energy sources or stored energy – capacitors, pneumatic, steam, chemical, etc.





LIMITS OF APPROACH FIGURE C.1.2.4

LETS EXAMINE WHAT CAN HAPPEN IF WE DO NOT HAVE AN ELECTRICALLY SAFE WORK CONDITION



THE ACCIDENT

- **Utility Company and Contractor jointly lock out the transformer powering Panel EMSB2.**
- **The work is to be performed on Panel EQH2DP1.**
- **Panel EQH2DP1 is fed from Panel EMSB2 via a 1200 ampere main.**

THE ACCIDENT

- **The Contractor opened Panel EH2DP1 and began work.**
- **The Contractor started removing temporary feeder cables from a circuit breaker in Panel EH2DP1.**

THE ACCIDENT

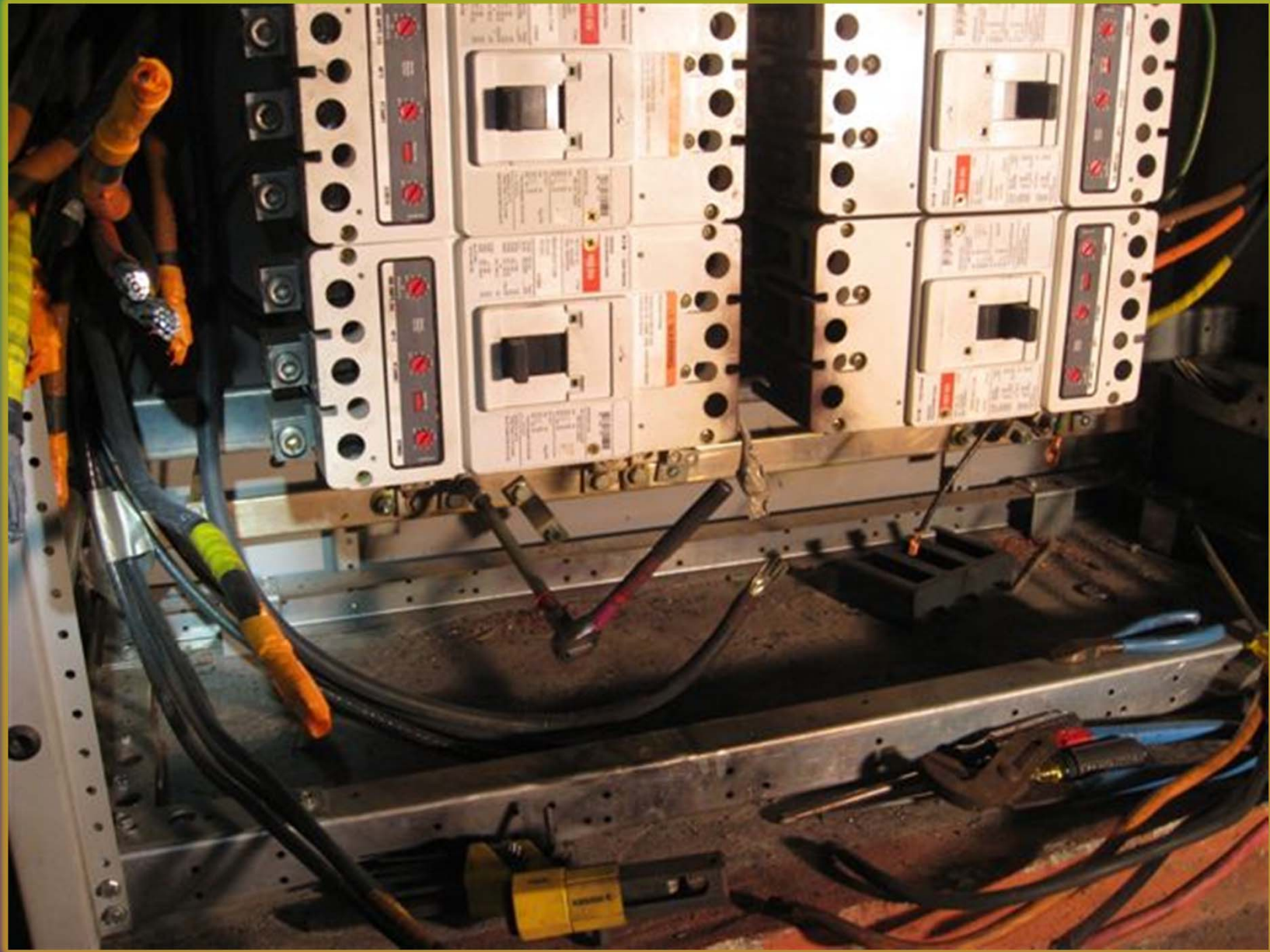
The Contractor's ratchet made contact between the ground bus and C-Phase!

THE ACCIDENT

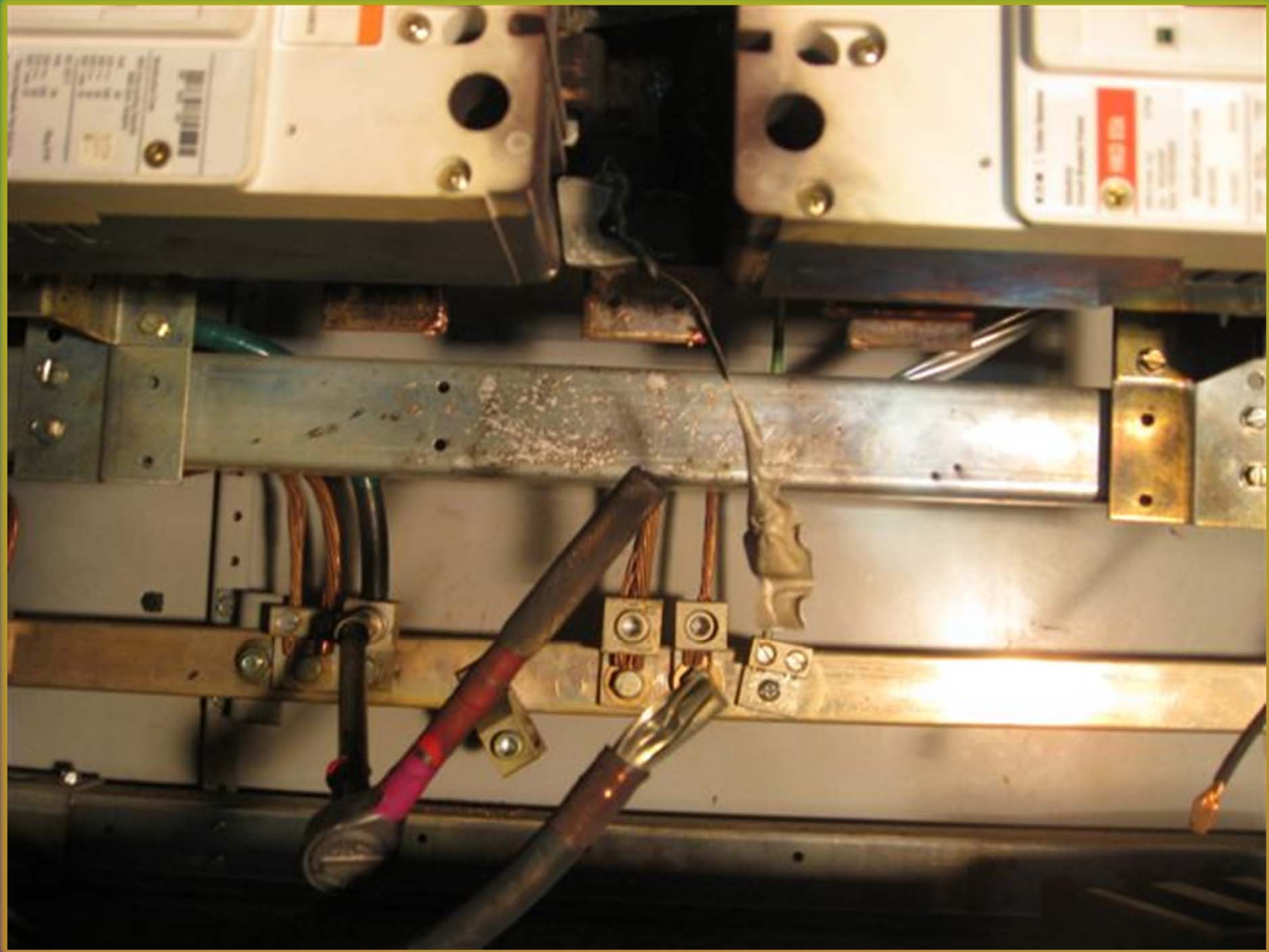
Has anyone noticed the problem?

- **Panel EQH2DP1 is locked out!**
- **Panel EH2DP1 is being worked!**

THE ACCIDENT



THE ACCIDENT



THE ACCIDENT

2 HOURS AFTER THE ACCIDENT





THE ACCIDENT

**38 HOURS AFTER
THE ACCIDENT**

WHAT WENT WRONG?

- The Contractor failed to ensure an *ELECTRICALLY SAFE WORK CONDITION* was achieved.
- Step 5 – Verify the absence of voltage.
- Panel EH2DP1 is protected by a 1200 amp main circuit breaker.

**JUST BECAUSE WE CAN –
SHOULD WE?**



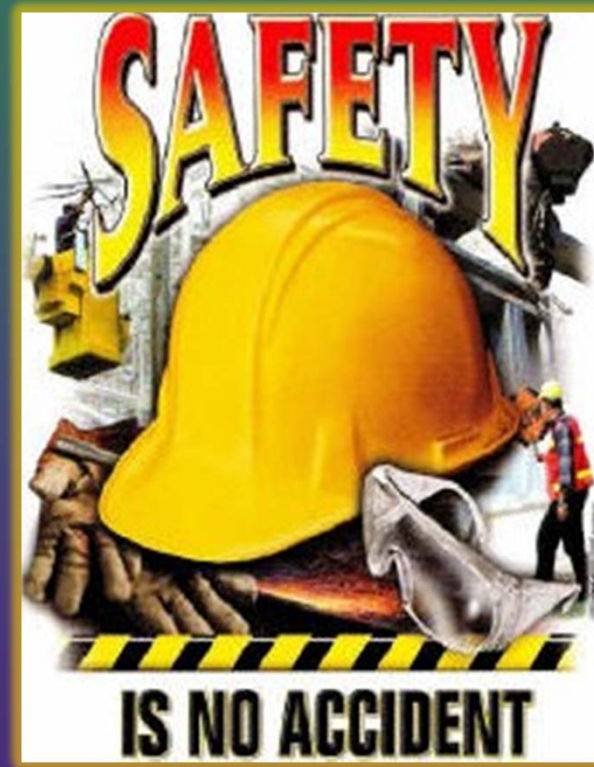
IN SUMMARY



***"NEVER DO ANYTHING THAT
YOU WOULDN'T WANT TO
EXPLAIN TO THE
PARAMEDICS"*** - ANONYMOUS

WE NEED TO PUT SAFETY FIRST!

THANK
YOU!





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IES 2011 PRESENTATION REFERENCES

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