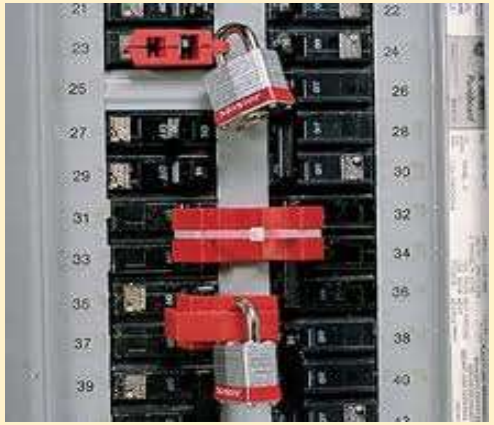
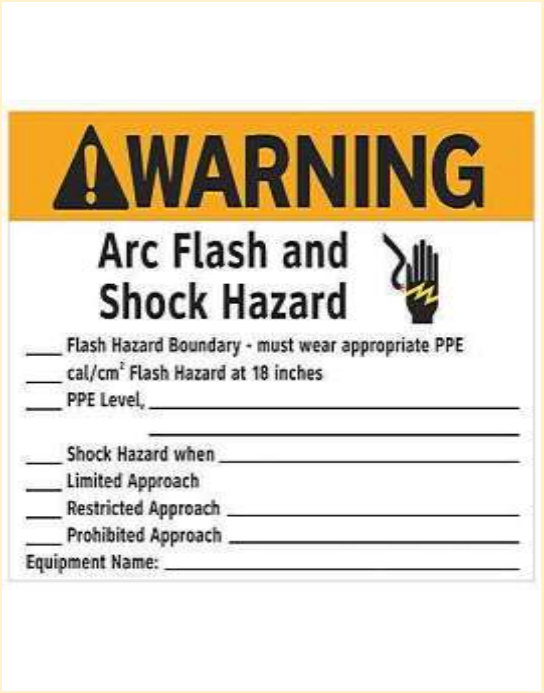
Electrical Safety

Today's Safety Topics

1. Documents
2. Lockout/Tagout
3. Arc Flash
4. PPE & More





Don’t let Electrical Safety Accidents suddenly “Bite You”

What major documents influence and guide electrical safety?

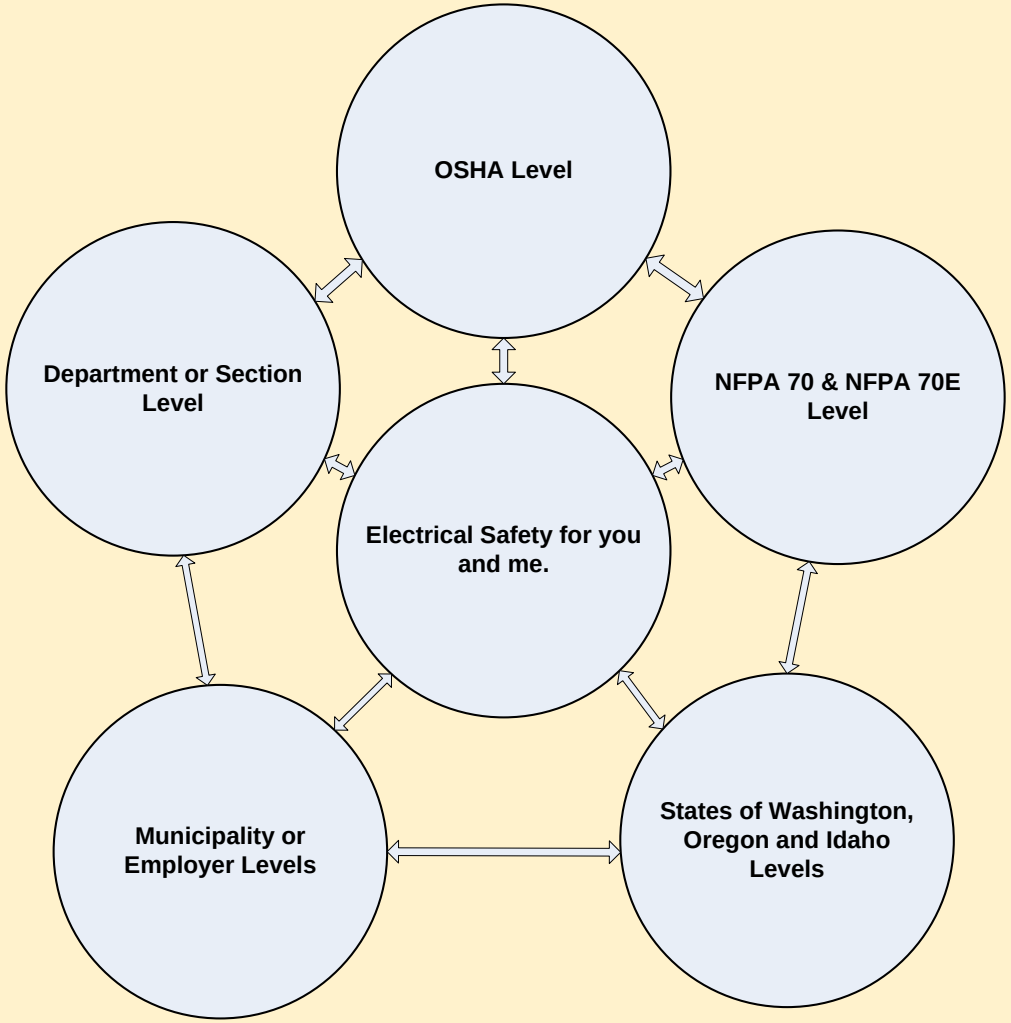
1. OSHA (Occupational Safety and Health Standards) This is the federal law. Think of it as regulations.
2. NFPA 70 (National Electrical Code) and NFPA 70E (Standard for Electrical Safety in the Workplace). Think of this as Rules and recommendations.
3. State Levels
   Washington Labor and Industries (RCW/WAC)
   Oregon Electrical Specialty Code
   Idaho State Electrical Bureau
4. Municipality or Employer
5. Department or Section level
6. YOU and Me!!!!!!!

1. Documents

1. Documents

Relationship showing Safety documents

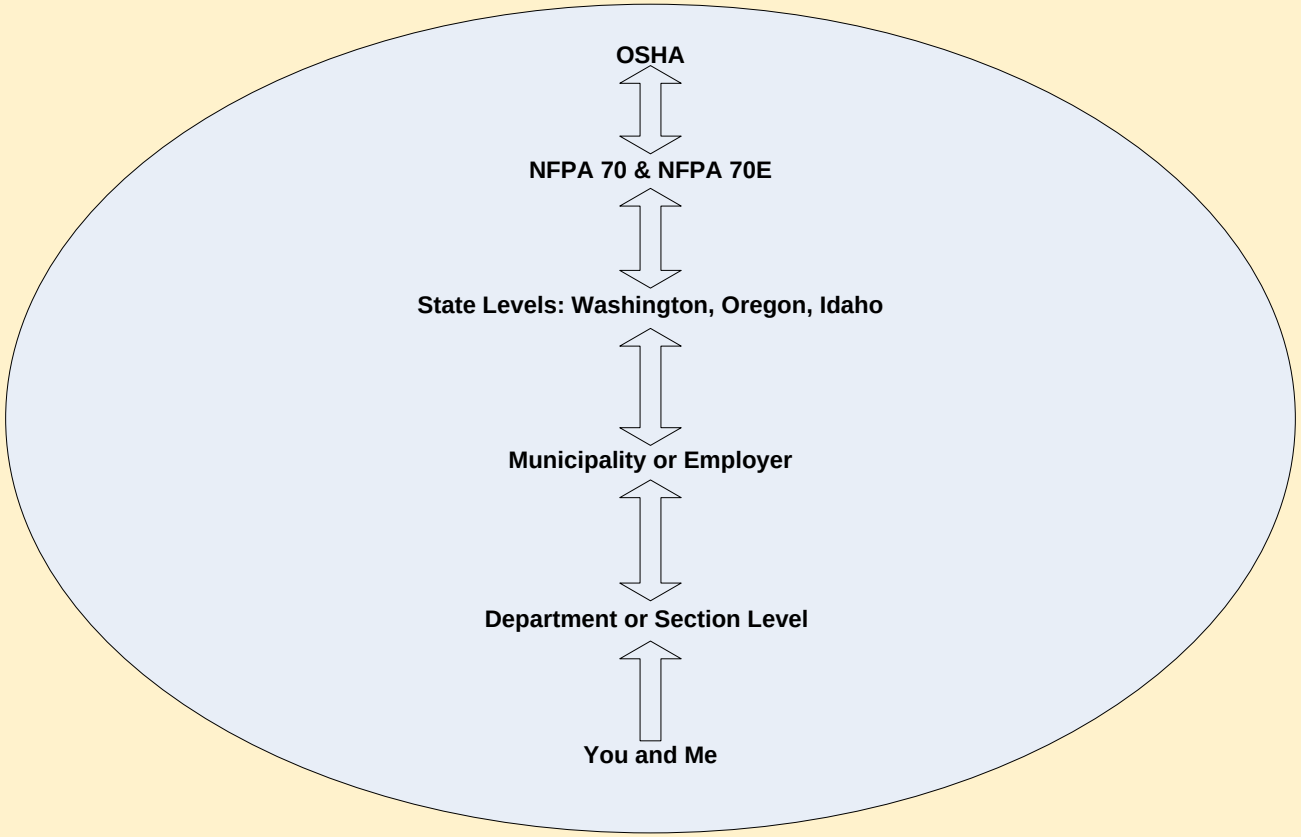
- Nothing wrong using this approach. Hard to do without prior years of exposure to these resources.



Another way of looking at Safety document Relationships

1. Documents

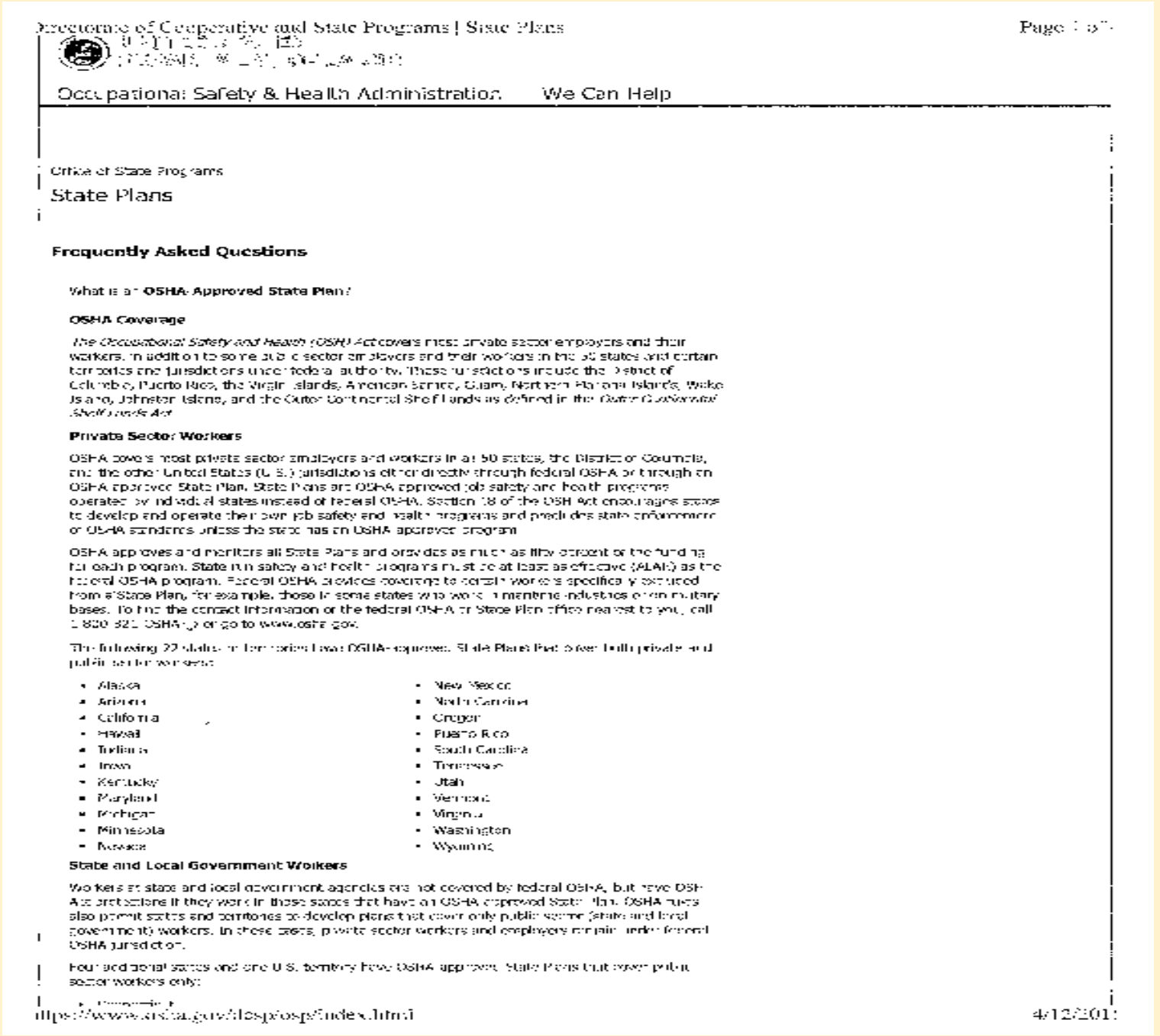
- This relationship has the advantage of taking a logical (linear) approach of incorporating added safety features. Please note: Idaho has different relationship with OSHA.



2. Documents

OSHA STATE PLANS

- Workers at state and local government agencies are not covered by federal OSHA, but have OSHA Act protections if they work in those states that have an OSHA-approved State Plan.
- Washington and Oregon have approved State Plans that cover both private and public sector workers.
- Idaho follows OSHA plan.



Directorate of Cooperative and State Programs | State Plans

Occupational Safety & Health Administration We Can Help

Office of State Programs

State Plans

Frequently Asked Questions

What is an **OSHA-Approved State Plan?**

OSHA Coverage

The Occupational Safety and Health (OSH) Act covers most private sector employers and their workers. In addition to some public sector employers and their workers in the 50 states and certain territories and jurisdictions under federal authority. These jurisdictions include the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, Northern Mariana Islands, Wake Island, Johnston Island, and the Outer Continental Shelf Lands as defined in the *Outer Continental Shelf Lands Act*.

Private Sector Workers

OSHA covers most private sector employers and workers in all 50 states, the District of Columbia, and other United States (U.S.) jurisdictions either directly through federal OSHA or through an OSHA-approved State Plan. State Plans are OSHA-approved job safety and health programs operated by individual states instead of federal OSHA. Section 18 of the OSH Act encourages states to develop and operate their own job safety and health programs and provides state enforcement of OSHA standards. Unless the state has an OSHA-approved program

OSHA approves and monitors all State Plans and provides as much as fifty percent of the funding for each program. State run safety and health programs must be at least as effective (ALAE) as the federal OSHA program. Federal OSHA provides coverage to certain workers specifically excluded from a State Plan, for example, those in some states who work in maritime industries or on military bases. To find the correct information on the federal OSHA or State Plan office nearest to you, call 1-800-321-OSHA (-) or go to www.osha.gov.

The following 22 states or territories have OSHA-approved State Plans that cover both private and public sector workers:

- Alaska
- Arizona
- California
- Hawaii
- Indiana
- Iowa
- Kentucky
- Maryland
- Michigan
- Minnesota
- Nevada
- New Mexico
- North Carolina
- Oregon
- Puerto Rico
- South Carolina
- Tennessee
- Utah
- Vermont
- Virginia
- Washington
- Wyoming

State and Local Government Workers

Workers at state and local government agencies are not covered by federal OSHA, but have OSHA Act protections if they work in those states that have an OSHA-approved State Plan. OSHA rules also permit states and territories to develop plans that cover only public sector (state and local government) workers. In these cases, private sector workers and employers remain under federal OSHA jurisdiction.

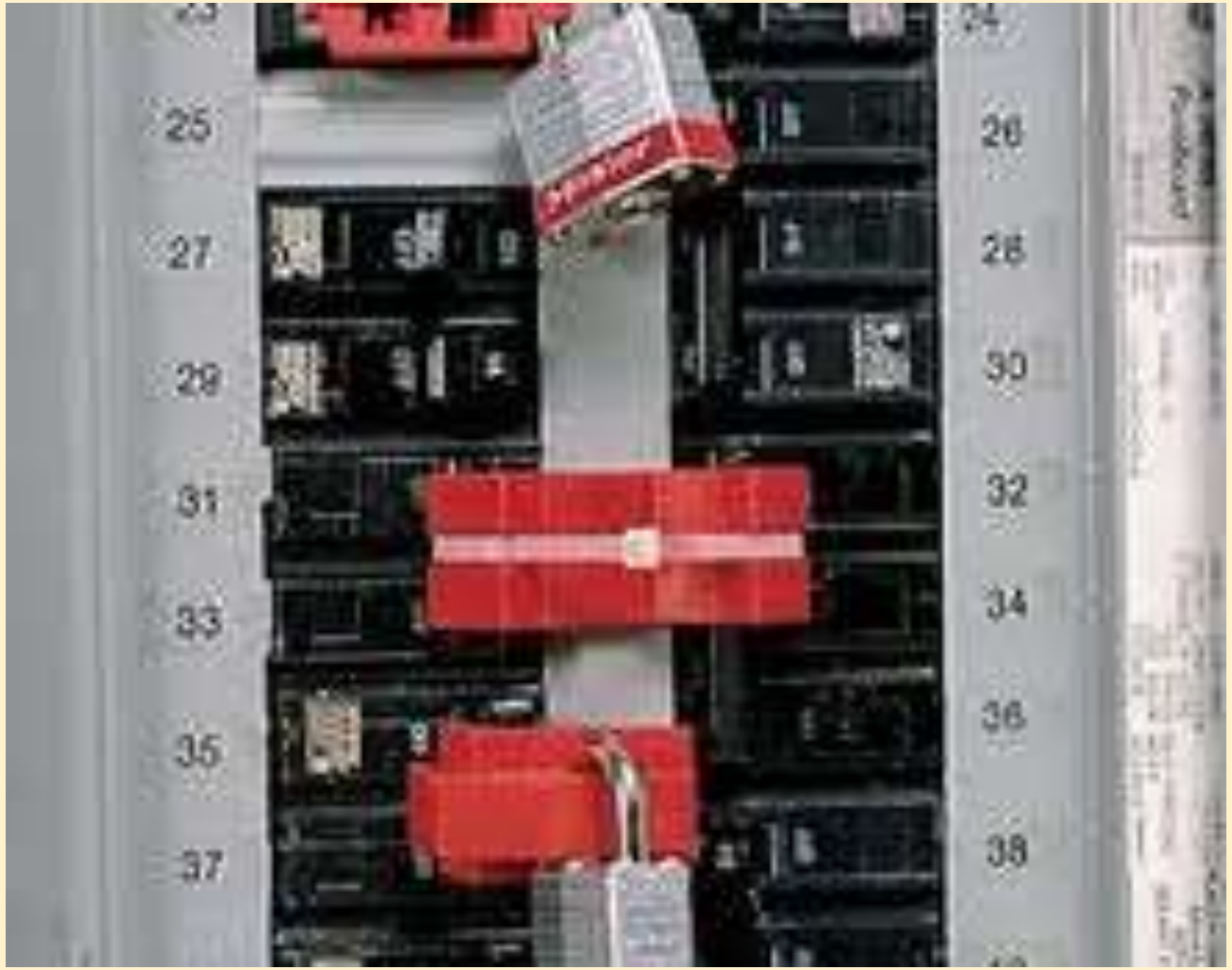
Four additional states and one U.S. territory have OSHA-approved State Plans that cover public sector workers only:

https://www.osha.gov/dcsp/osp/index.html 4/12/2011

History leading to Lockout/TagOut

2. Lockout/Tagout

- In 1970, the Occupational Safety and Health Act became Law.
- Enforcing employers to protect employees and others working for them.
- States and Cities began to provide law and language.
- NFPA 70 and NEMA (National Electrical Manufactures Association) working together began to establish rules, requirements, and methods to allow equipment with lockout features.
- NFPA 70E first edition came out in 1979.
- Current NFPA 70E is the 2015 edition.



Major Significant Change for 2015

2. Lockout Tagout

- Hold Tags are often used on outdoor electrical power equipment that does not have provisions for applying a lockout device.

- When a hold tag is being used, the tag out procedure must contain a method of accounting for all employees working under its protection. So, when using a hold tag, all workers must be accounted for before the hold tag is removed and the circuit is energized.

Example of electrical equipment that would utilize a Holding Tag out method

2. Lockout Tagout

- This is a CT (Current Transformer) cabinet fed directly from the power company and is ahead of the main circuit protection device. In other words, can't shut the power off to inspect and work on.

A few examples of lockout kits

2. Lockout Tagout

Note: NFPA 70E Is a great document resource for Lockout Tagout information!!!

Question: Does plug cord connected equipment need to be locked out?????

3. Arc Flash

Big Change in NFPE 70E Art 130. Prohibited Boundaries no longer used: Only has Limited Approach and Shock Approach

The 2015 NFPA 70E

More than twice as many workers are killed and injured each year from electrical shock than from electrical arc flash. Approximately 50% of those killed and injured are non-electrical workers. They are unqualified, which means they cannot recognize a hazard and cannot be expected to avoid a hazard. Qualified persons must protect unqualified workers from exposure to electrical hazards by using barriers, signs, or attendants.

Figure 4-6. An unqualified person must be advised of specific hazards and continuously escorted by a qualified person when entering the Limited Space.

This exception is provided because it may be necessary for work to be audited by an unqualified person or to train apprentices or others who may not be familiar with a work practice or a task. Under no circumstances may the unqualified person cross the Restricted Approach Boundary. If the escort leaves the Limited Space, the unqualified person must also leave. Unqualified persons, regardless of occupational title or purpose, may not cross the Limited Approach Boundary unescorted.

Unqualified Persons. If unqualified persons are working near the Limited Approach Boundary, NFPA 70E 130.4(D)(2) requires they be warned of the hazards and that they stay outside the Limited Approach Boundary. This includes employees such as painters, plumbers, apprentices, helpers, and laborers who may be required to perform their tasks in the area of exposed energized conductors or circuit parts. If the equipment or circuits are placed in an electrically safe work condition by a qualified person, unqualified persons can work on or near them for the purposes of cleaning, tightening, or other tasks appropriate for deenergized work.

Qualified Persons. Only a qualified person can cross the Limited Approach Boundary unescorted. The qualified person must wear appropriate PPE for shock and arc flash hazards. An energized electrical work permit must also be completed. An *energized electrical work permit* is a document that describes the job planning needed to perform energized electrical work safely.

An energized electrical work permit is not required when a qualified person is troubleshooting, voltage testing, or performing other similar activities. However, all requirements in the permit must still be followed. To ensure all the proper steps were followed in the planning for these tasks, it is recommended that employees fill out an energized electrical work permit with the exception of the required signatures. If the Restricted Approach Boundary is not crossed and the Limited Approach Boundary is crossed only for visual inspections, an energized electrical work permit is not required.

Arc Flash: What is it?

3. Arc Flash

- Working on certain energized equipment has the potential to create both shock hazard and electrical arching flashes and/or explosions that can cause severe burns, injuries and even death.

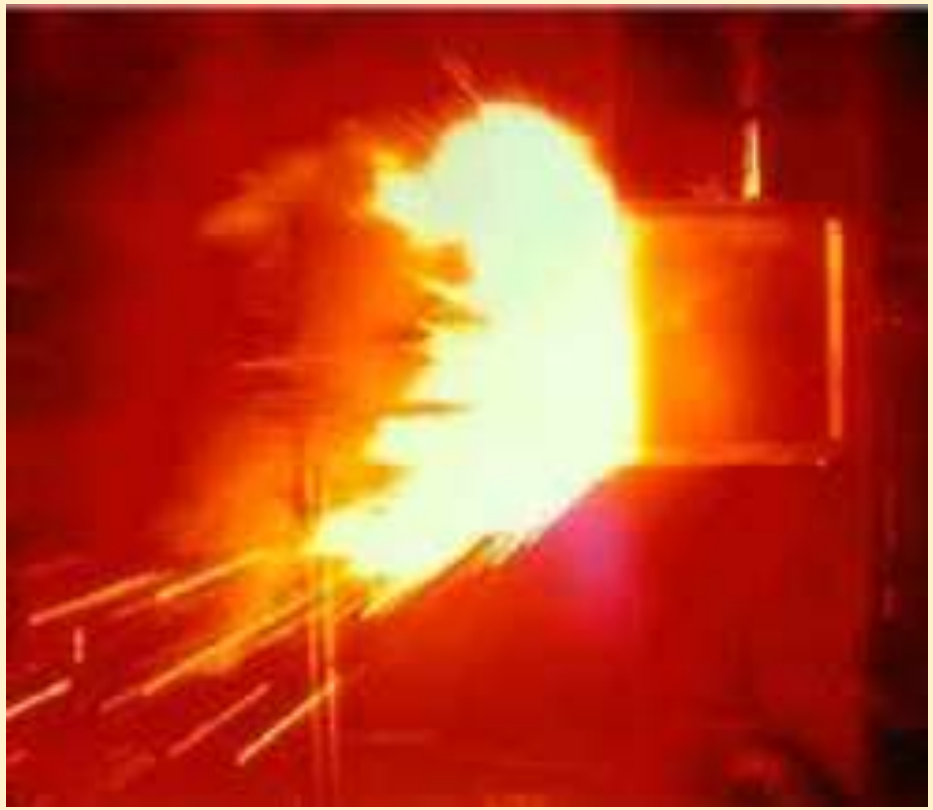
- Safety rules are in place to protect **qualified** and **unqualified employees** working or near such equipment.

- All other workers not directly involved in repairs but work in the same area need to know about Arc Flash.

Don’t let Electrical Safety Accidents “Bite You”

I wonder what PPE should be worn in these situations?

3. Arc Flash



3. Arc Flash

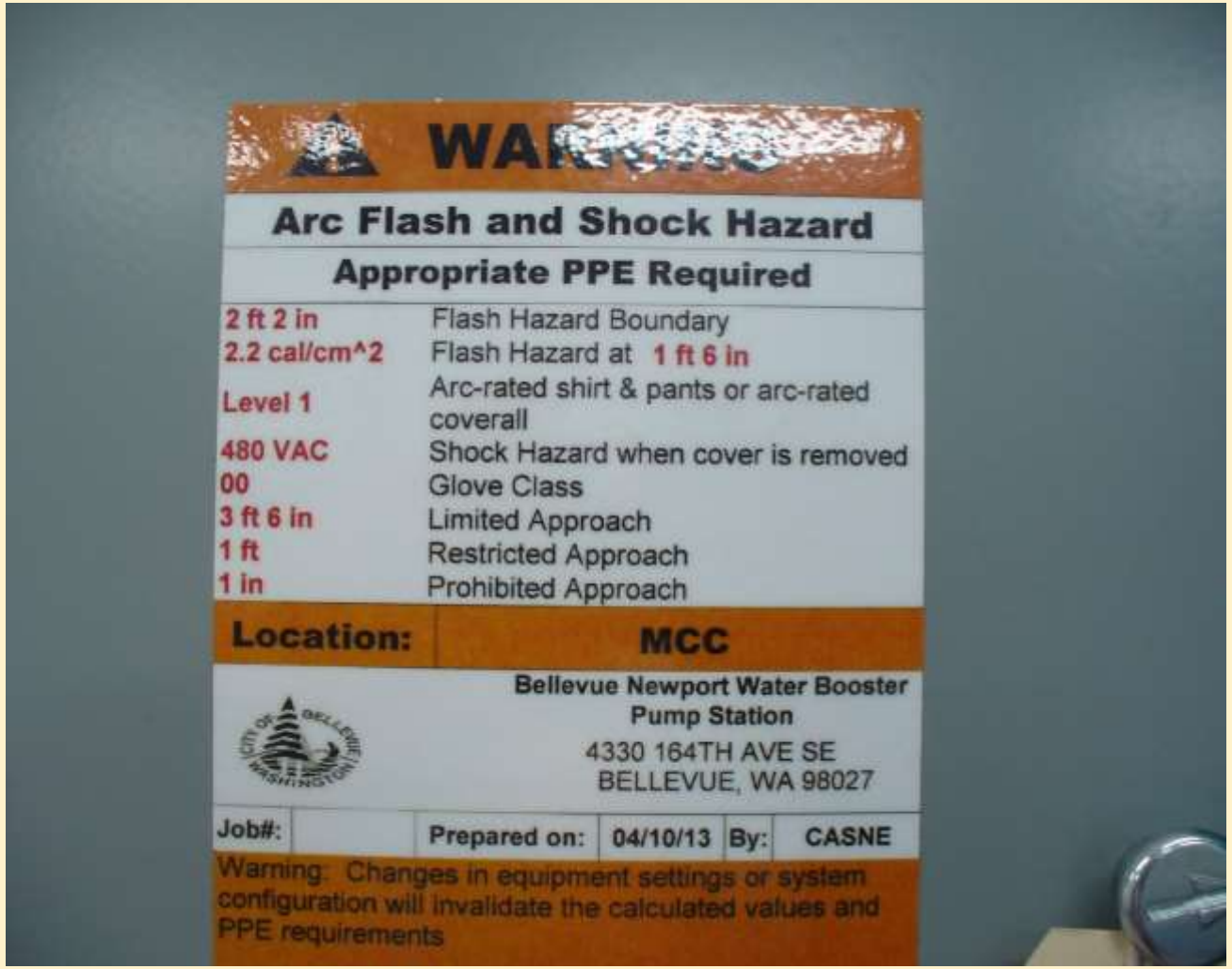
Arc Flash Labels

Remember to comply with the AHJ (Authority Having Jurisdiction).

Art. 110.16: The Washington Cities Electrical Code adds language to the first paragraph of NFPA 70 Art. 110.16.

To read as follows, *The flash protection marking shall be an identification plate or label meeting ANSI Standards Z535.4-1998 or be of a type approved by the Code Official or designated representative. The plate or label may be mounted using adhesive.*

Goes on to say, *The arc flash hazard shall be updated when a major modification, renovation or changes in the electrical distribution system that could affect the results of the arc flash analysis takes place.*



3. Arc Flash

PPE's Working on Alternating Current (AC) based on Categories 1,2,4

- Categories are rated by the amount of energy and heat given off by the arc flash, measured in Calories.

70E Arc-Flash Hazard PPE Categories for Alternating Current (ac) Systems

Table 130.7 (C)(15)(A)(b)

Equipment	PPE Category	Arc-Flash Boundary
Panelboards or other equipment rated 240V or below. Maximum of 25kA short-circuit current available, maximum of 0.03 sec (two cycles) fault clearing time, working distance 455 mm (18 in.).	1	485 mm (19 in.)
Panelboards or other equipment rated >240V and up to 600V. Parameters: Maximum of 25kA short-circuit current available; maximum of 0.03 sec (two cycles) fault clearing time; working distance of 455 mm (18 in.).	2	900 mm (3 ft.)
Other 600 V class (277 V through 600V, nominal) equipment. Parameters: Maximum of 65 kA short-circuit current available; maximum of 0.06 sec (two cycle) fault clearing time; minimum ... 8 in. working distance.	2	1.5m (5 ft.)
Metal-clad switchgear, 1kV through 15 kV. Parameters: Maximum of 35 kV short-circuit current available; maximum of up to 0.24 sec (~15 cycles) fault clearing time; working distance 910 mm (36 in.).	4	12m (40 ft.)

Once the HRC number has been identified from the task table, the PPE table (130.7 (C)(15)(A)(b)) See page 40 will be used to determine the requirements for the specific protective clothing and other PPE based on that HRC number. HRC 1 and 2 are typically standard work clothes that have been arc rated from between a minimum of 4 cal/cm² for HRC 1, and a minimum of 8 cal/cm² for HRC 2. When the incident energy potential reaches 25 cal/cm², HRC 3 is required; at 40 cal/cm² and greater, HRC 4 garments are required.

Three Important Elements to Understand with Energized Parts and Arc Flash Procedures

1. Approach boundaries for unqualified workers to Energized Electrical Conductors or Circuit Parts for Shock Protection

2. Equipment Labeling

3. Arc Flash PPE’s

3. Arc Flash

Electrical PPE's and more for Electrical Work.

- Work Boots: No longer ANZI Z41 rated. Now have EH (Electrical Hazard) on label.
- Safety Glasses: Electrical Safety glasses need to have UV rating.
- Electrical Gloves: Have electrical ratings corresponding to voltage levels.
- Hearing Protection
- Hard Hats
- Clothing
- Jewelry, watches, etc…..
- Voltage Meters and Volt Sticks
- Portable GFCI devices
- Extension Cords
- Power Tools

4. Electrical PPE's

Be careful using a volt-stick!!

4. Electrical PPE's

- The volt-stick only tells you if there is a presence of voltage. Not a good choice of trouble shooting electrical problems. Good to have for safety.

- Make sure you test the volt-stick on a known energized circuit before testing on the one you are working on.

GFCI Protection

4. Electrical PPE's

Avoid using portable GFCI in Series with another GFCI

GFCI protects against current flow. 6 mA.

Any Questions?

Where to find Information:

Great Place to find any of the Electrical Code and Safety material:

Builders Book, Inc. 8001 Canoga Avenue, Canoga Park, Ca. 91304

www.buildersbook.com