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1. **Speaker Handouts** – “Arc Flash Safety Requirements: Keep Complaint; Protect Your Employees” handouts.
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- The question and answer period of the conference will be interactive. We have scheduled the last 15 minutes of the program for this part of the session.
- The operator will announce when the Q&A period is ready to begin. You will be prompted to press *1 (star, one) on your touch-tone phone if you have a specific question for the speaker.
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Again, welcome and thank you for your enrollment. If you have any questions, please contact us at 800-964-6033.

Sincerely,



Michelle Myers
Conference Manager

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Arc Flash Safety Requirements: Keep Complaint; Protect Your Employees



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Introduction

- Electrical Hazards
- Arc Flash & Blast – 5W’s
- Recent OSHA Enforcements
- Staged Testing
- Codes & Regulations
- 3 Step Arc Flash Compliance
- Table vs. Engineered Method
- Hazard Risk Categories & PPE
- Warning Labels
- LO/TO & Arc Flash



ELECTRICAL HAZARDS

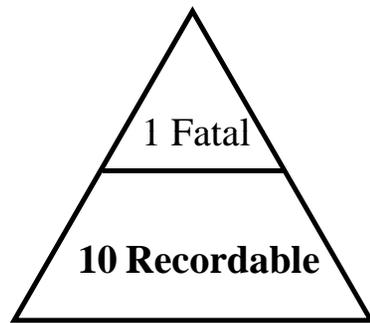
Electrical Hazard Injury

The “Big Three”

- Electric Shock (23% of all injuries)
- Electric Arcs
- Electric Blasts > (77% of all injuries)

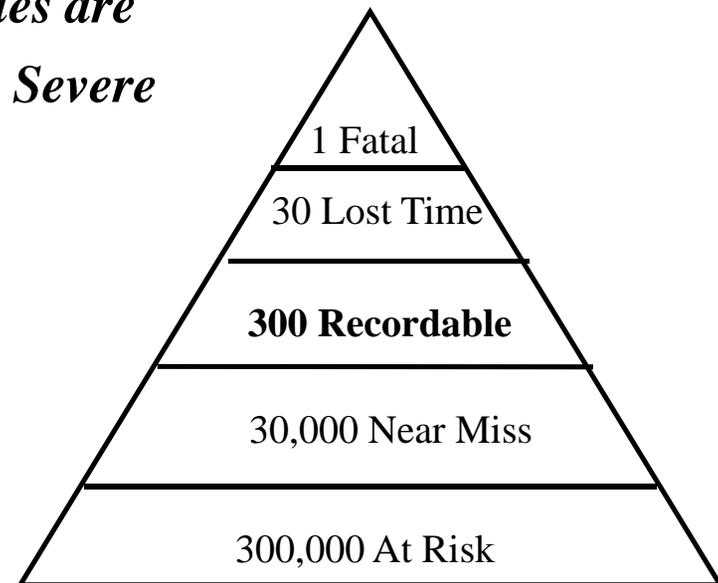
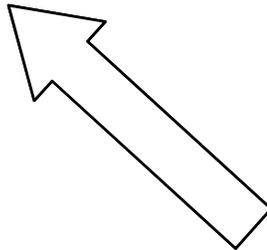
Source – U S Dept of Labor

Why Electrical Safety is Important



Electrical Hazards

*Electrical Injuries are
Relatively More Severe*



General Safety Hazards

Arc Flash Vocabulary

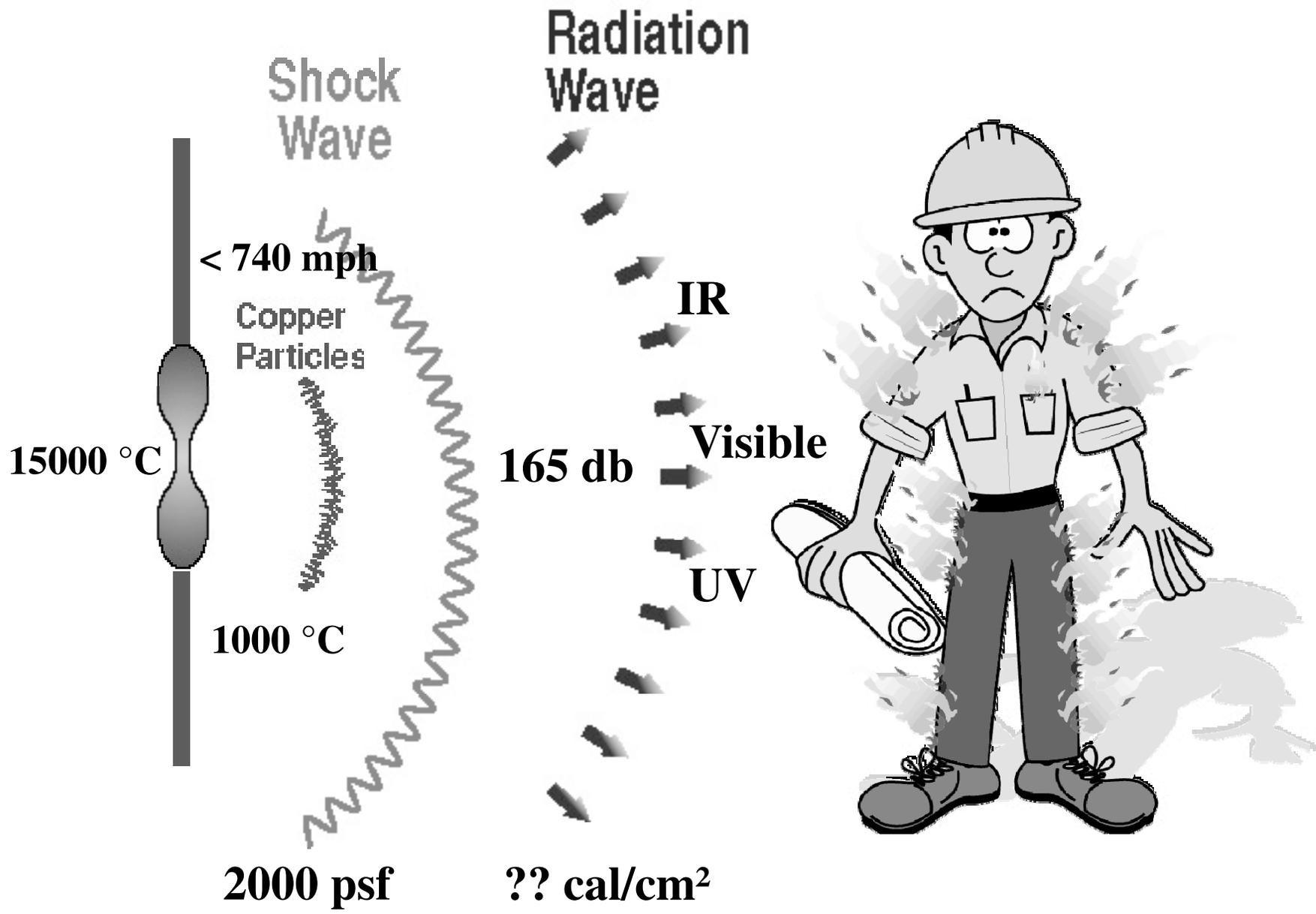
- Arcing Fault – An electrical fault where current flows through ionized air causing an arc (energy is dissipated in the surrounding environment i.e. lightning).
- Bolted Fault – An electrical fault where high current flows through a solid connection (energy is dissipated in equipment i.e. grounding rod or cable).

Arc Flash Vocabulary

- Incident Energy – The amount of energy impressed on a surface, a certain distance from the source, that is generated during an arc event (measured in calories/cm² or joules/cm²)
- Flash Protection Boundary – Distance where the incident energy = 1.2 cal/cm² (1.2 cal/cm² is the minimum energy required to produce 2nd degree burns on skin)
- PPE - Personal Protective Equipment; voltage rated gloves, flash protective clothing (i.e. coats, pants, hood)

Arc Flash and Arc Blast

- Arc flash happens when an electrical arcing fault occurs. The current flows through ionized air causing energy to be dissipated on the surrounding environment producing intense heat and light (25,000-35,000 F).
- Arc blast comes from the air surrounding the arc that is instantly heated causing the conductors to vaporize and resulting in a pressure wave and accompanying loud sound (Cu expands 67,000 times from solid to vapor).



**ARC FLASH & BLAST 5 W's
(Who, What, When, Where, Why)**

Who is Affected?

- Electricians
- Maintenance personnel
- Engineers, supervisory personnel, or others that are within the flash protection boundary.
- Electrical equipment

These hazards can cause death, severe burns, hearing damage, sight damage, flying debris, significant equipment damage, and loss of operations.

What is the Cost to the Business?

- Average Medical Cost of Arc Flash Victim is \$1.5M
 - 6-8 months of lost work
 - Devastating injury ends work career
- The average cost of litigation in an arc flash case is \$10 - \$15 million.

When do they occur?

- 5-10 arc flash explosions occur in electric equipment every day in the United States.

Note: This number does not reflect cases where a victim is sent to an ordinary hospital.

Source: Chicago-based CapSchell, Inc.

- Each year more than 2,000 people are treated in burn centers with severe arc-flash injuries.

Source: Article on IEEE & NFPA to Research Arc-Flash (Business Wire Pub. 9/13/04)

Where do they occur?

- Main Switchgear Room
- Electrical Rooms
- Production Floor
- Power Panels
- Motor Control Centers

Why do they occur?

- Causes of arc flash incidents can be:
 - inadvertent contact
 - loose connections
 - insulation failure
 - poorly maintained equipment
 - voltage transients
 - unsuccessful short circuit interruptions
 - or animals (squirrels, snakes, etc..)

Burn Injury – Probability of Survival



Clothing Matters

- Natural fibers like 100% cotton, wool or silk will protect your skin.
- Arc Flash can immediately set clothing on fire, so what you're wearing matters!



RECENT OSHA ENFORCEMENT REPORTS

Recent OSHA Enforcement

- 8/4/09 Golden, CO Brewing Co. - \$128K
- 9/6/09 Norwalk, CT Contractor - \$148K
- 10/22/09 New Britain, CT Armor Svs. - \$113K
- 11/18/09 Buffalo, NY Contractor - \$88K
- 3/15/10 Harbeson, DE Poultry Plant - \$182K
- 5/17/10 Jersey City Mftc. - \$158K
- 6/14/10 Whitehall, PA National Retailer - \$81K

Recent OSHA Enforcement

- 10/23/10 Wilkes-barre, PA Mftc. - \$156K
- 11/9/10 Graniteville, SC Media Co. - \$11K
- 11/11/10 Schiller Park, IL Bakery - \$274K
- 12/1/10 Nebraska Biofuel Mftc. - \$60K
- 12/9/10 Philadelphia, PA Paper Mftc. - \$86K
- 2/22/11 Beverly, CA Hospital - \$63K
- 2/8/11 Nation Wide Postal Facilities - \$6.2M

Recent OSHA Enforcement

U.S. Postal Service faces nationwide complaint for electrical safety violations

As of the end of last year, the Occupational Safety and Health Administration (OSHA) issued fines totaling more than **\$6.2 million** for what it describes as “willful and serious” electrical safety violations at 30 U.S. Postal Service (USPS) processing and distribution and bulk mail facilities across the country

Recent OSHA Enforcement

As a result of the violations discovered at the Providence facility in July, the U.S. Department of Labor (DOL) filed an unprecedented “**enterprise-wide**” complaint against USPS. The complaint — which asks the Occupational Safety and Health Review Commission to order USPS to correct electrical violations at **all of its facilities**; uphold the fines and penalties; conduct training on safe electrical work practices; provide PPE to affected employees; and withdraw flawed management orders and instructions regarding safe electrical work practices — marked the first time the department sought enterprise-wide relief as a remedy. **“When the same safety violation is discovered in multiple locations of an organization, we need an enterprise-wide remedy to protect workers from the hazard,”** says M. Patricia Smith, DOL solicitor

OSHA Enforcement Summary

If your facility requires power, you have the potential for an Arc Flash incident, a litigation verdict and subsequent OSHA fine.

STAGED TESTING

Staged Tests

(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

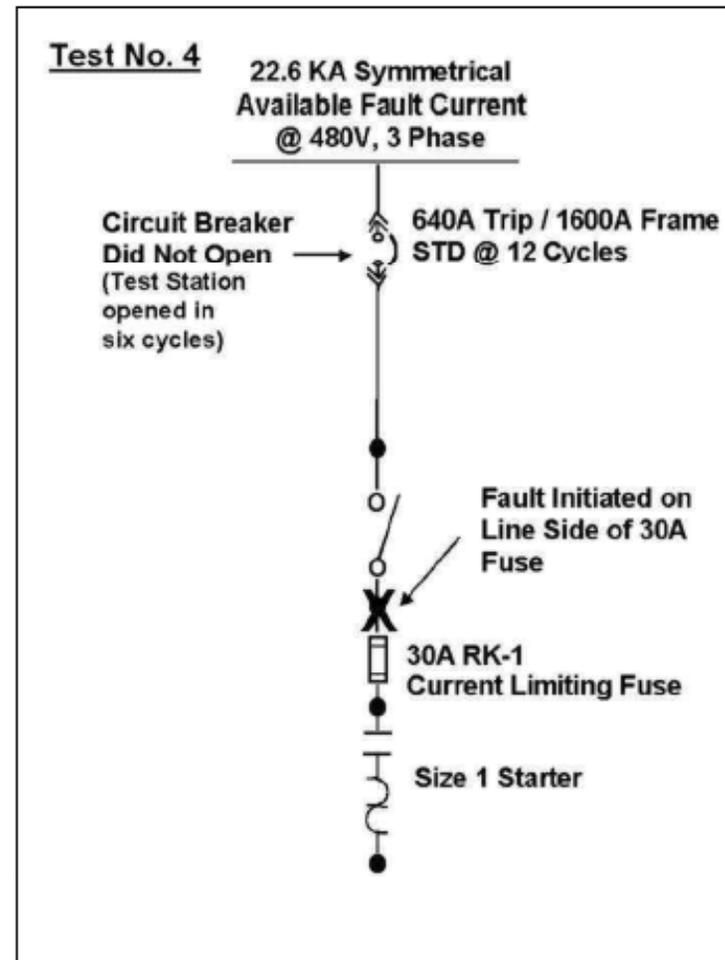
- Conducted in 1996 at Paul Gubany High Power Laboratory in Ellisville, MO
- Sensors were installed on both mannequins to measure temperature, pressure, and sound level.
- Subjects are wearing cotton clothing, safety glasses, hard hats, and leather work gloves.



Staged Test HRC 4

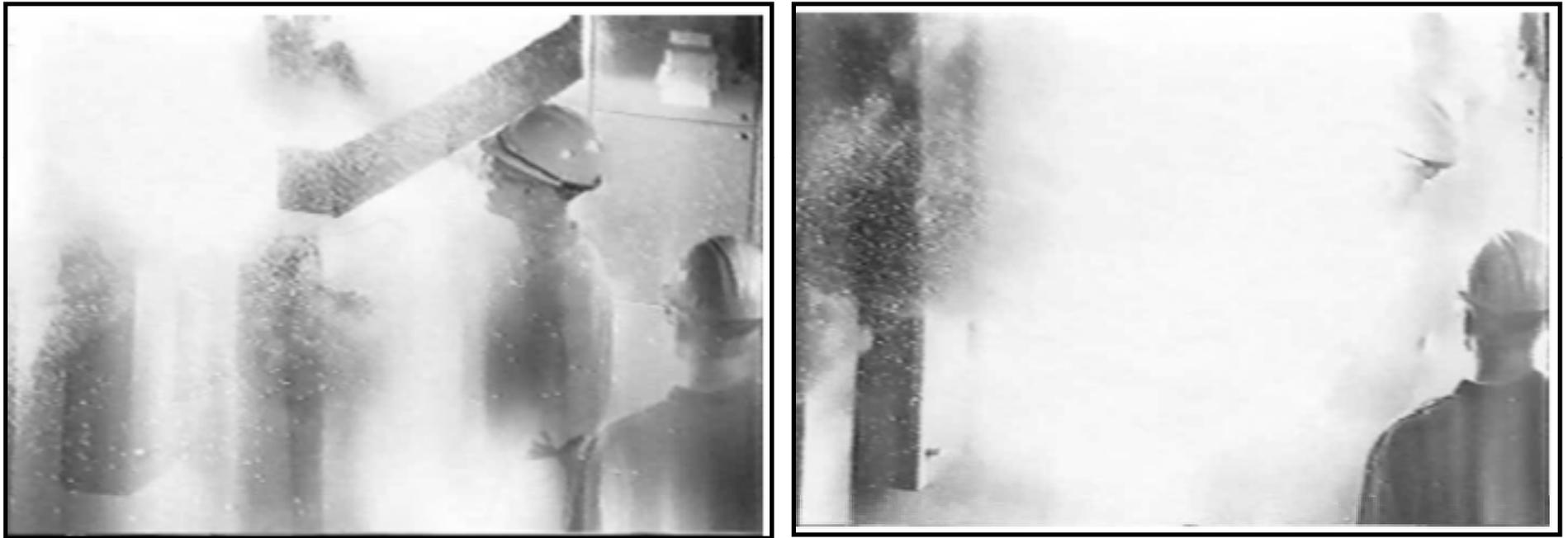
(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

- Size 1 Combo Starter with 30A Fused Switch
- Load side CB – screwdriver phase C to Ground
- This test interrupted at 6 cycles (half of standard)



Staged Test HRC 4

(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

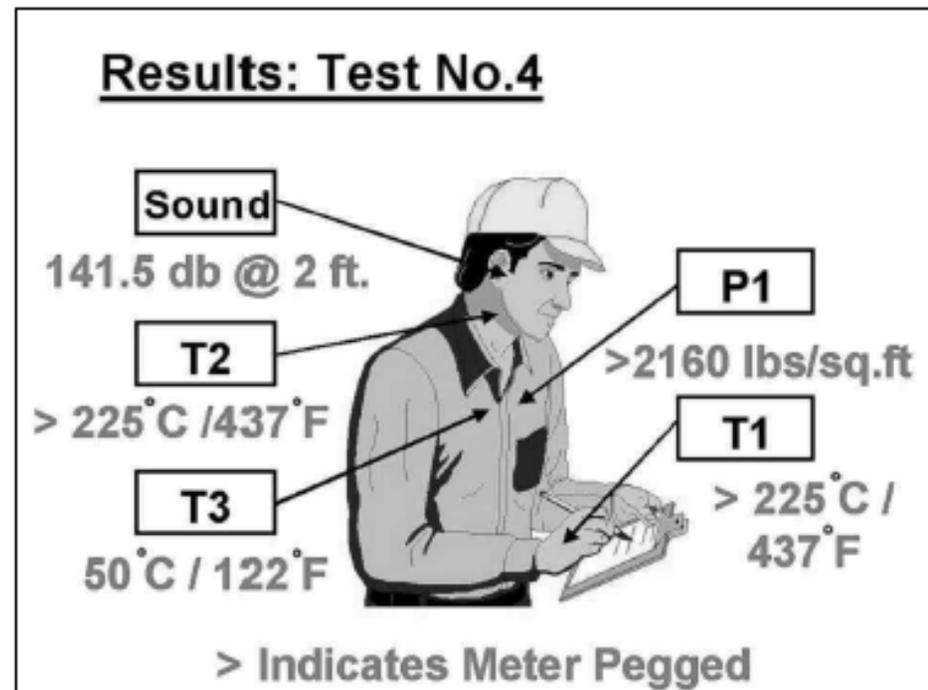


- The worker mannequin is engulfed in the arc-blast while the helper mannequin, several feet away, is also affected.

Staged Test HRC 4

(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

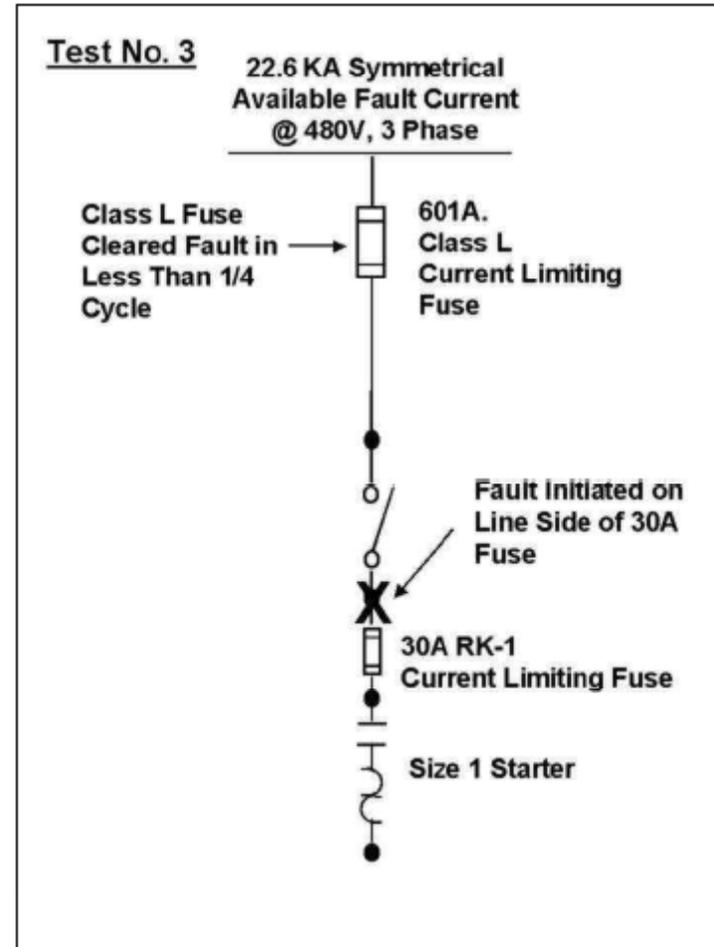
- 6000 lbf against chest
- Collapsed lungs (1728-2160 lbs/ft² threshold for lung damage)
- Hearing Damage (720 lbs/ft² threshold for ear drum rupture)
- Hands & Neck serious burns 437F
- Chest no skin damage



Staged Test HRC 3

(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

- Size 1 Combo Starter with 30A Fused Switch
- Load side – screwdriver phase C to Ground
- Class L Fuse is in place of 640A Power Circuit Breaker



Staged Test HRC 3

(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

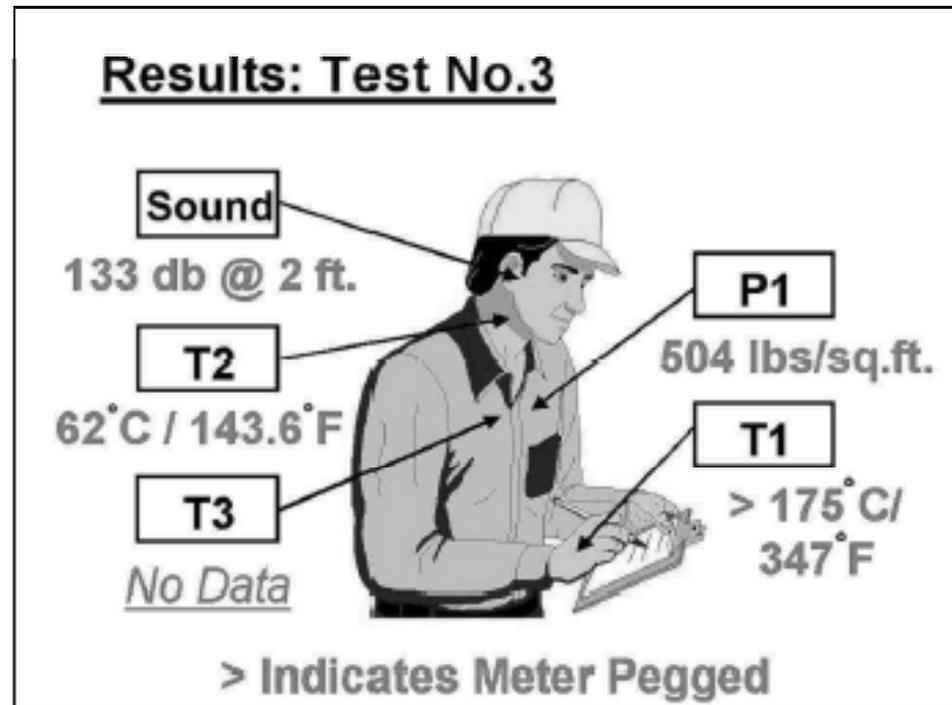


- Damage is greatly reduced because the fault is cleared in less than $\frac{1}{4}$ Cycle compared to 6 Cycles.

Staged Test HRC 3

(source: Crnko and Dyrnes: Arcing Flash/Blast Review)

- 1500 lbf against chest
- 504 lbs/ft² - Well Below Threshold Collapsed Lungs
- 133 db Half Intensity Temporary Hearing Loss
- Hands Serious burns 437F
- Neck & Chest no skin damage 143F



Staged Tests - Conclusions

- Similar tests conducted on larger starters and MCC's were more violent in nature.
- Arc Rated PPE provides protection against burns but may provide minimal protection from explosive pressures and shrapnel.
- Proper engineering, coordination and current limiting devices can greatly reduce damage due to arc-fault energy.

CODES and REGULATIONS

Federal Codes & Regulations Involving Arc-Flash

- Codes & Standards – NFPA 70 (NEC)
 - NEC 110.16 (Warning Labels)
 - NEC 110.9 (Interrupt Ratings)
 - NEC 110.10 (Coordinating Protective Devices)
- 70E (Electrical Safety Requirements for Employee Workplaces)
 - NFPA 70 E 2012 (Requires a Flash Hazard Analysis)
- OSHA – 29 CFR 1910 (Electrical Subparts)
 - OSHA 29 CFR 1910.132 (PPE)
 - OSHA 29 CFR 1910.333 (Qualified Personnel and PPE)
 - OSHA 29 CFR 1910.335 (Tools and Barriers)
- IEEE Std. 1584
 - (IEEE Guide for Performing Arc-Flash Hazard Calculations)

OSHA Standards 29-CFR, Part 1910 Sub part S

Standard number 1910.333

- Before opening any enclosure that may contain energized parts or equipment, every power source over 50V must be disconnected and appropriate LOTO procedures initiated.

EXCEPTIONS

- A greater hazard will be created by de-energizing the equipment such as disconnecting ventilation to a hazardous area.
- Access to energized equipment is required to perform voltage current, or other tests. The person conducting these tests must be “qualified” by the company that hires him.

OSHA Standards 29-CFR, Part 1910 Sub part S Standard 1910.132

- Requires the employer to conduct a risk assessment to determine what the potential is for electric shock and other hazards and then require that the employees performing the work be provided with the appropriate PPE.

OSHA 1910.331-.335 and NFPA 70E 2012

- The training requirements contained in this section apply to employees who face a risk of electric shock that is not reduced to a safe level by electrical installation requirements.
 - Other employees who may reasonably be expected to face comparable risk of injury due to electric shock or other electrical hazards must also be trained.
 - The required training **MUST** be of the classroom or on-the-job type.
 - Training shall be Documented and Retraining shall not exceed 3 years.
- **Employees exposed to shock hazards and those employees responsible for taking action in case of emergency shall be trained in 1st Aid, CPR, AED use and certified by the employer annually.**

NFPA 70E 2012 – Employer Responsibilities

- **The employer shall implement and document an overall Electrical Safety Program that identifies procedures for working within the limited approach boundary AND arc flash boundary before work begins.**
 - Limited Approach = 36 in. for 50V-750V
 - Arc Flash Boundary = 4 ft. or as determined by engineering study.
- The Electrical Safety Program AND the Field Work must be audited and documented at least every 3 years.

Arc-Flash Label Requirements – NEC 2011

- “Industrial control panels” covers almost every enclosure with an exposed energized conductor or component.
- Label all enclosure doors, removable panels, etc., but with what type of label?

110.16 Flash Protection. - “Switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.”

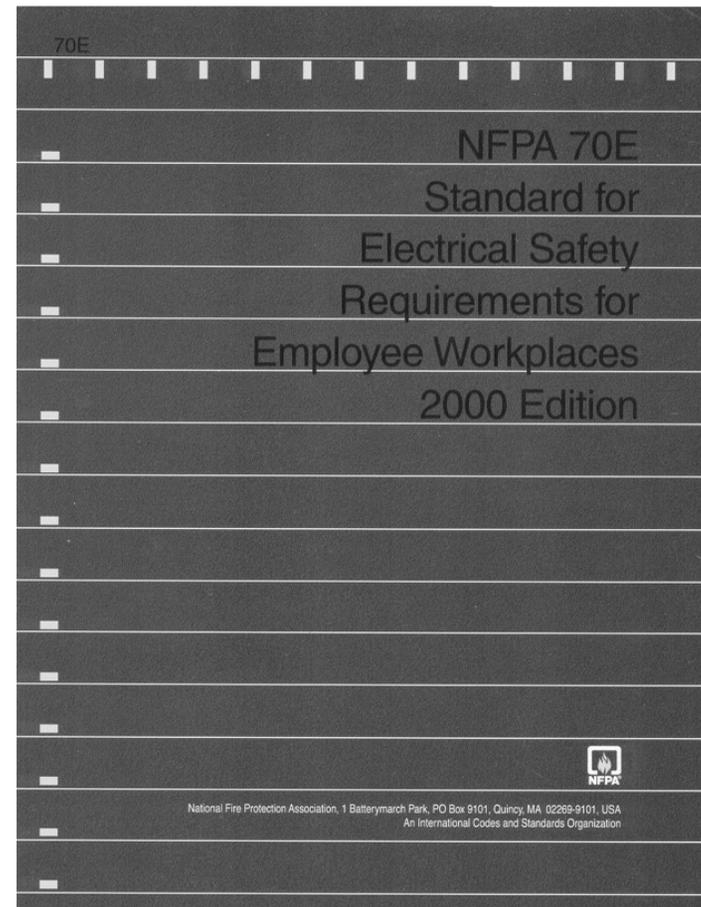
Arc-Flash Label Requirements – NFPA 70E 2012

- Must include:
 - System Voltage
 - Arc Flash Boundary
 - At Least One of the Following:
 - Incident energy at corresponding working distance
 - Minimum arc rating of clothing
 - Required level of PPE
 - Arc Flash Boundary

 <h1 style="margin: 0;">WARNING</h1>	
HRC Level <h2 style="font-size: 2em;">2</h2>	<h3>ARC FLASH & SHOCK HAZARD</h3> <h3>Appropriate PPE Required</h3>
166 inches Arc Flash Boundary 5.28 cal/cm² Flash Hazard at 36 inches Working Distance Category 2 Protective Clothing and PPE (Per NFPA 70E-2012) 2400 VAC Shock Hazard when cover is removed	
Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label.	
Bus: No. 4 CR Sol Pump 8 Disc Bus Prot: No. 4 CR N U1	Label: CR Pump 8 Date: Mar 2012 Review & Update By: Mar 2017

Arc-Flash Regulations and OSHA

- OSHA standards were based on the 1979 edition of NFPA 70E.
- As of 2/14/07 OSHA has adopted the NFPA 70E 2000 edition as the general industry new electrical installation requirement.

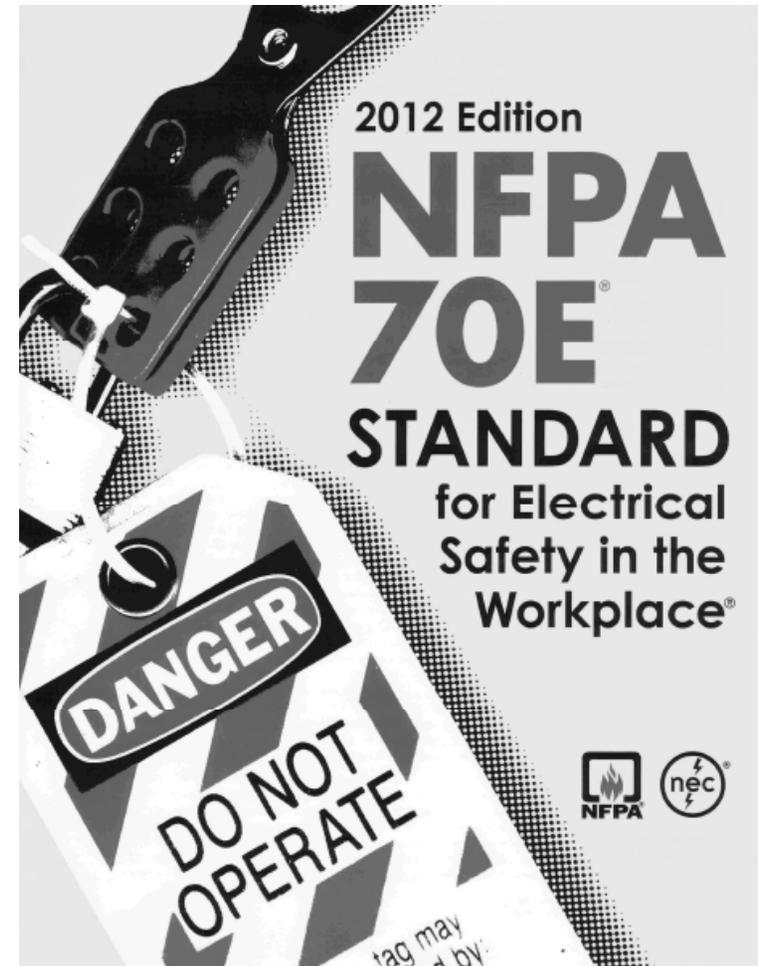


Arc-Flash Regulations – NFPA 70E

- NFPA 70E-2000, part II, Chapter 2, paragraph 2-1.3.3 states that a flash hazard analysis must be performed in order to determine the level of hazard and appropriate PPE for given tasks.
- NFPA 70E is referenced in OSHA 1910.333 signifying that OSHA looks at NFPA 70E 2004 as the “how to do it” model for arc flash hazards.

Arc-Flash Requirements and OSHA

- The adoption of the NFPA 70E 2000 edition for NEW installations should be a sign that OSHA is seriously moving in the direction of the NFPA 70E 2012 as it's electrical standard.



Arc-Flash Regulations – NFPA 70E

NFPA 70E-2009, Article 130.3, states

- “The AFHA shall be updated when a major modification or renovation takes place. It shall be reviewed periodically, not to exceed 5 years, to account for changes in the electrical distribution system.”

OCPD's and NFPA 70 Article 205

- 205.2 – “A **single line diagram**, where provided for the electrical system, shall be maintained in a legible condition and shall be **kept current**.”
- 205.3 – “Electrical equipment shall be **maintained** in accordance with **manufacturers’ instructions or industry consensus standards** to reduce the risk of failure and the subsequent exposure of employees to electrical hazards.” *NFPA 70B and ANSI/NETA MTS are consensus standards.*
- 205.4 – “Maintenance, tests, and inspections shall be documented.”

OCPD's and NFPA 70B Annex K

DEVICE	TASK	FREQUENCY
MV Transformers	Oil - Draw sample and test in laboratory	Annually for service transformers Bi-annually for rectifiers/arc furnaces
MV Metal-Clad Switchgear	De-energized maintenance	3-6 years depending on ambient conditions
MV Air-break Breakers	De-energized maintenance	Max. of 3 yrs or maximum # of operations
MV Oil Immersed Breakers	De-energized maintenance	Max. of 3 yrs or maximum # of operations
MV Air Switches	De-energized maintenance	3-6 years depending on ambient conditions
MV Oil or Gas Switches	De-energized maintenance	500 Operations
Induction Disk Relays	Inspect, clean, calibrate, and test	2-3 yrs or more often depending on ambient conditions
LV Switchgear	De-energized maintenance	3-6 years depending on ambient conditions
LV Air-break Breakers	De-energized maintenance	Max. of 3 yrs or maximum # of operations
LV Oil Immersed Breakers	De-energized maintenance	Max. of 3 yrs or maximum # of operations
LV Fused Switches	Cleaning, inspection, and maintenance	3-6 years depending on ambient conditions
Molded Case Breakers	Mechanical Test	2 years
Molded Case Breakers	Electrical Test	3-5 years

3 Steps to NFPA-70E Compliance

1. Conduct Hazard Assessment to determine:
 - Hazard Risk Category & PPE
 - Flash Protection Boundaryand Apply Equipment Warning Labels
2. Purchase & Make Available PPE
3. Train Employees

TABLE vs. ENGINEERED METHOD

Determining Flash Protection Boundary and Associated HRC/PPE

According to NFPA-70E the two
approved methods are:

1. The Table Method
2. Engineered Study

NFPA-70E Table Method

- Flash Protection Boundary, Hazard Risk Categories and PPE are determined by
 - Voltage
 - Task being Performed

NFPA-70E Table Method

600 V Class Motor Control Centers (MCCs) — Note 2 (except as indicated)	
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	1
CB or fused switch or starter operation with enclosure doors closed	0
Reading a panel meter while operating a meter switch	0
CB or fused switch or starter operation with enclosure doors open	1
Work on energized electrical conductors and circuit parts, including voltage testing	2*
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	0
Work on control circuits with energized electrical conductors and circuit parts >120 V, exposed	2*
Insertion or removal of individual starter “buckets” from MCC — Note 3	4
Application of safety grounds, after voltage test	2*
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts) — Note 3	4
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts) — Note 3	1
Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the motor control center	2*

NFPA-70E Table Method

- Specific Notes for 240V (Note 1) and 600V (Note 2) Electrical Equipment:
- Available Current and Clearing Time **MUST** be known in order to use the Table

Specific Notes (as referenced in the table):

1. Maximum of 25 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time.
2. Maximum of 65 kA short circuit current available; maximum of 0.03 sec (2 cycle) fault clearing time.
3. Maximum of 42 kA short circuit current available; maximum of 0.33 sec (20 cycle) fault clearing time.
4. Maximum of 35 kA short circuit current available; maximum of up to 0.5 sec (30 cycle) fault clearing time.

NFPA-70E Table Method

- Table Method issues are clearly problematic when comparing to actual calculated incident energy and actual HRC.
 - The Hidden Dangers of NFPA-70E 2009 Table 130.7 (C) (9)

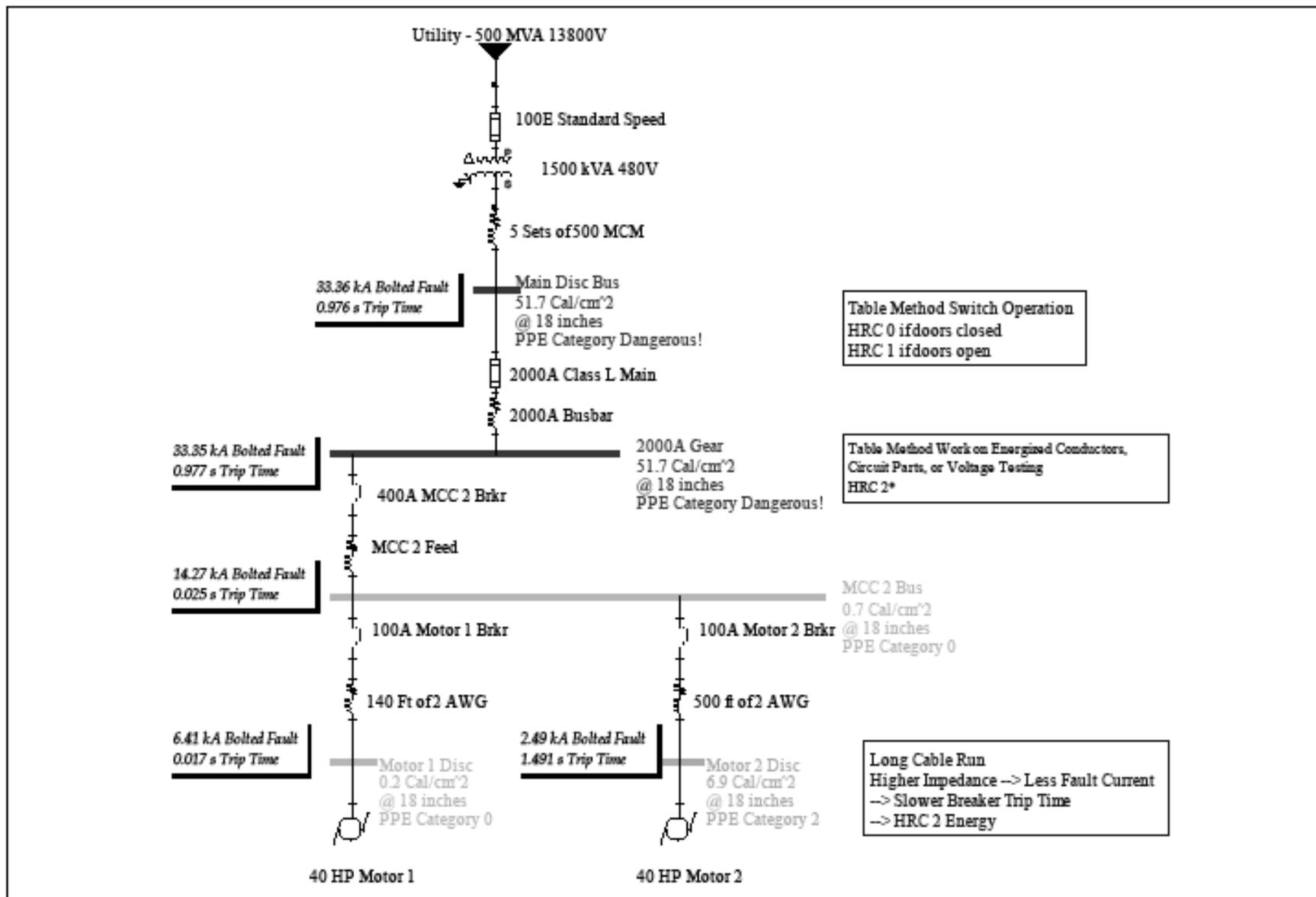


Table Method Dangers
Identical Starters
NFPA 70E 2009 Table 130.7(CM9)



NFPA-70E Table Method

Conclusions

- Inconsistent results as based on Voltage & Tasks
- FPN2: Requires that Available Fault Current and Clearing Time are quantified in order to apply the table
- Specifies **NO “Dangerous” HRC** i.e. >40 cal/cm², when we KNOW they exists at both 480V and 240V levels

IEEE Standard 1584 Method

- Developed by a group of engineers in the petroleum industry. Several high power labs conducted tests in open, enclosed situations for single-phase, three-phase, low voltage, and medium voltage conditions. The results were published in 2002.
- This method has the most field data to validate its formulas

Engineered Method IEEE-1584

Analysis Steps

- Step 1 - Data Collection / Verify Single Line (10%)
- Step 2 - Short Circuit Study
- Step 3 - Over-Current Protective Device Study
- Step 4 - Arc Flash Hazard Analysis
- Step 5 - Make Available Proper PPE
- Step 6 - Train Employees
- Step 7 - Apply AFHA Labels

Note: Analysis should be conducted by a Registered Power P.E. that specializes in electrical power systems engineering.

Step 1 - Field Verified Single Line

Transformer:

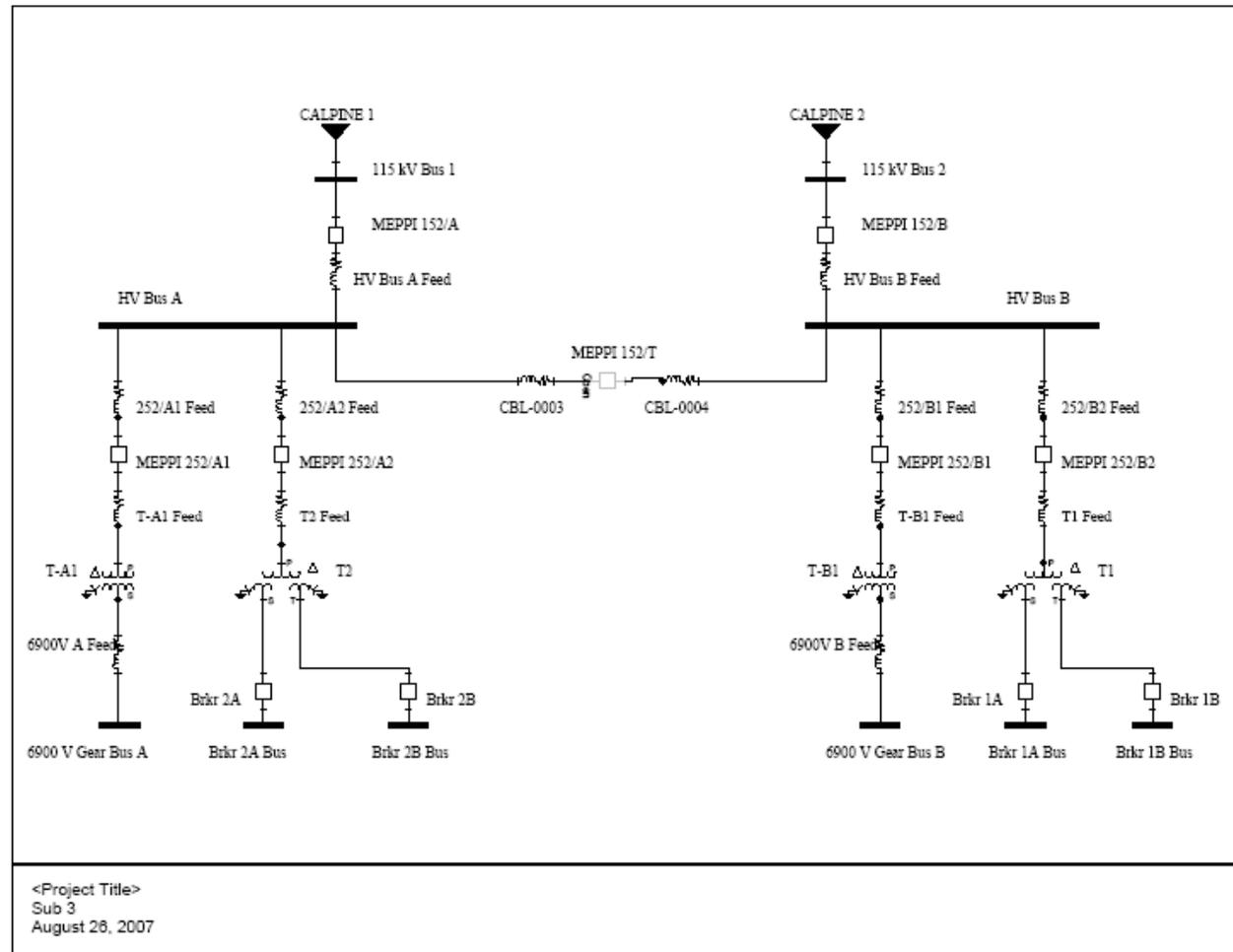
- Size KVA
- % Impedance
- Configuration
- Upstream Protection

Breaker:

- Manufacturer
- Make, model
- Settings
- Cable Size, #/Phase

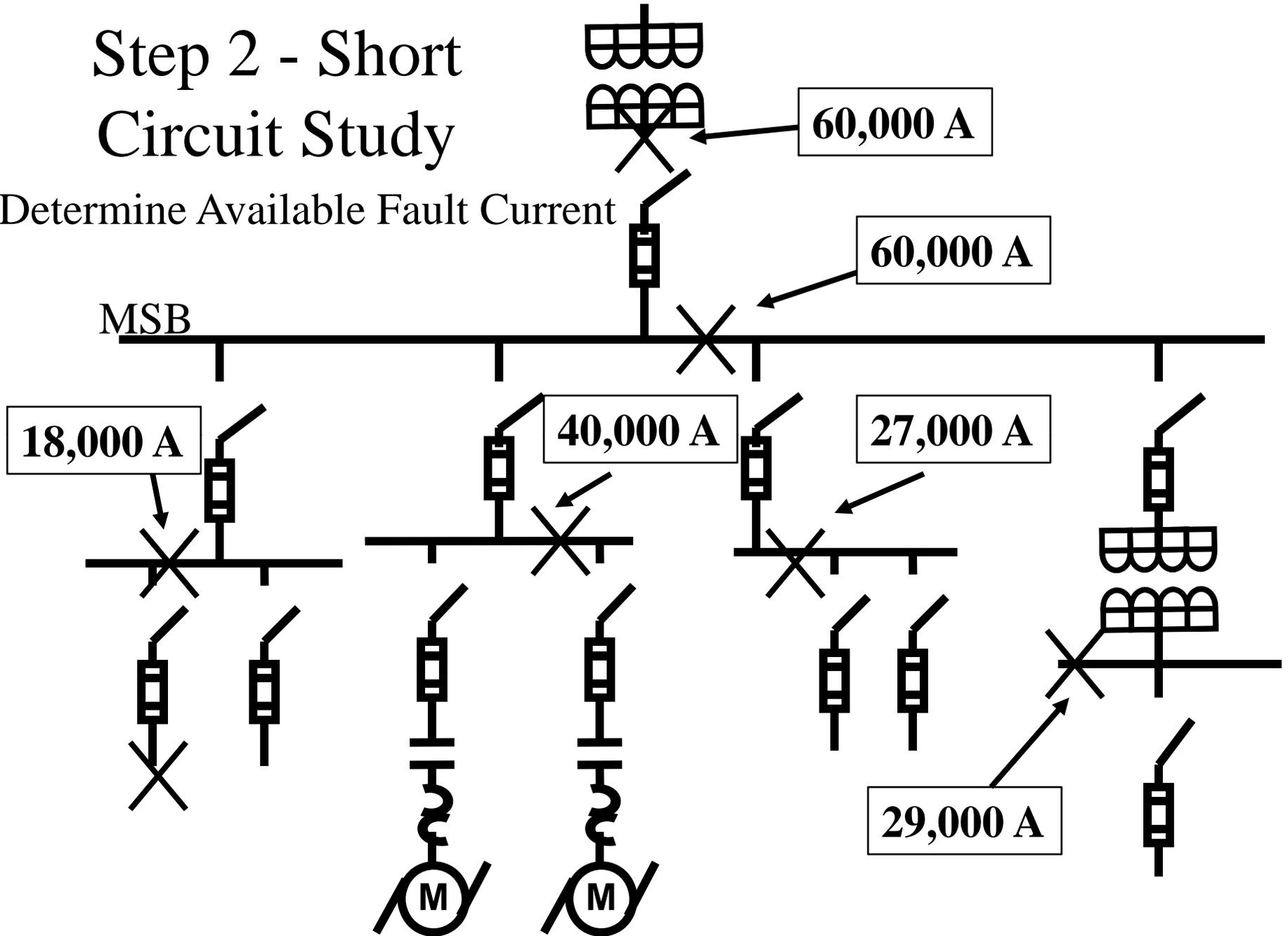
Fuse:

- Manufacturer
- Size
- Type
- Etc.



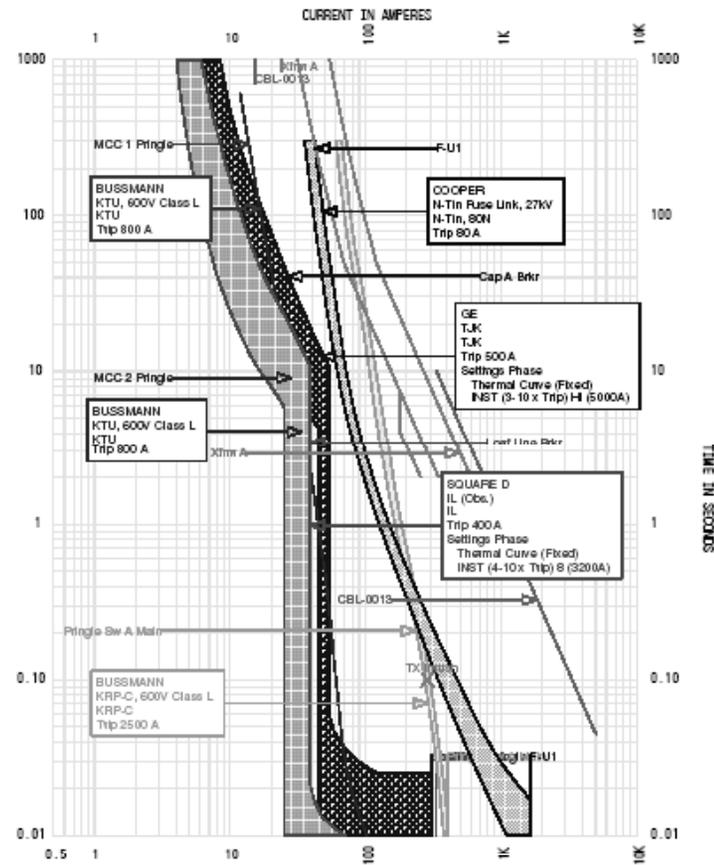
Step 2 - Short Circuit Study

Determine Available Fault Current



Step 3 – Over Current Protective Device Coordination

- Ensures devices “trip” in the proper order.



TCC: Main Switchboard A Coordination Curves Current Scale x 100 Reference Voltage: 480 November 2006

Step 4 - Engineering Analysis

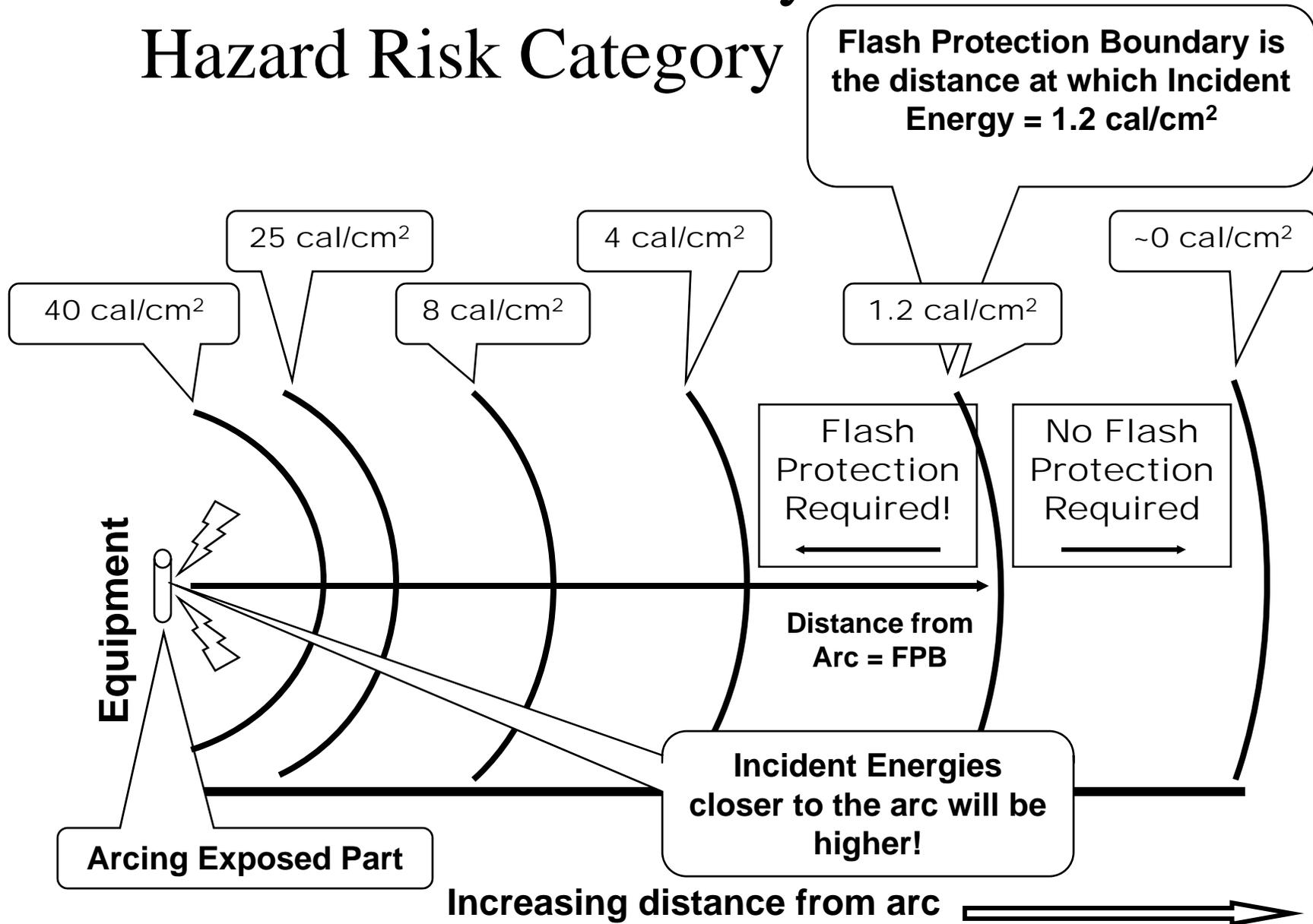
Bus Name	Arcing Fault (kA)	Duration of Arc (sec.)	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/ cm2)	Required Protective FR Clothing
MCC 501	15.92	0.05	26.80	18.00	2.16	Class 1, FR Shirt & Pants
MCC 502	16.01	0.5	127.26	18.00	21.43	Class 3, Cotton Underw ear + FR Shirt & Pant + FR Coverall
NH3-9	16.92	0.15	63.56	18.00	7.70	Class 2, FR Underw ear + FR Shirt & Pants
PAST HOMO ST	15.11	0.025	16.43	18.00	1.05	Class 0, Untreated Cotton
S3 PRI	4.53	0.089	61.37	18.00	13.95	Class 3, Cotton Underw ear + FR Shirt & Pant + FR Coverall
S3 SEC	15.98	0.33	147.24	18.00	26.57	Class 4, Cotton Underw ear + FR Shirt & Pant + Double Layer Sw itching Coat
S4 SEC	1.07	0.597	204.69	18.00	43.18	**** Dangerous!!! No FR Class Found

Determines Proper HRC and PPE requirements.

Flash Protection Boundary

- Flash Protection Boundary (1.2 cal/cm^2) & Hazard Risk Category are both equipment & installation dependent and can vary depending on:
 - Fault current (can greatly exceed normal running current)
 - Clearing time of fuse or circuit breaker
 - Numerous other variables

Flash Protection Boundary & Hazard Risk Category



Hazard Risk Categories (HRC)

- HRC numbers and associated clothing (other PPE such as face shields, hearing protection, hardhat may be required as well):

Category 0 = 0 to 1.2 cal/cm ² (Untreated Cotton)
Category 1 = 1.2 to 4 cal/cm ² (FR Shirt & Pants, Face Shield, 4 Cal Min)
Category 2 = 4 to 8 cal/cm ² (Cotton Underwear+FR Shirt&Pants,Balaclava+Face Shield,8 Cal Min)
Category 3 = 8 to 25 cal/cm ² (Cotton Underwear + 2-Layer Switching Suit, 25 Cal Min)
Category 4 - 25 to 40 cal/cm ² (Cotton Underwear + 2-Layer Switching Suit, 40 Cal Min)
Over 40 cal/cm ² (Dangerous due to Blast)

- HRC 0 requires safety glasses and voltage rated gloves.

Step 5 – Make PPE Available

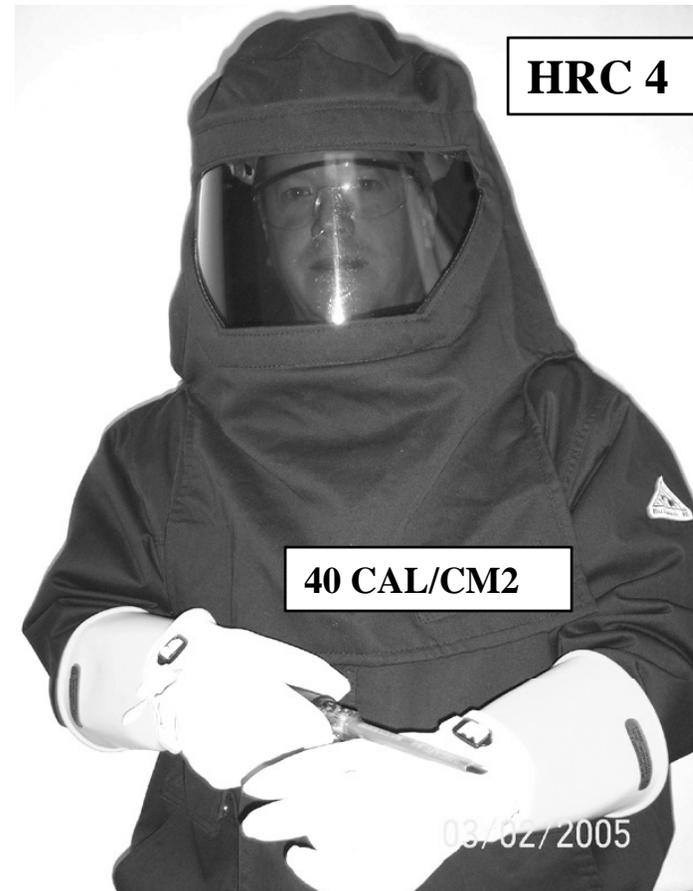
- Safety Glasses
- Arc rated wrap around face shield with minimum arc rating of 8 cal/cm²
- Voltage rated gloves with leather covers
- Class E-rated hard hat
- FR coveralls with minimum rating of 8 cal/cm²



HRC 2

Step 5 – Make PPE Available

- Safety Glasses
- Arc hood and suit with minimum arc rating of 40 cal/cm²
- Voltage rated gloves with leather covers
- Class E-rated hard hat
- Ear protection



HRC 4

Step 6 – Training Personnel

- Electrical Technicians
- Maintenance Technicians
- Supervisors
- Engineers

Step 7 – Apply Labels

		WARNING	
HRC Level	1	ARC FLASH & SHOCK HAZARD Appropriate PPE Required	
110 inches Arc Flash Boundary 3.53 cal/cm² Flash Hazard at 36 inches Working Distance Category 1 Protective Clothing and PPE (Per NFPA 70E-2012) 13800 VAC Shock Hazard when cover is removed			
Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label.		Label: 5832	
Bus: SE Baghouse B Bus Prot: 5823 Relay		Date: Mar 2012 Review & Update By: Mar 2017	

		DANGER	
NO SAFE PPE EXISTS ENERGIZED WORK PROHIBITED			
2094 inches Arc Flash Boundary 4130 cal/cm² Flash Hazard at 36 inches Working Distance Dangerous! DANGEROUS! NO SAFE PPE EXISTS 115000 VAC Shock Hazard when cover is removed			
Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label.		Label: Mar 2012	
Bus: 115 kV Bus No. 1 Prot: Mar 2017		Date: 5336 Relays Review & Update By: 5322	

Engineering IEEE-1584 Method

Conclusions

- Most experimental data from lab testing
- Utilizes actual Available Fault Current and actual Clearing Times of protective devices of Your power distribution system
- Accurately prescribes HRC and PPE
- Specifies HRC Categories Level 0, 1, 2, 3, 4 and “Dangerous”
- Protects Employees and mitigates Risk

Engineering IEEE-1584 Method Additional Benefits

- Updated Single Line Diagram
- Updated Short Circuit Study
- IAC Ratings for New Equipment
- Updated Coordination Study
- Listing of Fuses, Breaker etc.
- Living Document

HOW DOES NFPA-70E AFFECT LO/TO PROCEDURES?

General LOTO Procedures

1. Check area and notify affected personnel
2. Shut down the equipment using the normal stopping procedures
3. Disengage the disconnect (Wear Appropriate HRC rated PPE)
4. Lockout the electrical energy source
5. Release any stored energy, if applicable
6. Verify “Zero Energy State” – in the case of lockout to enable someone to perform work on electrical parts this will include a voltage test (Wear Appropriate HRC rated PPE).

NFPA-70E Arc Flash Compliance

- Conduct Engineered Study and Labels Equipment
- Train Affected Employees on Arc Flash
- Purchase and Make Available Arc Rated PPE and Voltage Rated Insulated tools
- Work on energized equipment is to be a last resort

Questions?

- Who to contact?

John Skal

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Fax: 724-453-3145

Email: jskal@falconengr.com

Falcon Engineering Consultants

P.O. Box 1872

Cranberry Twp., PA 16066

<http://www.falconengr.com>

Falcon Engineering Consultants would like to Thank Progressive Business Conferences for the opportunity to speak with you regarding this important Safety, Compliance and Risk Management issue.

PROGRESSIVE BUSINESS CONFERENCES

370 TECHNOLOGY DRIVE • MALVERN, PA 19355
PHONE 800.964.6033 • FAX 215-689-3435

IMPORTANT SAFETY CREDIT INFORMATION

Arc Flash Safety Requirements: Keep Complaint; Protect Your Employees
Event ID #4068 Thursday, May 31, 2012 (Safety)

In order to receive COCs from the BCSP we require a representative from the attending company to verify that all associates returning conference evaluations for credit sign and verify attendance. Please provide information listed below.

COMPANY NAME: _____

ADDRESS: _____

CITY: _____ STATE _____ ZIPCODE _____

PHONE: _____

EMAIL: _____

**PLEASE LIST ATTENDEES PRESENT REQUESTING
CONFERENCE CREDIT:**

**CERTIFICATE
REQUESTED:**

Attendee Name _____

Print Company Representative Name: _____

Authorization –Signature: _____

Phone: _____

***Please be sure to fax an attendee evaluation for each attendee requesting CPE credit. Progressive Business Audio Conference Fax Number: 215-689-3435**

*Please list additional attendees on a separate sheet of paper if necessary.

PB AUDIO & WEBINAR CONFERENCES

Arc Flash Safety Requirements: Keep Complaint; Protect Your Employees

May 31, 2012 (Event 4068)

IMPORTANT ATTENDEE EVALUATION FORM

Please help us improve our training by promptly responding to this brief survey at the end of the presentation. Honest feedback is valued. It normally takes less than five minutes.

JOB IMPACT

	Strongly Agree				Strongly Disagree	
1. This training and development was a worthwhile investment in my career.	5	4	3	2	1	N/A
2. This training and development was a worthwhile investment for my employer.	5	4	3	2	1	N/A
3. Overall I was satisfied with the course.	5	4	3	2	1	N/A
4. The scope of the course was about right.	5	4	3	2	1	N/A
5. This training will have a positive impact on my performance.	5	4	3	2	1	N/A

INSTRUCTOR

6. The presenter was knowledgeable about this subject.	5	4	3	2	1	N/A
7. The presenter's style was effective.	5	4	3	2	1	N/A

MAIN REASON FOR TAKING THE TRAINING

1. Subject matter was of value to me.	5	4	3	2	1	N/A
2. My boss wanted me to.	5	4	3	2	1	N/A
3. Advance my career in present job.	5	4	3	2	1	N/A
4. Advance my career in a different job.	5	4	3	2	1	N/A
5. I took prior course with you and was satisfied.	5	4	3	2	1	N/A

LEARNING EFFECTIVENESS

1. I like the convenience & flexibility of online learning.	5	4	3	2	1	N/A
2. Compared to other learning providers, I would rate your training superior.	5	4	3	2	1	N/A

INTEREST IN FUTURE TRAINING AND DEVELOPMENT

1. Based on this experience I would look forward to taking another course with you.	5	4	3	2	1	N/A
2. Based on this experience I would recommend this training to others.	5	4	3	2	1	N/A
3. I would like to be notified about advanced or complementary courses in the future.	5	4	3	2	1	N/A

OTHER COMMENTS

What about this training and development was most useful to you?

What about this training was least useful to you (If any)?

If you feel you will be successful applying any of the lessons learned, please provide a few tangible examples of what or how that would be.

Please provide any additional comments or recommendations to help us continue to improve our training and development programs.

RATE FUTURE TOPICS

Please rate the following topics that we are considering for upcoming training. (5=very interested, 1=not at all interested)

➤ How to Legally and Effectively Handle Whistleblowers	5	4	3	2	1
➤ Safety Incentive Programs: What’s Working Today	5	4	3	2	1
➤ Ergonomic s Today: Guidelines for Protecting Employees	5	4	3	2	1

ADDITIONAL QUESTIONS

Gender Male Female

Your age:

Under 25 25-29 30-34 35-39 40-44 45-49 50-54 55+

How many years have you been working in the current job?

Less than 1 year 1-2 yrs 3-5 yrs 6-10 yrs 11-19 yrs over 20 yrs

TRAINING REQUIREMENTS

By signing this evaluation, I am confirming that I was in attendance for the ENTIRE conference presentation.

Conference Sign-in Time: _____ Conference Sign-out Time: _____

Print Name: _____ Signature: _____

Contact Information:

Name: _____ Title: _____

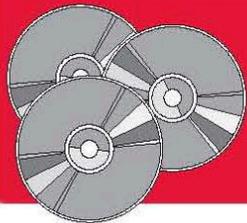
Company: _____

Address: _____ City: _____ State: __ Zip: _____

(please include your company address so your Continued Education Certificates can be mailed)

Phone: _____ E-Mail: _____

Thank you for completing this questionnaire. It helps us improve our training.



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Yes! I want to reserve my copy of the “Arc Flash Safety Requirements: Keep Complaint; Protect Your Employees” Event #4068 webinar at the special discounted price of only \$99 (regularly \$199). This price is for conference attendees only.

Payment information:

Check enclosed for \$_____ (payable to Progressive Business Conferences)

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For fastest service, call:

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THE PURPOSE OF THE PBC ONE HOUR LIVE WEBINARS AND AUDIO CONFERENCES FOR EXECUTIVES

The purpose is to keep executives current, knowledgeable and effective where they have needs related to their important accountabilities. Organizations are heavily influenced by new regulations, current know how in many areas and the latest best practices for solving problems they're facing. PBC brings executives and their staff reliable, practical, cutting-edge information to help them be more informed and more effective without having to leave their office. A portion of every conference is reserved to answer questions from attendees. Attendance at conferences during the last 12 months has been approximately 160,000 executives and their team, up from 120,000 in the prior 12 months.

THE SPEAKERS

PBC attracts experts who are among the most accomplished practitioners in their field from all over the country. This has ensured that the emphasis is on the practical rather than the theoretical. The major criteria in speaker selection are that they have the knowledge and demonstrated track record in their field.

Please fill out the evaluation after the conference so that we can gain important insight into how well we're meeting your accountabilities and needs and any suggestions for improvement.

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Sincerely,



Michelle Myers
Conference Manager
Progressive Business Conferences