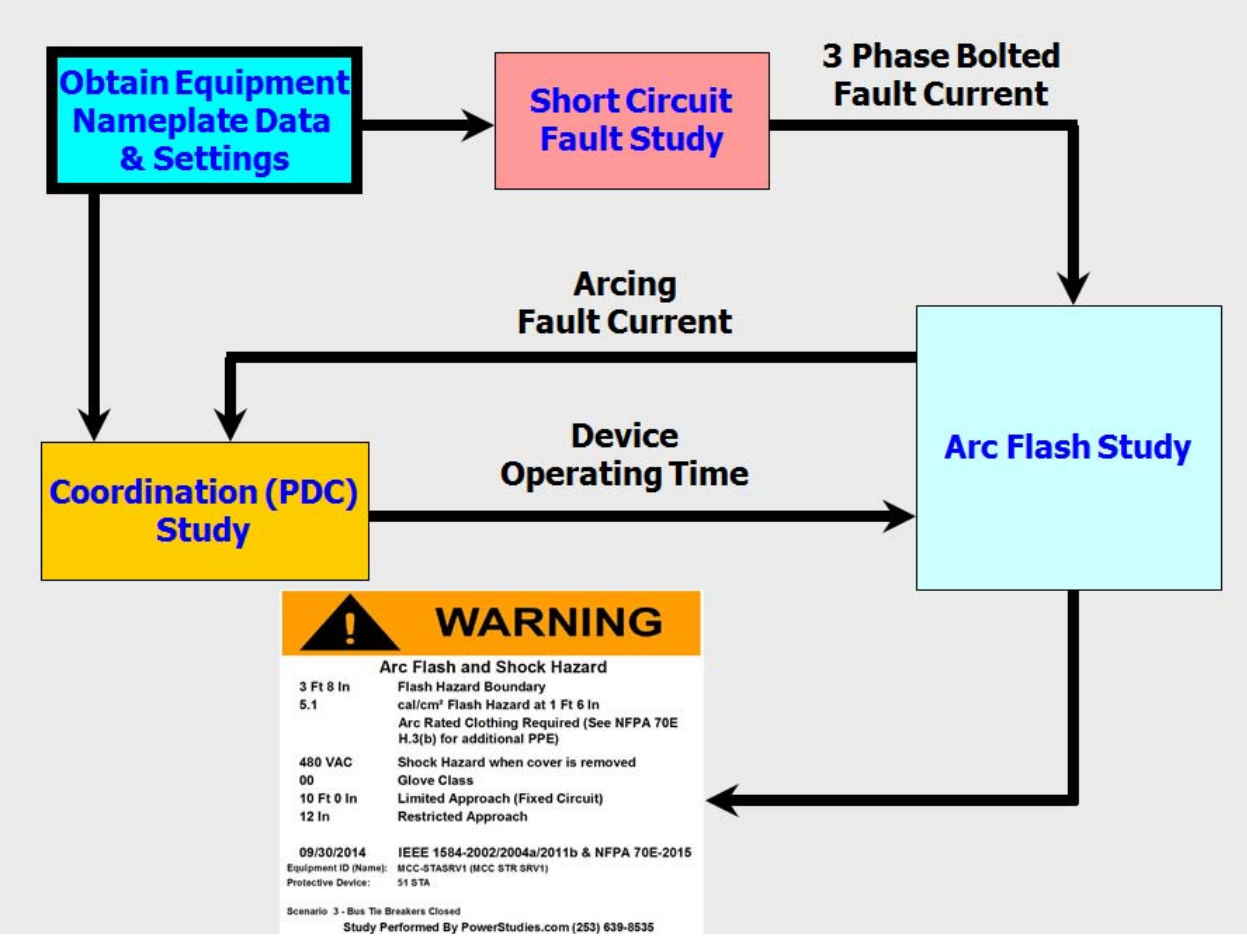
PowerStudies INC. ®
Phone 253-639-8535 ■ Fax 425-413-6797 ■ 22443 SE 240th St., Ste. 207, Maple Valley, WA 98038

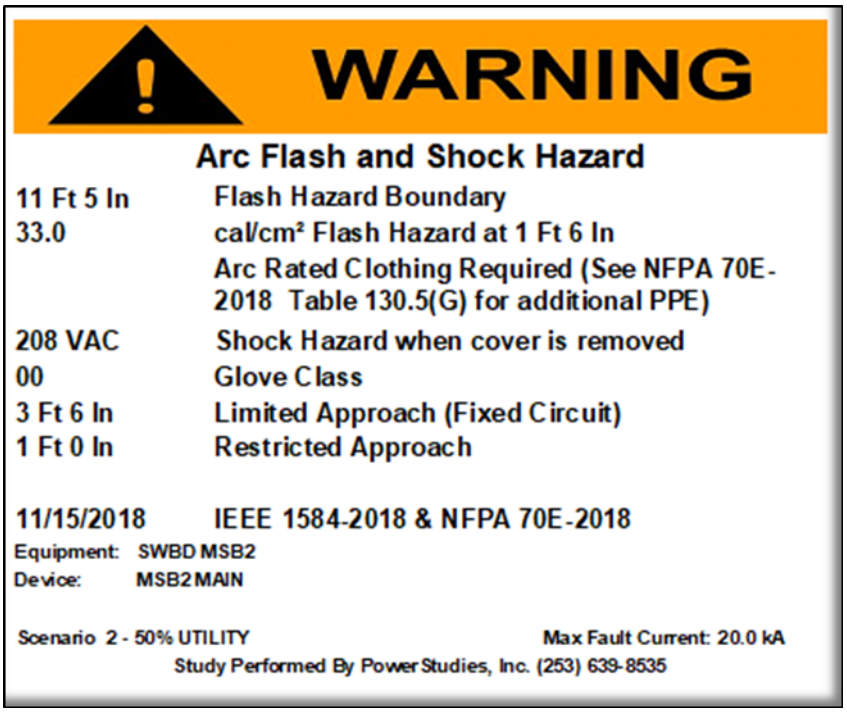
Congratulations on your decision to have an Arc Flash Hazard Analysis (Arc Flash Study) performed at your facility. You are on your way to complying with OSHA your State regulations and making your facility a safer place to work. The following is a discussion of what an Arc Flash study is, study phases, and options available.

Arc Flash Study: To calculate the arc flash (incident energy) at a location, the amount of fault current and the amount of time it takes for the upstream device to trip must be known. We will model the distribution system into SKM, calculate the short circuit fault current levels and use the protective device settings feeding switchboards, panelboards, industrial control panels, and motor control centers to determine the incident energy level.



We will produce a colored custom Arc Flash Label that will list the following items:

- Arc Flash hazard boundary
- Amount of incident energy
- Personnel Protective Equipment (PPE) needed
- Shock hazard Voltage
- Glove Glass
- Limited approach boundary
- Restricted approach boundary
- Study completion date
- Study Method and Standards used (IEEE 1584 or NFPA 70E)
- Equipment ID
- Upstream protective device name
- Operating Scenario (i.e. Normal, Emergency)
- We will provide colored custom stick-on labels like the one shown below for each location



An arc flash hazard study will...

- Increase the awareness of flash hazards
- Increase facility reliability, equipment protection, and personnel safety
- Comply with NEC Article 110.16, NFPA 70E, State, and OSHA Standards
- Reduce the owner's liability for electrical accidents and personnel injury

Performing an Arc Flash Analysis is a multiphase project and requires careful planning and implementation. Below are the phases for completion of these important studies.

- **Quotation Phase**
    - *Quotation and Proposal* – Before we can provide you with a price to perform the study, we need to know how big is your electrical system, what study options you may want, who will collect the equipment data and install the arc flash labels. We can determine how big your electrical system is by counting the quantities of electrical equipment shown on your one line drawing or by an equipment inventory spreadsheet.
    - *One Line Drawing* - Customer provides one line diagram to PowerStudies, Inc. Old incomplete one line drawings are better than none. If no one line drawing is available, an electrical equipment inventory will need to be performed.
    - *Site Visit and Electrical Equipment Inventory* – If no one line drawing is available, then an electrical equipment inventory will need to be performed to determine the quantities of equipment and needed AF labels.
        - This can be performed by the owner's electricians or electrical contractor. We will provide a spreadsheet to enter the quantities & types of electrical equipment. (i.e. panelboards, transformers, generators….etc.)
        - PowerStudies, Inc can provide this service for small fee. Usually this fee is the travel costs and this will be refunded to the customer at the end of the project.
    - *Options that will affect the price* - There are several options that are available to the customer which can affect the total price.
        - *Data Collection* – This can be performed by different groups.
            - Customer's Electricians*
            - Customer's Electrical Contractor*
            - PowerStudies, Inc's Engineers or Electrical Contractors

            * - When the customer's electricians or electrical contractor are used, PowerStudies, Inc will provide up to eight hours of on site data collection and training. This insures that the data collections starts off on the right foot and eliminates costly return visits.

- *Impedance One Line Drawings* - After the data is collected, PowerStudies, Inc can provide an impedance one line drawing. This drawing is generated by the SKM program. It shows the reviewer the input data and how the distribution system is modeled. For an extra fee, we can also update your one line drawings and provide them in AutoCAD format .

- *Short Circuit and Protective Device Coordination Studies* – Now would be a good time to perform these studies for your facilities. These studies will verify that the equipment is properly rated for the available short circuit current. The protective device coordination study will determine new settings for your adjustable solid state circuit breakers and relays. This will increase the facility reliability and safety. More information about these studies can be found at the end of this document.

- *Label Installation* – Just like with data collection, there are several options that available to the customer. The labels can be installed by:
  - Customer's Electricians
  - Customer's Electrical Contractor
  - PowerStudies, Inc's Electrical Contractor

- *Electrical Safety in the Workplace (Arc Flash) Training* – PowerStudies, Inc has certified e-Hazard.com training instructors who can present an informative and interesting seminar to you and your employees. This will help you to comply with OSHA's training requirements, increase safety awareness, and reduce electrical accidents. This in turn will help lower your liabilities and may save reduce your facility liability insurance.

- **Data Collection Phase**

  - *Data Collection* – This is one of the most important phases of the project. It can represent 50 to 70% of the study cost. To perform an accurate arc flash study, the equipment nameplate data will need to be collected. Protective device settings will need to be entered. This data is needed to calculate the short circuit and upstream device operating times which in turn, is used in the Arc Flash energy equations.

  - *On Site Data Collection Training* – If the customer has selected to collect the data using their electricians or electrical contractor, then PowerStudies, Inc will provide an instructor for up to eight hours to train the personnel on how to collect the data and enter it into the PSDB database program. The seminar will include 4 hours of class room training and 4 hours of field data entry training.

- *PSDB Equipment Database* – (Option) Power System Equipment Database (PSDB) is provided to the owner at the completion of the study. The database will contain and list all electrical equipment used in the study and the results of the short circuit, protective device study, and arc flash study. This equipment database is a Microsoft ACCESS Database. For more information about this database, please see the ***Optional Power System Studies and Services*** section below.

- **Study Phase**

  - *Calculations* – After the equipment data has been collected and turned over to the PowerStudies, Inc. The protection engineer will perform the various study options listed previously above.

  - *Arc Flash Label Creation –* Once the calculations are completed, then the data is imported into our PSDB program from which we can print out the custom Arc Flash Labels.

- **Label Installation**

  - *Labels* – The labels are installed on the electrical equipment. This works best if it is done by person who collected the equipment nameplate data.

- **Training Phase**

  - *NFPA 70E Electrical Safety in the Workplace Training* – After the labels have been installed, we recommend an NFPA 70E electrical safety seminar to meet OSHA's training requirements. We can provide both High and Low Voltage Electrical Safety Training for qualified electricians. We can also provide electrical safety training for non-qualified personnel.

- **Study Deliverables**

  - *Report* –
    - Introduction
    - Executive Summary and Recommendations
    - Short Circuit Study description, assumptions, and results (option)
    - Short Circuit Study Computer Printout (option)
    - Equipment Summary List Comparing calculated to rated fault values (option)
    - Distribution system impedance one line drawing(s)
    - Protective Device Study description, assumptions, and results (option)
    - Color Time current curves demonstrating selective coordination (option)
    - Protective device settings list showing device data and settings

(option)
    - Copies of manufacturer's time current curves used in the study
    - Arc Flash Evaluation Bus Report
    - Arc Flash Bus Labels – Paper for indoor- no industrial facilities and vinyl labels for industrial or utility facilities.

- *Arc Flash Labels – Adhesive backed colored labels 4" x 5*

- *SKM project data base files. (option)*

- *Existing Equipment (PSDB) Database files (option) – ACCESS electronic files*

▪ Optional Power System Studies and Services

The following optional power system studies and services are available from PowerStudies, Inc:

PSDB Equipment Database: Power System Equipment Database (PSDB) is a database that contains and lists all electrical equipment used in the study. It contains imported results of the short circuit, protective device study, and arc flash study. This equipment database is written in Microsoft ACCESS Database. The data base has the following features and functions:

- Equipment Nameplate Data and Protective Device Settings for the following equipment shown in the table below. The database has an equipment database report listing the data below for each piece of equipment.

ATSs	Control Panels	Disconnect Switches
Circuit Breakers	Fuses	Generators
Motor Control Centers	Motor Starters	Motors > 50 HP
Bus Duct Runs	Panelboards	PDUs
Relays	Switchboards	Switchgear
Transformers	UPS	VSD
Conductor	Other Equipment	Utility Data

- Typical equipment nameplate data is shown below.

Manufacturer	Type	Voltage
Amperage	kVA	HP
Size (conductor)	Length (conductor)	# per Phase (conductor)
RLA (motor)	LRA (motor)	NEMA Code (motor)
Frame Size	Trip	Sensor
Breaker & Relay Settings	Impedance (generators & transformers)	Winding Connections (Transformers)
Temperature Ratings	Short Circuit Rating	Withstand Rating
Date of Manufacture	Weight (transformers)	Catalog Number
Serial Number		

- Library with conductor, transformer, fuse, relay, and circuit breaker data.
- Short Circuit Study results are imported from SKM program for all operating scenarios.
- Arc Flash Study results imported from SKM program for all operating scenarios
- Ability to print Arc Flash labels from the database.
- Protective Device sizes and settings

- Time Current Curve report and with comments on each curve

- The database produces the following reports:

Low Voltage Equipment Short Circuit Summary Sheet	Medium Voltage Equipment Short Circuit Summary Sheet	Arc Flash Energy Report (All Scenarios)
Arc Flash Energy Report (Maximum Energy)	Arc Flash Labels (All Scenarios)	Arc Flash Labels (Maximum Energy)
Equipment Nameplate Data and settings Report	Discussion of TCCs Report	Missing Transformer Data Report
Missing Motor Data Report	Missing Conductor Data Report	Missing Connections Report

The PSDB Database will…

- Allow the customer to quickly retrieve equipment nameplate data, device settings, and study results.
- Allows the customers to print additional arc flash labels from their own color printers if needed.

One Line Diagram Revision/Generation: We will construct a comprehensive and up-to-date power system one-line diagram using CAD drafting services. We will perform the equipment survey necessary to acquire the data needed to do the study.

An updated one line diagram will…

- Allow for greater ease of on-site electrical system trouble shooting
- Reduce potential mismatches when adding on to an existing facility
- Provide the most up-to-date information for performing accurate power system studies

Protective Device Coordination Study: We will determine settings for your protective devices (circuit breakers and relays) and determine ampacities for any fuses in the power system. These settings and ampacities will be determined by plotting the Time Current Curves of the devices and applying NEC, IEEE, ANSI and UL standards.

A protective device coordination study will…

- Increase equipment protection
- Ensure protective device coordination by setting the protective devices to trip in sequence.
- Increase facility reliability by limiting the effects of a disturbance (fault/over load) to smaller areas of the distribution system.

Short-Circuit Study: We will calculate the short circuit fault current levels at different locations in the power system. We will compare these calculated fault currents to your equipment short circuit interrupt/withstand ratings in order to determine if you have a

problem.

A short circuit study will…

- Identify underrated equipment before extensive system damage can occur
- Increase facility reliability, equipment protection and personnel safety
- Aid in future expansion plans by providing accurate fault current calculations at each location in the system, thereby allowing properly rated equipment to be specified.

Load Flow: We will calculate Kilowatts (KW), KiloVARs (KVAR), Power Factor (PF), and voltage drops at various locations in the power system. We will determine how the system will operate in normal and emergency conditions. We will also check for the application of power factor correction capacitors.

A load flow study will…

- Reduce your electric bill by determining the location and size of power factor correction capacitors
- Aid in future planning and present day to day operation by demonstrating how the electrical system will perform during normal and emergency operating conditions
- Determine the proper transformer tap settings so that the correct voltage will be present at motors and other loads during full load and no load conditions
- Identify under-utilized equipment to which will allow for future load growth
- Identify overloaded equipment
- Increase the distribution system operating efficiency and determine the most optimum operating configuration

Motor Starting: We will model and simulate the motors starting on your distribution system. We will calculate flicker and voltage drop due to motor inrush current. We will also determine the best method to start the motor with minimal impact to the rest of the distribution system.

A motor starting study will…

- Reduce voltage flicker or voltage drop problems in the facility
- Increase facility reliability

Harmonic Study: We will identify, monitor and measure harmonics generated by no-linear equipment. The study will determine if your facility exceeds the IEEE 519 Limits. We will determine harmonic mitigation techniques to reduce the harmonics. Examples of these are phase shifting, zig-zag transformers, and filter installation.

A harmonic study will…

- Identify the source of harmonics (internal or external to your facility)
- Evaluate the impact of non-linear loads (harmonic sources) on facility

distribution systems

- Evaluate compliance with IEEE 519
- Verify proper size and placement of capacitors when harmonic sources are present.
- Verify proper size, configuration and placement of filters, if necessary

Power Factor Study: We will select the size and location of capacitors to improve power system efficiency and eliminate penalty charges.

A power factor study will…

- Reduce utility penalties
- Improve voltage profile by raising voltage
- Ensure proper sizing of capacitors
- Ensure proper placement of capacitors
- Verify that there will be no abnormal interaction between harmonic sources and the capacitors

Transient Analysis Study: We will quantify and locate the cause of damaging transients and identify solutions to minimize or eliminate them.

A transient analysis study will…

- Increase equipment protection by eliminating, reducing, or controlling the transients to a safe level
- Increase facility reliability
- Minimize mis-operation of protective devices and switching equipment

Low Voltage NFPA 70E - 8 Hour Qualified Training Course Outline

Does your company need an electrical safety training program providing the following benefits?

1. Is comprehensive and fulfills the training requirements for NFPA 70E and applicable OSHA regulations for low voltage qualified persons.
2. Is oriented toward persons performing the work.
3. Is fast paced and engaging.
4. Video of arc flash accidents and PPE testing
5. Is common-sensed based.
6. Is taught by knowledgeable instructors with field experience.

If your answer is YES, then you want *Electrical Workplace Safety* from e-Hazard. In one day of training, low voltage qualified persons receive the mandatory level of classroom training needed on the primary governmental regulations for shock and arc flash safety. e-Hazard's *Electrical Workplace Safety* covers safe work practices, how to protect against shock and arc flash, PPE requirements, permits, creating an electrically safe work condition, and much, much more. Following is just an example of what is covered in this acclaimed program.

Safety Facts

Fact: Almost 8000 electrical contact accidents occur in the U.S. each year.
Fact: One worker dies each day from electrical contact.
Fact: Fatalities from electrical accidents with a potential arc flash component have been trending downward since recent mandatory safe work practices have become "law."

It often takes facts and statistics to convince us of why we need to take more care when working around electrical hazards. To achieve this level of understanding, e-Hazard includes the following:

- Accident statistics.
- Governmental regulations and laws, and their working relationships
  - OSHA and 70E
  - NESC and 70E
  - Citations.
- What comprises an electrical safety program?
- What makes the most difference in an electrical safety program?

Low Voltage NFPA 70E - 8 Hour Qualified Training Course Outline

Electrical Hazards & Protection

You have to understand the hazards before you can understand how the prevention works. That is why our program covers:

- Types of hazards -
  - Shock,
  - Arc flash and flash.
- Common location of hazards.
- Shock and shock protection -
  - Approach boundaries,
  - PPE,
  - Protecting against shock exposure,
  - Mitigating shock exposure through engineering,
  - The most common killer of electricians, not what you think.
- Arc flash and flash protection -
  - Flash hazard boundary,
  - PPE,
  - De-energizing,
  - The single most important PPE item for arc flash,
  - Reducing the hazard through work practice and engineering.

Personal Protective Equipment

When a hazard cannot be removed or controlled, defensive action must be taken. That is where PPE comes in because PPE does save lives. This section of the training includes:

- What is PPE.
- Gloves in electric arc, which should I use?
- FR clothing - what works and what doesn't.
- What you should know about underwear and misc PPE.
- Arc flash protection principles -
  - The power of layering,
  - The power of FR clothing,
  - Making habits for living a long life.
- PPE protection schemes.

Flash Hazard Assessment

Knowing the level of potential hazard is critical to taking the proper level of precaution. That is why everyone needs a basic understanding of:

- Risk analysis.
- Arc energy theory.
- How to determine safe working distances.
- 70E Table requirements.
- IEEE 1584 Hazard Assessment Calculations

Low Voltage NFPA 70E - 8 Hour Qualified Training Course Outline

- What effects Arc Flash Hazard Energy Levels

Safe Work Practices

Persons exposed to electrical hazards, whether from using a portable electric drill or racking out a CB, need to know the work practices that keep them safe from harm. Here is a sampling of what is covered:

- Using portable tools.
- GFCIs.
- Grounding.
- Lockout/tagout.
- Insulated tools.
- Is it guarded, isolated or insulated?
- Operating mobile equipment around electrical hazards.
- Necessary record keeping.
- Auditing to keep safety awareness high.

Working On or Near Live Parts

When does working “near” become working “on”? When are insulated tools required? When is it live-line work? This section of the training answers these questions and covers:

- General rules,
- OSHA and NFPA 70E best practices,
- “Left” hand rule,
- Safe work zone,
- Live work permit,
- Personal grounds,
- Barricading and guarding live parts,
- Signage,
- Labeling equipment (minimum requirements from NEC and best practice).

Be Safe Out There

Complacency **will** get you killed. The closing section of this program, reminds everyone how safety must be attended everyday. This is re-enforced through:

- Training requirements from NFPA 70E and OSHA,
- Four-step analysis,
- Audit bloopers (Can you see the mistakes?),
- Don’t drop your defenses.

e-Hazard

Low Voltage NFPA 70E - 8 Hour Qualified Training Course Outline

Seminar Features:

- Numerous Videos and Clips
  - Arc Flash Accidents
  - NFPA's 70E Safety Requirements for Electricians
  - Arc Flash PPE testing
  - "I Felt Comfortable" The Randy Fellhoelter Story
- Each student will receive:
  - Course workbook with copies of Power Point slides for each student
  - NFPA 70E Electrical Safety in the Workplace book for each student

This seminar is an approved course for CEUs by the State of Washington and many other States. Contact us for the latest list of States that have approved this course. The instructors for this seminar are Robert E. Fuhr, P.E. and Kevin Taulbee who are approved Electrical Continuing Education Course Instructors by the State of Washington. Their resumes can be found on the next page. For more information, contact
Robert E. Fuhr, P.E. at fuhr@PowerStudies.com or Kevin Taulbee at Taulbee@powerstudies.com

PowerStudies INC.

Robert (Bob) Fuhr, P.E., P. Eng.
President
Fuhr@PowerStudies.com

Our POWER is in Our PEOPLE !

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Low Voltage NFPA 70E - 8 Hour Qualified Training Course Outline

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Robert E. Fuhr; P.E., P. Eng.
President

PROJECT DESIGN AND IMPLEMENTATION

- Designs control systems for circuit breakers, metering circuits, transformers, protective relays, gas turbines and generators
- Performs short circuit, protective device coordination, arc flash, harmonic, load flow & other power system studies for industrial, commercial, and governmental clients
- Proficient in the use of SKM PowerTools and ETAP software
- Co-designed 115 kV Substation and 13.8 kV Distribution system for Boeing - Renton Facilities

ANALYSIS AND EVALUATION

- Investigates power quality problems and installs monitoring equipment
- Investigates problems and repairs power delivery equipment and control circuits (analog and digital)
- Evaluates test results and writes both summaries and large reports

CUSTOMER RELATIONS AND SERVICE

- Appraises customer's distribution systems and prepared quotes
- Teaches customer electrical safety, harmonics, protective device coordination, arc flash hazard assessments, power factor correction, and equipment operation seminars and workshops

SUPERVISION AND LEADERSHIP

- Owns and operates consulting firm specializing in power system studies
- Officer and Chairman for Seattle - IEEE Industrial Applications Society 1991-92
- Supervised service shop craftsmen and electricians in installation, maintenance and repair jobs
- Teaches seminars on Arc Flash Energy Calculations and Ways to Reduce Arc Flash Energy
- State Certified LV & HV Electrical Instructor and e-Hazard Certified Instructor

EMPLOYMENT HISTORY

- 1986 - Present President-PowerStudies, Inc., Maple Valley, WA
- 1986 -1989 Senior Facilities Engineer-Univ. of Washington, Seattle, WA
- 1980 -1986 Field Engineer-General Electric Co., Seattle, WA
- 1977 -1980 Engineer's Assistant-Madison Gas & Electric Co., Madison, WI
- 1976 -1977 Coop Student-Tennessee Valley Authority, Knoxville, TN

EDUCATION & PROFESSIONAL CREDENTIALS

- B.S., Electrical Engineering - University of Wisconsin, Madison, WI
- Professional Engineer Licenses - Alaska, Arizona, California, Colorado, Delaware, Florida, Hawaii, Idaho, Iowa, Nevada, New Mexico, New Jersey, Maryland, Oregon, Pennsylvania, Virginia, Washington, and British Columbia
- State of Washington Approve Electrical Continuing Education Course Instructor – 2005 to Present
- IEEE - Protective Relaying Principles & Applications – 1988
- IEEE 1584 Committee Member 2010 - Present
- General Electric Co. - Industrial Power Systems Coordination - 1985
- SEL - Directional and Reclosing Relays - 2006

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Kevin Taulbee, CSP OHST
Electrical Engineer

PROJECT SUPPORT

- Performs short circuit, protective device coordination, harmonics analysis, motor starting, generator sizing, power factor correction and arc flash for industrial, commercial, and governmental clients
- Reviews project data prior to completion
- Creates Impedance Drawings
- Compiles and delivers final reports for power system studies

CUSTOMER RELATIONS AND SERVICE

- Customer liaison for determining current project status
- Provides support in contacting contractors and engineers to obtain information needed to perform studies
- Serves as company representative working with engineers, owners, and manufacturing clients

CERTIFICATIONS

- Certified Safety Professional (CSP)
- Certified Occupational Health and Safety Technologist (OHST)
- Level One Certified Auditor for process safety management (PSM-1)
- OSHA Authorized General Industry Training (10 & 30-hour training)

EMPLOYMENT HISTORY

- 2016 – Present: Electrical Engineer – PowerStudies, Inc., Maple Valley, WA
- 2007-2015: KY- OSHA - Senior Safety Consultant Region 4 – Division of Education & Training – Frankfort, KY
- 2005-2007: KY - OSHA - Safety Compliance Office Region 4 – Division of Compliance - Frankfort, KY

EDUCATION

- B.S., Electrical Engineering – University of North Dakota – 2016
- B.S., Electronics Engineering Technology – DeVry University – 2013
- B.A., Political Science – Transylvania University - 2005

* END CUSTOMER NAME:

PowerStudies.com
POWER STUDY REQUEST FORM

QUOTE#

* DATE: _____

SUBMIT QUOTE REQUEST FOR SCHEDULING OF CUSTOMER WALK-THROUGH

* DISTRIBUTOR NAME / LOCATION / ACCOUNT NO:	Salesperson Bob Fuhr	QUOTE THROUGH: ☐ DISTRIBUTOR ☑ PowerStudies.com Direct
* CELL:	Region: Covington	COMPETITOR AWARENESS:
* DISTRIBUTOR ACCOUNT MGR:	Cell: 206-915-4361 Office: 253-639-8535	☐ BUSSMANN ☐ CUTLER-HAMMER ☐ SQUARE D ☐ SIEMENS ☐ OTHER:
	EMAIL: fuhr@powerstudies.com	
REP FIRM: %	*REP SALESMAN: *please identify primary contact*	
REP CELL PHONE:	* REP EMAIL:	Job Spec/Pricing info? Y / N ? - *if available provide details on Page 2 or attach*

*** END CUSTOMER CONTACT INFORMATION -- FILL IN END-CUSTOMER QUALIFICATION INFORMATION ON PAGE 2**

	* LOCATION 1 -- MAIN	* LOCATION 2 *(if applicable)*	* LOCATION 3 *(if applicable)*
ADDRESS			
CITY / ST			
CONTACT			
TITLE			
PHONE			
EMAIL			

* ALA-CART SERVICES / DESCRIPTIONS	* CHECK IF NEEDED		* REASON FOR REQUESTING SERVICES, I.E., OSHA COMPLIANCE, ACCIDENTS / LEGAL, INSURANCE, EXPANSION OF SAFETY PROGRAM
DATA GATHERING	☐		
HAZARD ASSESSMENT (ARC FLASH)	☐		
* SHORT-CIRCUIT STUDY	☐		
* COORDINATION STUDY	☐		
ONE-LINE DRAWINGS	☐		
LABEL GENERATION	☐		They are trying to increase safety and reduce the number of outages.
LABEL INSTALLATION	☐		**ANY COMPETITIVE PRICING INFORMATION?**
TRAINING DOCUMENTATION	☐		
QUALIFIED SAFETY TRAINING	☐		
UNQUALIFIED SAFETY TRAINING	☐		
DEVICE EVALUATION STUDY	☐		
SAFETY PROGRAM EVALUATION	☐		
SAFETY PROGRAM DOCUMENTATION			

INFO NEEDED TO ESTIMATE TIME OF WALK-THROUGH

END CUSTOMER NAME:

Internal use only:

QUOTE#

DATE: _____

* CUSTOMER'S FACILITY SIZE & SERVICE INFO FOR WALK-THROUGH:

* NO. OF WALK-THRU LOCATIONS: _____

* FACILITY 1 - SQ. FOOTAGE: _____

* FACILITY 2 -SQ. FOOTAGE: _____

* FACILITY 3 - SQ. FOOTAGE: _____

* AGE OF FACILITIES: _____

* NO. OF INCOMING ELECTRICAL SERVICES FROM UTILITY: _____

* NO. OF INCOMING ELECTRICAL SERVICES FROM UTILITY: _____

* NO. OF INCOMING ELECTRICAL SERVICES FROM UTILITY: _____

* ARE THERE ON-SITE GENERATORS / UPS SYSTEMS? _____

* CUSTOMER DETAILS NEEDED IF A COMMERCIAL BUILDING:

* NO. OF ELEVATORS & FLOORS: _____

* NO. OF CONTROL CENTER ROOMS: _____

* TENANTS/BUSINESS TYPES IN BUILDING: _____

* ARE THERE LARGE DATA CENTERS? _____

* OTHER CUSTOMER DATA NEEDED TO QUALIFY OPPORTUNITY:

*** AVAILABILITY AND ACCURACY OF EXISTING ELECTRICAL ONE-LINE DIAGRAMS:**	
*** IS THERE A BUDGET FOR THIS PROJECT? WHAT IS THE APPROX. AMOUNT?**	
*** DOES CUSTOMER HAVE ANY TIMELINE OR DEADLINE EXPECTATIONS OR REQUIREMENTS FOR COMPLETING THE WORK?**	
*** CUSTOMER'S DECISION-MAKING PROCESS (I.E. IDENTIFY DECISION MAKERS AND MANAGERS):**	
*** SPECIAL SAFETY REQUIREMENTS FOR WALK-THRU OF FACILITY: (HARDHATS, SAFETY GOGGLES, STEEL-TOE SHOES, ETC.)**	

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Site Inventory Instructions

1 - To estimate the cost of the Power System Study (Arc Flash, Short Circuit, and Protective Device Studies), we need to know the types and quantities of equipment in your facility. This will not require de-energizing any equipment.

2 - To get started, click on the Printout Inventory Sheet Worksheet below. Print out the Data Sheet in 11 X 17" format if possible. You can also print out the sheet in 8 1/2 X 11" format and then enlarge it to 11 X 17" format. Make several copies as you may need them.

3 - Start anywhere in your facility and count the different types of equipment found. Continue through out the facility. We usually place quantity tick marks (i.e. II - qty 3 and ~~IIII~~ - qty 5) for each category. See the Printout Inventory - Example Worksheet.

4 - At the end of the inventory, we enter the equipment totals into the Equipment Inventory Worksheet. This spreadsheet will count up the number of labels needed and the approximate equipment data collection time.

If you have any questions, please call our office at 253-639-8535. Thank you for supplying us with this information. We look forward to preparing a quotation for your facility.

Definitions:

ATSs or MTSs - Automatic Transfer Switch or Manual Transfer Switches

Control Panels - Examples are Lighting control panels or other control panels that have 480 Volt service or 208 V fed by 125 kVA transformer or larger.

Control Panels (w/ Disc & Mtr Starters) - Examples of this type of equipment are compressor skids, packaging equipment, and other equipment skids. These are usually fed by 480 V sources and have disconnect switches (fuse or unfused) and motor starters.

Disconnect Switches - We normally include all LV-low voltage fused & MV-medium voltage fused and non fused disconnect switches. However, including all non-fused low voltage disconnect switches can be very expensive. Since the non fused disconnect switches are normally used for lockout and tagout purposes only, we normally do not include them in our studies.

LV Fused - Recommended to be included in equipment count.

LV Non-Fused - - NOT Recommended to be included in equipment count.

MV Fused - Recommended to be included in equipment count.

MV Non-Fused - Recommended to be included in equipment count.

Enclosed Circuit Breakers - These are separately mounted circuit breakers that are not installed in panelboards, MCCs, switchboards, or switchgear.

T/M Trip - Thermal Magnetic Trip Unit

SS Trip - Solid State or Electronic Type Trip Unit.

Generators - Some generators will have a main breaker installed on it. Please indicate the quantity and type of breaker installed.

T/M Trip - Thermal Magnetic Trip Unit

SS Trip - Solid State or Electronic Type Trip Unit.

Motor Control Centers (MCC) - Enter the name of the form.

Main Device -T/M - Thermal Magnetic Trip Unit or Fuses

Main Breaker - SS Trips - Solid State or Electronic Type Trip Unit.

Motor Starters (externally mounted) - These are separately mounted motor starters that are not installed in motor control centers or control panels.
Motors > 50 HP - We include large motors because they can contribute fault current which effects the short circuit and arc flash calculations.
Bus Duct Runs - Enter the name on the form. These are runs of aluminum or copper bus duct. Usually, they will have plug in fused disconnect switches or plug in enclosed circuit breakers. Count up how many plug-in fused disconnect switches or plug in circuit breakers are on each bus duct run. DO NOT enter them twice above under fused disconnect switches or enclosed circuit breakers. Also, note in the comment section if this bus duct is mounted high and a man lift will be required to obtain the fuse and circuit breaker data.

Panelboards - There are two types of panelboards that we interested in. Panelboards fed at 208 Volts supplied by a transformer rated 125 kVA or greater and all fed by 480 Volts. The other panelboards are fed by 208 Volts and transformers less than 125 kVA (these are automatically considered to be Hazard Risk Category (HRC) 0 by Standard IEEE 1584.

480 & 208 >125 kVA - Fed by 480 V or 208 V transformers rated 125 kVA or greater.
208 fed by <125 kVA - fed by transformers rated less than 125 kVA.(Automatically HRC-0)
PDUs - PDUs usually contain a step-down transformer and one or more panelboards on the secondary. Total the number of transformers and panelboards in each PDU.
Panelboards
Xfmrs - Transformers
Switchboards - Enter the Name of the form
Main or Ties - Main or Tie Breakers or Fused Disconnects
T/M - Fuses -T/M - Thermal Magnetic Trip Unit or Fuses
SS Trips - Solid State or Electronic Type Trip Unit.
Fdr Brkrs/Fuses - Feeder or Branch Breaker or Fuses
T/M - Fuses -T/M - Thermal Magnetic Trip Unit or Fuses
SS Trips - Solid State or Electronic Type Trip Unit.
Switchgear - Enter the Name of the form
Main or Ties - Main or Tie Breakers or Fused Disconnects
T/M - Fuses -T/M - Thermal Magnetic Trip Unit or Fuses
SS Trips - Solid State or Electronic Type Trip Unit.
Fdr Brkrs/Fuses - Feeder or Branch Breaker or Fuses
T/M - Fuses -T/M - Thermal Magnetic Trip Unit or Fuses
SS Trips - Solid State or Electronic Type Trip Unit.
Transformers - Enter the type of transformer
Main Service - Utility or Customer Main Service
Dist >125 kVA - Distribution Transformers Rated > 125 kVA
Dist <125 kVA - Distribution Transformers Rated < 125 kVA
UPS - Uninterruptible Power Supply
Brkr with SS Trip - Breakers with Solid State or Electronic Type Trip Units
Brkr with T/M Trip - Breakers with Thermal Magnetic Trip Units
Transformer - Some larger UPS units have a front end transformer.
VSD (Externally Mounted) - Variable Speed, Frequency, Speed Drives
Lrg w/Relays & CBs - Larger 50HP or larger or VSDs with relay or circuit breaker trip units.
Small - Units rated less that 50 HP that do not have internal circuit breakers with Solid State or Electronic trip units.
Other Equipment (List) - Other equipment that electricians or technicians may work on while energized. List the name and type of equipment. An example of this would be Power Factor Capacitor Bank.

END CUSTOMER NAME:

Equipment Inventory

Internal use only:
QUOTE#

DATE: _____

Inventory Taken by:		Quantities & Locations								
	Drawings or Locations									
Category	**SubCategory**									
ATSs or MTSs										
Control Panels										
Control Panels (w/ Disc & Mtr Starters)		-								
Disconnect Switches										
	LV Fused									
	LV Non-Fused									
	MV Fused									
	MV Non-Fused									
Enclosed Circuit Breakers										
	T/M Trip									
	SS Trip									
Generators	Name									
	Brkr with SS Trip									
	Brkr with T/M Trip									
Motor Control Centers	Name									
	Main Device -T/M - Fuses									
	Main Breaker - SS Trips									
Motor Control Centers	Name									
	Main Device -T/M - Fuses									
	Main Breaker - SS Trips									
Motor Control Centers	Name									
	Main Device -T/M - Fuses									
	Main Breaker - SS Trips									
Motor Control Centers	Name									
	Main Device -T/M - Fuses									

		Main Breaker - SS Trips										
Motor Starters (externally mounted)												
Motors > 50 HP												
Bus Duct Runs		Name										
		Bus Duct Plugs	-									
Panelboards*												
		480 & 208 >125 kVA										
		208 fed by <125 kV										
PDUs		Name										
		Panelboards										
		Xfmrs										
Switchboards		Name										
		Main or Ties										
			T/M - Fuses									
			SS Trips									
		Fdr Brkrs/Fuses										
			T/M - Fuses									
			SS Trips									
Switchboards		Name										
		Main or Ties										
			T/M - Fuses									
			SS Trips									
		Fdr Brkrs/Fuses										
			T/M - Fuses									
			SS Trips	-								
Switchgear		Name										
		Main or Ties										
			T/M - Fuses									
			SS Trips									
		Fdr Brkrs/Fuses										
			T/M - Fuses									
			SS Trips									
Switchgear		Name										
		Main or Ties										
			T/M - Fuses									
			SS Trips									
		Fdr Brkrs/Fuses										
			T/M - Fuses									
			SS Trips									

Transformers										
	Main Service									
	Dist >125 kVA									
	Dist <125 kVA									
UPS	Name									
	Brkr with SS Trip									
	Brkr with T/M Trip									
VSD (Externally Mounted)										
	Lrg w/Relays & CBs									
	Small									
Other Equipment (List)										

Data Collections and Site Comments: