ARC FLASH
CALCULATION

Master the requirements of NFPA 70E and steps of conducting and implementing an arc flash assessment.
25th – 26th March 2019 | Kuala Lumpur, Malaysia

Mike Bahr expertise

Mike Bahr brings over four decades of experience in the electrical field to his presentations and programs to help people avoid the pain and suffering of workplace injury to electrical workers. Mike developed an interest in electrical safety after several serious arc flash incidents occurred at the facility where he worked early in his career. Since then he has dedicated his career to the safety profession and has specialized in the area of Arc Flash Safety. Mike has developed and presented arc flash training worldwide and is a former principal member of the NFPA 70E committee (Electrical Safety Related Work Practices). Mike also served as the principal investigator for the development of the United States Department of Energy (DOE) Electrical Safety Program.

Electrical dangers such as shock, electrocution, arc flash, and arc blast will always be present on the job, but proper training and safety strategies can minimize the likelihood of injuries and fatalities.

The process of arc flash analysis and the programs to protect employees from shock and arc flash is still developing. Research into arc flash is ongoing, and calculation methods and safe work practices changing rapidly in order to better protect the workers that workers exposed to the hazards of shock and arc flash.

This 2 days masterclass will review all of the significant changes to both NFPA 70E-Standard for Electrical Safety in the Workplace and IEEE 1584:2018-IEEE Guide for Performing Arc-Flash Hazard Calculations.

Arc Advisor: (Each participant will received arcadvisor software tools F.O.C to use during the course and to keep for own subsequently use)
Participants will be given worksheets with a sample one-line diagrams with the information needed to perform short circuit current calculations. This will provide participant with hands-on experience on determine incident energy, arc flash protection boundaries and complete the arc flash warning label for each location by using the Arcadvisor software. They will also select the proper PPE required to protect exposed workers.

Will this course benefit companies that are currently have an existing software such as ETAP, SKM or Easy Power?
There are major changes to IEEE 1584. The changes include equations for 5 different electrode configurations, choices for enclosure sizes, an enclosure correction factor calculation to adjust for enclosure sizes, and the grounded vs. ungrounded difference has been eliminated. Those that are currently using commercially available software for performing arc flash hazard analysis will need to be aware of these major changes in the calculations. Participants will also learn how to properly obtain the necessary data based on the latest requirements to accurately represent the system under study.

MASTER the necessary knowledge and complexities of:
- Define arc flash assessment methods
- How to choose between the table method and the calculation method of arc flash hazards assessment
- Identify when to use single phase vs three phase calculations
- Understand changes to IEEE 1584
- When to use ArcPro (utility) Vs IEEE 1584 (utilization)
- Requirements of NFPA® 70E (2018)
- Arc flash clothing requirements
- Calculation methods (hand calculations or commercial software)
- Limiting arc exposure

PRACTICAL INVOLVEMENT:
Having the ability to implement directly once you are back at your workplace is crucial for every participant. During the 2 days training, practical involvement and activity will be share. Participant will be involved in activities as per below:
- Data collection exercise
- Arc flash calculation exercise
- Label development exercise
- PPE selection exercise

This program is intended for:
Any industrial and manufacturing that have employees that service and maintain electrical equipment while energized should attend this course:
- Plant, facility, and electrical engineers
- Consulting, utility and industrial engineers responsible for arc hazard analysis in the selection of protective equipment and clothing
- Safety officers and program managers
- Utility Engineers needing in-depth understanding of arc hazard assessment and analysis
- Engineers that are currently using commercially available software (ETAP or Easy power) for performing arc flash hazard analysis will need to be aware of the major changes in the calculations. (Due to major changes to IEEE 1584)
DAY 1

**Introduction to the Arc Flash Hazard**
What is an arc flash, characteristics, electrical safety overview.

**Human Effects**
Physiological effects, electrocution, tissue damage, internal organ damage, burns, fibrillation, “curable” 2nd degree burn

**Arc Flash Hazards**
Electric shock, arc flash, arc blast, ultraviolet light, sound pressure, burn injury

**Arc Flash Circuit Dynamics – Fault Current, Arc Duration**
Arcing faults vs. bolted faults, effect of current on overcurrent device clearing time, current limitation, effect of transformer size and source strength

**NFPA 70E Requirements**
Shock and arc flash hazard analysis, creating energized work permits, electrically safe working conditions

**Approach Boundaries**
Limited, restricted, approach boundaries, arc flash boundary

**Hazard/Risk Categories vs. Arc Flash Calculations**
Defining the NFPA 70E Hazard /Risk category table requirements, limitations of tables, using calculations instead.

**Personal Protective Equipment PPE**
Protective clothing characteristics, selection of PPE, ATPV and EBT ratings, ASTM testing methods

DAY 2

**The Arc Flash Calculation Study Using IEEE Std. 1584™**
Study requirements, methodology, calculation standards, qualifications and methods

**Data Collection Process**
Transformer, conductor, utility company, motor, overcurrent device, equipment type, working distance, generator data

**Single Line Diagram and System Modeling**
Importance of the up-to-date diagram, system configurations, high vs. low fault current, 125 kva transformer exception, motor contribution

**Arcing Current Calculations**
Arcing current calculations, defining the arc gap based on equipment type

**Arc Flash Duration - Time Current Curves**
Determining the arcing current clearing time, 85% vs. 100%, 2 second cut off rule, time current curves, arc extinction

**Incident Energy Calculations**
Incident energy calculations, calculation parameters, calculation factor, distance exponent, working distance

**Arc Flash Boundary Calculations**
Arc flash boundary calculations based on normalized incident energy, detailed IEEE calculations, unusually large boundaries, calculation worksheets, problem solving

**Determining PPE Requirements from Incident Energy Calculations**
Using calculated incident energy to determine PPE requirements. Comparing calculations to NFPA 70E tables, simplifying the selection

**Arc Flash Warning Labels**
Requirements, Label Locations

**Recommendations to Reduce the Arc Flash Hazard**
Increase working distance, remote operation, maintenance settings, arc resistant equipment and current limiting devices

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**CASE STUDIES:**
Several case studies of serious arc flash incidents. Each case study has photos of the results of improperly assessing the arc flash hazards and not utilizing proper PPE. The class will also see many video examples of the same.

The course is delivered as a combination of lectures, tutorials, exercises and discussion. Participant will have ample opportunity to discuss their own issues. Each participant will receive arcadvisor software tools to use during the course and to keep for own subsequently use.

Laptop is required

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Energy1asia.com
Mike Bahr expertise

- 30 years safety professional in the electrical utility/construction industry.
- Mike has dedicated his career to the safety profession and has specialized in the area of Arc Flash Safety.
- Mike has developed and presented arc flash training worldwide and is a former principal member of the NFPA 70E committee (Electrical Safety Related Work Practices).
- Served as the principal investigator for the development of the United States Department of Energy (DOE) Electrical Safety Program.
- Developed a reputation for being one of the best trainers in the electric power industry.

Mike Bahr previous testimonials:

“Mike’s been doing some work for AES in this part of the world examining the Electrical Safety Rules and Work Management Processes a real insight where significant safety and reliability gains can be made, including training based on NFPA 70E.”

B Vranes, AES Corporation

“The training was a huge success. Mike did an outstanding job with the electrical safety training. I received many positive comments which include, but are not limited to:

"I usually don’t enjoy this type of training, but I enjoyed the class. Mike kept it interesting"

"I learned a lot. I didn’t realize the risks I’ve been taking"

"The training really opened my eyes to the hazards and what can happen"

"The instructor did an outstanding job"

"That was the best safety class I have ever been to"

I probably had 20+ people who made comments similar to the above.

The technicians were especially impressed with Mike’s ability to present the material at a level which they could relate to their daily activities. I have witnessed a culture change.

J Daniel, Georgia Gulf

Interested in bringing a course to your location? Do you have 10 or more people needing training?

We would love to help! Call us at +603 7727 3952 or email ihtraining@petro1.com.my to discuss special pricing and information.
ARC FLASH CALCULATION (2 Days) Registration Form

<table>
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<th>3 or more participants</th>
<th>Per Participant</th>
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<tr>
<td>Full 2 Days</td>
<td>SGD 2599</td>
<td>SGD 2999</td>
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REGISTER 3 AND SENT THE 4TH FREE
- Please note that all registrations must be made at the same time to qualify.
- The above investment fee are inclusive of course material, tea breaks and lunch.
- The above investment fee is exclude of SST 6%.

I would like to organize this training on-site and save at least 25% on the total course Fees! Please call +603 7727 3952 for more about our in-house training or email training@petro1.com.my (Terms & Conditions apply)

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Delegates Details

1. Name: ____________________________ Mr/Mrs/Ms/Dr
   Job Title: __________________________
   Email: ____________________________
   Contact No: ________________________
   Department: ________________________

2. Name: ____________________________ Mr/Mrs/Ms/Dr
   Job Title: __________________________
   Email: ____________________________
   Contact No: ________________________
   Department: ________________________

3. Name: ____________________________ Mr/Mrs/Ms/Dr
   Job Title: __________________________
   Email: ____________________________
   Contact No: ________________________
   Department: ________________________

Head of Department: __________________________

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Invoice Details

Invoice Attention to: __________________________

Company: __________________________
Industry: __________________________
Address: __________________________
Postcode: __________________________ Country: __________________________
Telephone: __________________________ Fax: __________________________
Email: __________________________

Authorized Signature: __________________________

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Program Details

Venue: Kuala Lumpur, Malaysia
Date: 25th – 26th March 2019

REGISTER NOW
CONTACT: kelvin
MAIN: +603 7727 3952
FAX: +603 7727 5278
Email: registration@petro1.com.my

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Credit card Payment

Please Debit my credit card:

- [ ] VISA
- [ ] MASTERCARD

Card Number: __________________________
Security Code: __________________________
Expired Date: __________________________

Named printed on card: __________________________

Signature: __________________________

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Payment Method
By Direct Transfer: Please quote invoice numbers on remittance advice.

ACCOUNT NAME: PETRO1 SDN BHD
BANK: United Overseas Bank (Malaysia) BHD
ACCOUNT NO: 202 900 3191 (SGD)
All bank charges to be borne by payer. Please ensure that PETRO1 SDN BHD received the full invoice amount.

** Credit card payment will include a charges 2.8%

Payment Policy: Upon receipt of a completed registration form, it confirms that the organization is registering for the seat(s) of the participant(s) to attend the conference or training workshop. Payment is required with registration and must be received prior to the event to guarantee the seat. Payment has to be received 7 working days prior to the event date to confirm registration.

Sales and service Tax (SST): The above investment fee is exclude of SST 6%. The SST charges of 6% will be include during issuance of the invoices.

Venue: All of our training courses are held in 4 – 5 star venues.
The course fee does not include accommodation or travel cost. It’s recommended to book the hotel room early as there are only limited room available at the discounted corporate rate.

DATA PROTECTION
The information you provide will be safeguarded by Petro1 that may be used to keep you informed of relevant products and services. We take it seriously when it comes to protection of our client data.

Cancellation & Substitutions:
Upon receipt of a completed registration form, it confirms that the organization is registering for the seat(s) of the participant(s) to attend the conference or training workshop. Should you be unable to attend, substitutes are always welcome at no additional cost. Please inform us as early as possible. Payment is non-refundable if cancellation occurs 7 working days prior to event commencement. However if a substitute is welcome at no additional charges. If cancellation occurs 5 working days prior to the registration date and there is no substitute, the organizer reserves the right to charge 50% of the total investment from your organization.

PETRO1 SDN BHD is not responsible for any loss or damage as a result of a substitution, alteration or cancellation/postponement of an event. PETRO1 SDN BHD shall assume no liability whatsoever in the event this training course is cancelled, rescheduled or postponed due to a fortuitous event, Act of God, war, fire, labor strike, extreme weather or other emergency.

Walk in Registration:
Walk-in participants with payment will only be admitted on the basis of seat availability at the event and with immediate full payment.

Program Change policy:
The organizer reserves the right to make any amendments and/or changes to the workshop, venue, facilator replacements and/or modules it warranted by circumstances beyond its control.