etap
Thinking Power

Arc Flash

Arcing Fault Currents

Fault Clearing Times

Incident Energy

NFPA 70E

IEEE 1584

CSA Z462

Power System Enterprise Solution

ETAP is the most comprehensive analysis platform for the design, simulation, operation, control, optimization, and automation of generation, transmission, distribution, and industrial power systems.

Customize ETAP to fit your needs, from small to large power systems

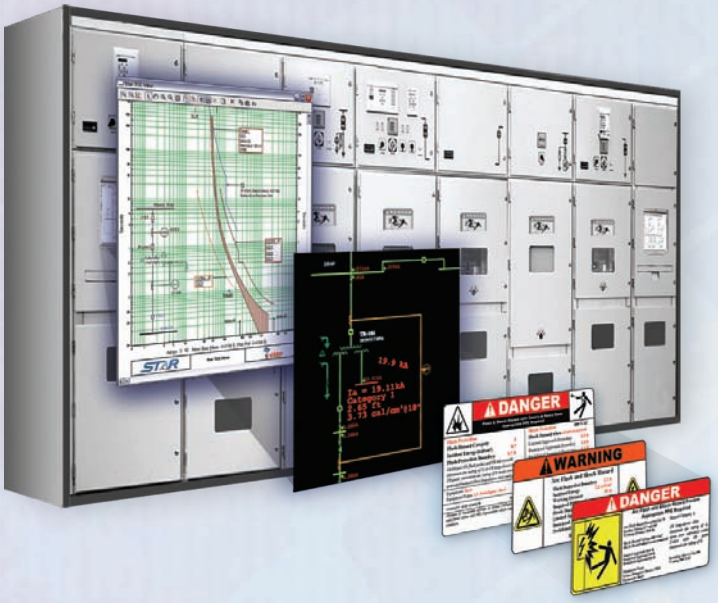
ETAP Enterprise Suite provides one solution to your power system design, analysis, and operation needs. ETAP offers a comprehensive suite of analysis modules that can be configured to suit your specific needs. This modular approach allows you to purchase only the modules you need.

Featured in this brochure

Arc Flash Analysis

Reduce Risk, Improve Safety, Enforce Compliance

ETAP Automatically Calculates...



Arcing Fault Currents
Protective Device Operating Time
Arc Fault Duration & Decay
Incident Energy
Arc Flash Protection Boundary
High Incident Energy Areas

Industry Leader in Comprehensive Arc Flash Analysis Solutions

ETAP Arc Flash Analysis provides multiple capabilities for faster and easier performance. ETAP Arc Flash Analysis allows you to identify and analyze high risk arc flash areas in your electrical system, and it also allows simulation of several different methods used by engineers to mitigate high incident energy. This integrated program enables you to create multiple scenarios to determine which configuration produces the highest incident energy. In addition, it provides several methods to print professional quality reports and arc flash labels.

One-Line Diagram: TCC and arc flash results

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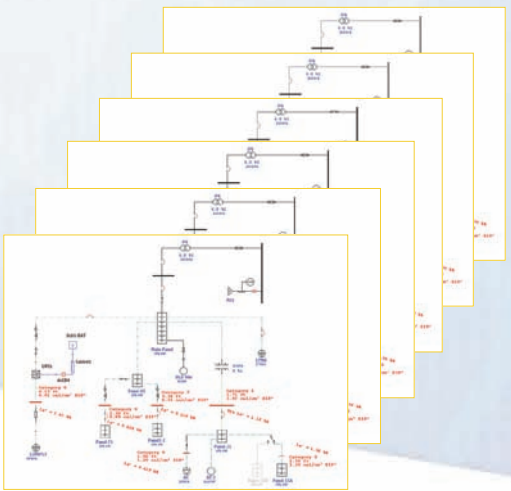
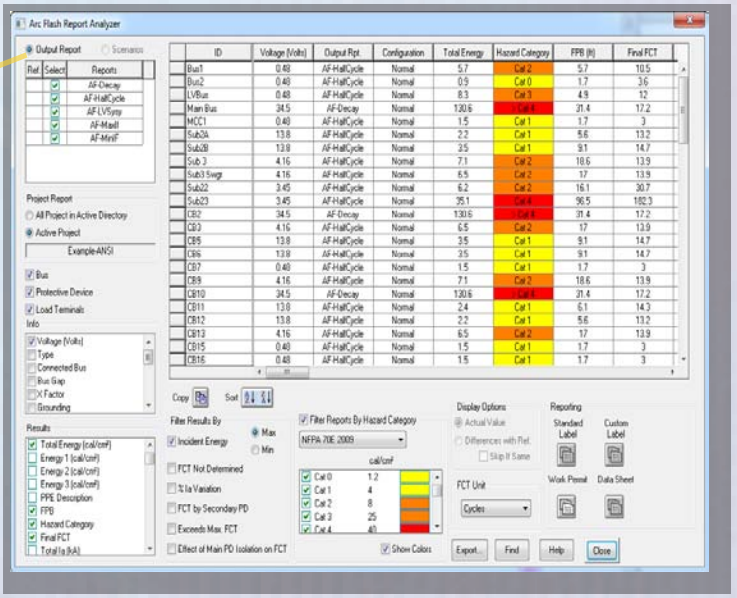
Arc Flash Result Analyzer

Arc Flash analysis requires the consideration of several scenarios including those which produce the maximum and minimum fault current levels. The task of analyzing the results from different scenarios is greatly simplified with the use of the Arc Flash Result Analyzer. With one click, this time-saving tool allows you to determine which scenario produces the worst case results. The analyzer also provides warnings and filters out problem areas which present problems in the Arc Flash analysis. Once the results are analyzed, labels and reports can be generated directly from the analyzer for all the faulted locations including arc faults at the buses, protective devices, or load terminals.

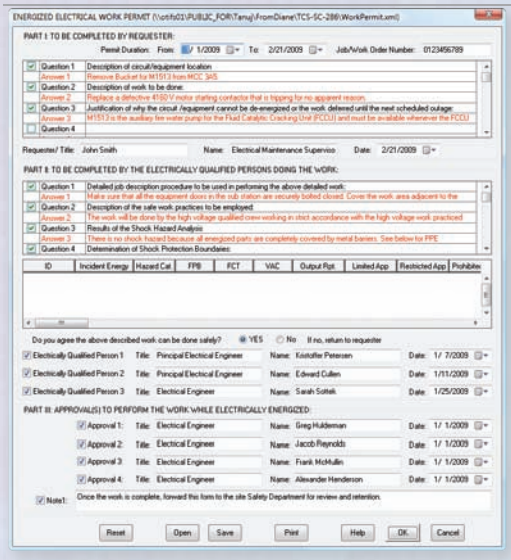
Features

- Sort results from different studies by multiple criteria
- Find the worst-case incident energy results
- Quickly identify incorrect sequence of protective device operation
- Find which protective devices failed to operate
- Filter out & analyze results by incident energy levels
- Identify arcing current variation problems
- Identify slow operation of protective devices
- Automatically Export / Create MS Excel arc flash reports
- Analyze the results in metric or english units
- Color code & filter results by incident energy level
- Group arc flash results by equipment location
- Generate standard / custom arc flash labels, work permits, and study parameters data sheets





Work Permits, Data Sheets, Labels, . . .



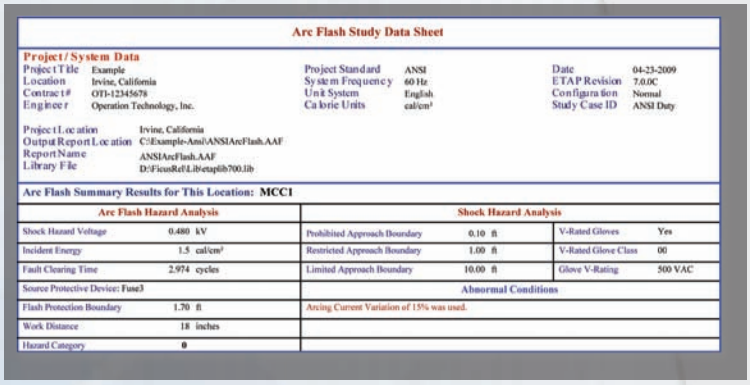
Work Permits

According to NFPA 70E 2012 guidelines, written permits (work permits) are required when working on energized electrical conductors or circuit parts that are not placed in an electrically safe work condition. ETAP Arc Flash provides work permits which include all the elements required by Article 130.2(B) of NFPA 70E. The benefits of printing work permits from the AF program are the automatic population of the incident energy results and shock hazard analysis approach boundaries. The work permits also have the following features:

- Customizable to fit different requirements
- Can be saved for all locations and stored with the ETAP project to be used at a later time
- Can be printed based on the worst case AF analysis results or based on whatever operating condition is used to perform the energized work.

Data Sheets

The data sheet is an enhanced version of the arc flash analysis report. It gives a detailed description of what selections (parameters) were made in the short circuit study case and how the bus results were obtained. This feature allows you to share with field engineers or electricians all the study assumptions and study case options which were used to determine the arc flash analysis results. This information is of high importance to provide additional information about the methodology to determine the incident energy.



Arc Flash Study Data Sheet

Project / System Data

Project Title	Example	Project Standard	ANSI	Date	04-23-2009
Location	Irvine, California	System Frequency	60 Hz	ETAP Revision	7.0.0C
Contract #	OTI-12345678	Unit System	English	Configuration	Normal
Engineer	Operation Technology, Inc.	Calorie Units	cal/cm²	Study Case ID	ANSI Duty

Project Location	Irvine, California
Output Report Location	C:\Example-Ansi\ANSIArcFlash.AAF
Report Name	ANSIArcFlash.AAF
Library File	D:\ElcutRef\Lib\etaplib700.lib

Arc Flash Summary Results for This Location: MCC1

Arc Flash Hazard Analysis		Shock Hazard Analysis			
Shock Hazard Voltage	0.480 kV	Prohibited Approach Boundary	0.10 ft	V-Rated Gloves	Yes
Incident Energy	1.5 cal/cm²	Restricted Approach Boundary	1.00 ft	V-Rated Glove Class	00
Fault Clearing Time	2.974 cycles	Limited Approach Boundary	10.00 ft	Glove V-Rating	500 VAC
Source Protective Device: Fuse3		Abnormal Conditions			
Flash Protection Boundary	1.70 ft	Arcing Current Variation of 15% was used.			
Work Distance	18 inches				
Hazard Category	0				

Multiple Language Arc Flash Labels

ETAP has a wide variety of professional quality arc flash labels in multiple languages including English, Spanish, French, and Portuguese. Automatically batch print arc flash labels based on highest incident energy from all operating modes.

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Arc Flash Standards & Calculations

NFPA 70E 2009 Standard

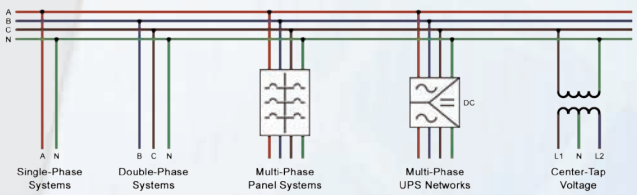
ETAP gives the option to define incident energy levels and personal protective equipment requirements based on NFPA 70E-2000, 2004, 2009 and 2012 standards.

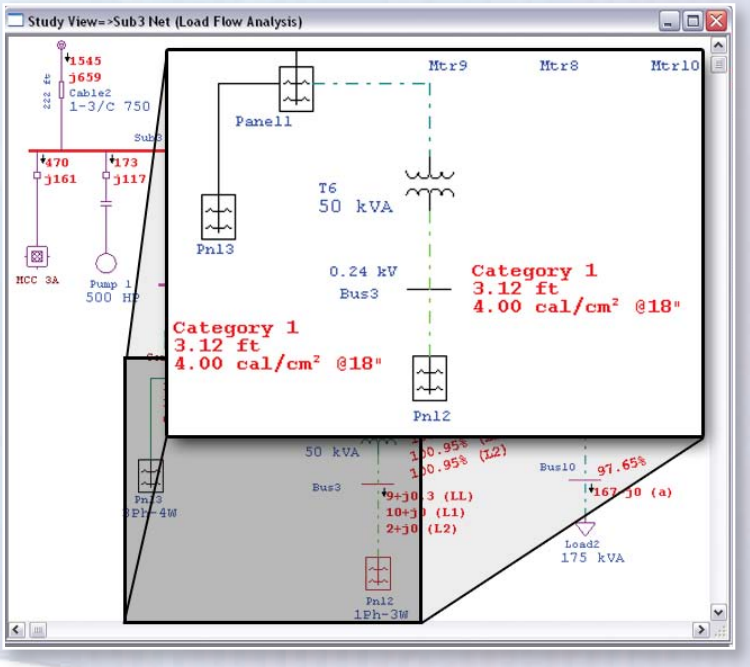
Complies with Standards . . .

- NFPA 70E 2012
- CSA Z462 2008
- OSHA 29 CFR 1910
- ASTM D 120-02a
- IEEE 1584 2002
- IEEE 1584a 2004
- IEEE 1584b 2011
- NEC 110.6
- NESC

Single Phase Arc Flash Calculations

In addition to 3-phase systems, ETAP arc flash allows you to perform arc flash calculations for 1-phase systems. This feature allows you to conservatively estimate the incident energy for single phase arc faults. The reality is that a lot of the equipment is single phase and engineers still need to determine what energy levels can be encountered at these locations. This tool allows the engineer to provide a conservative estimate of that energy.

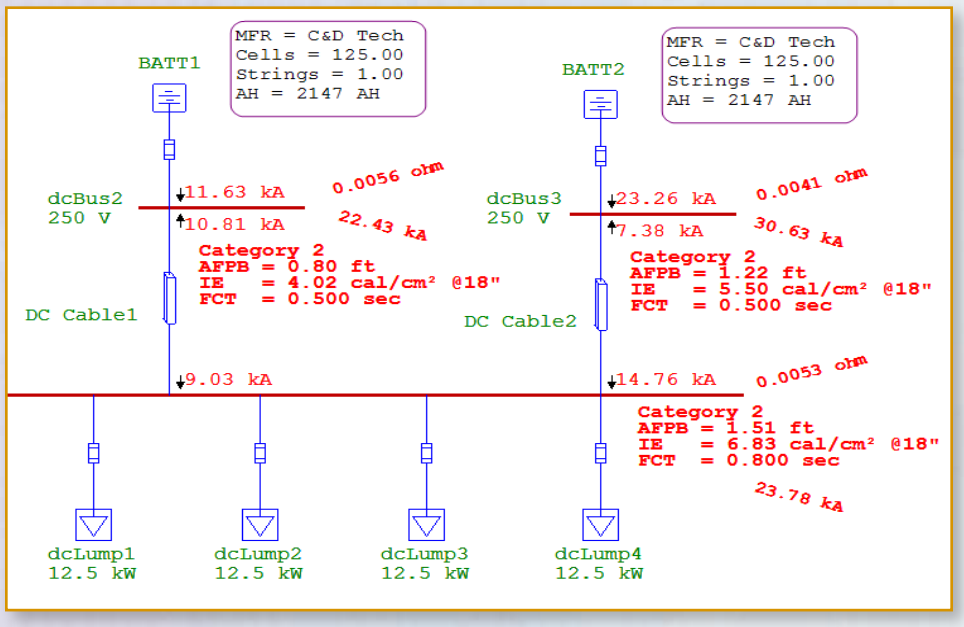




DC Arc Flash Features & Calculation Methods

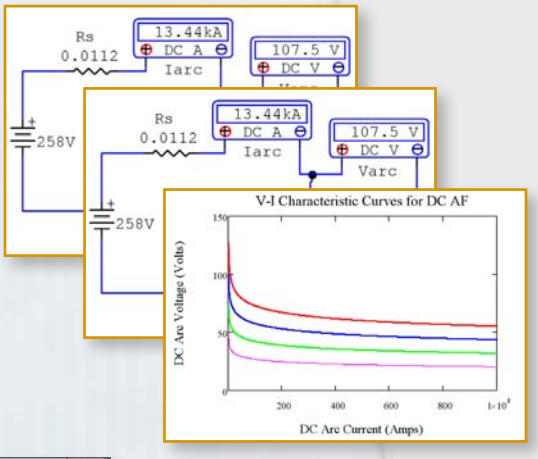
DC Arc Flash

The new NFPA 70E 2012 version includes one new annex section (Annex D.8) dedicated to the direct current incident energy calculation. The ETAP DC Short Circuit module has been integrated with three DC Arc Flash calculation methods. This allows the engineer to compare DC Arc Flash incident energy values and decide which method yields the most accurate results.



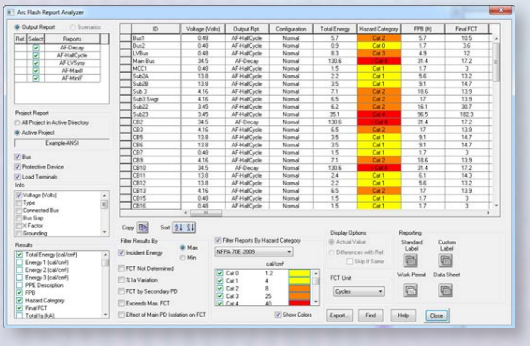
Calculation Methods

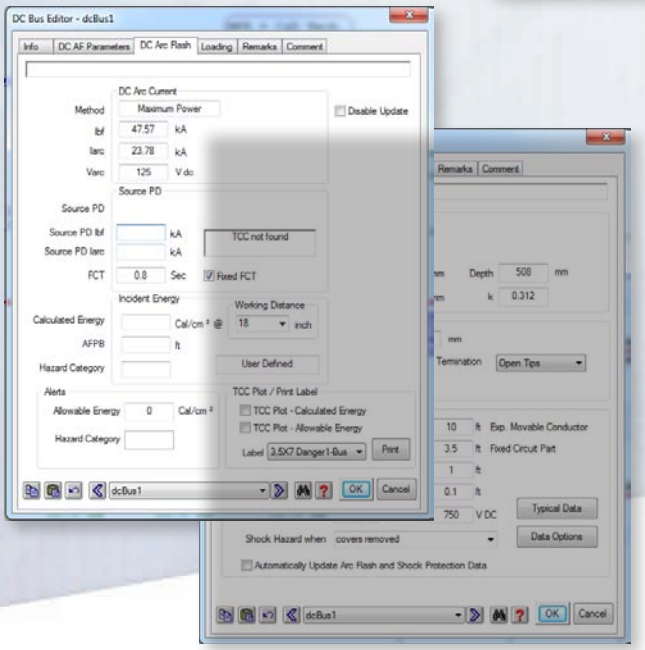
- Maximum Power
- Stokes & Oppenlander
- Paukert



DC Arc Flash Analysis Features

- Arc Flash Result Analyzer
- Arc Flash Labels
- Incident Energy Plots
- Display results on the DC One-Line Diagrams
- Export results to Microsoft Excel





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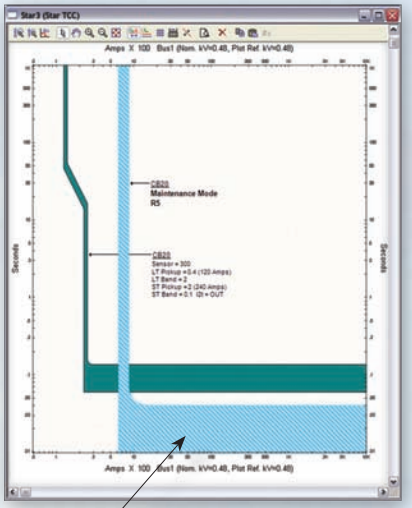
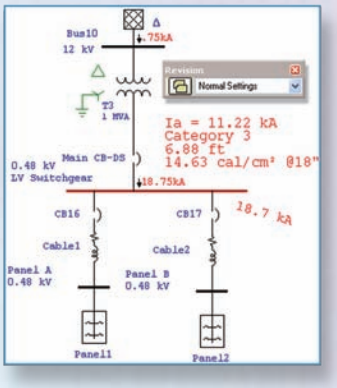
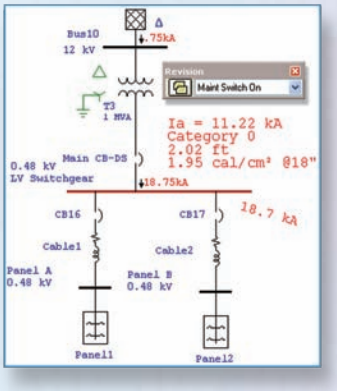
Simulate Incident Energy Mitigation Methods

Model the Incident Energy Reduction for

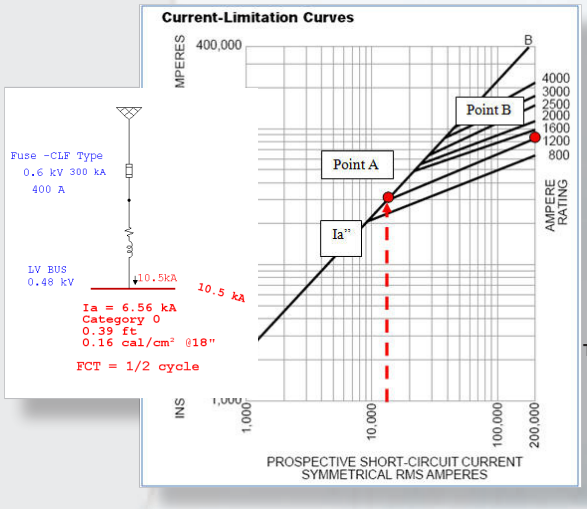
- Zone Selective Interlock Protection
- Maintenance Mode Switch
- Determine Current Limiting Fuse from
  - Peak-Let-Through Curve Method
  - IEEE 1584 Method
  - Bottom of the Curve Method
- Differential Relay Protection
- Light Detecting Relay Action





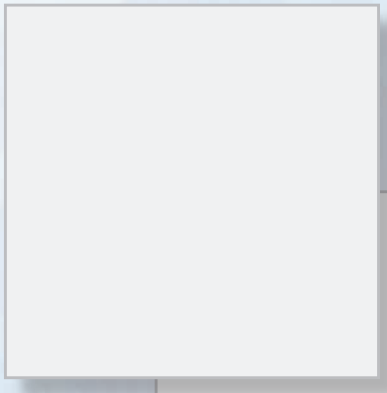


Maintenance Mode



Through Curves

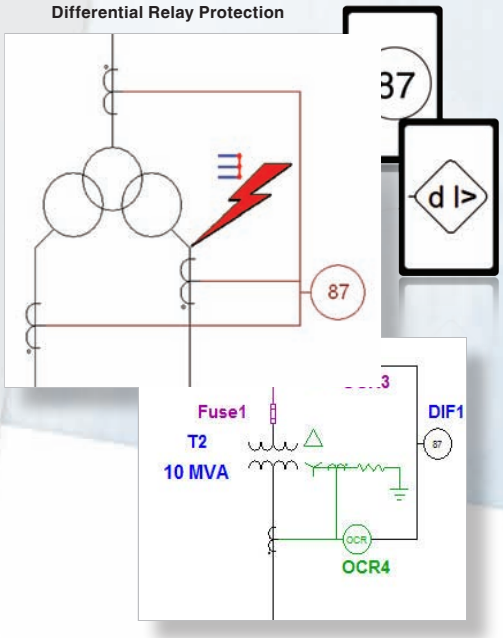
Zone Selective Interlock Protection



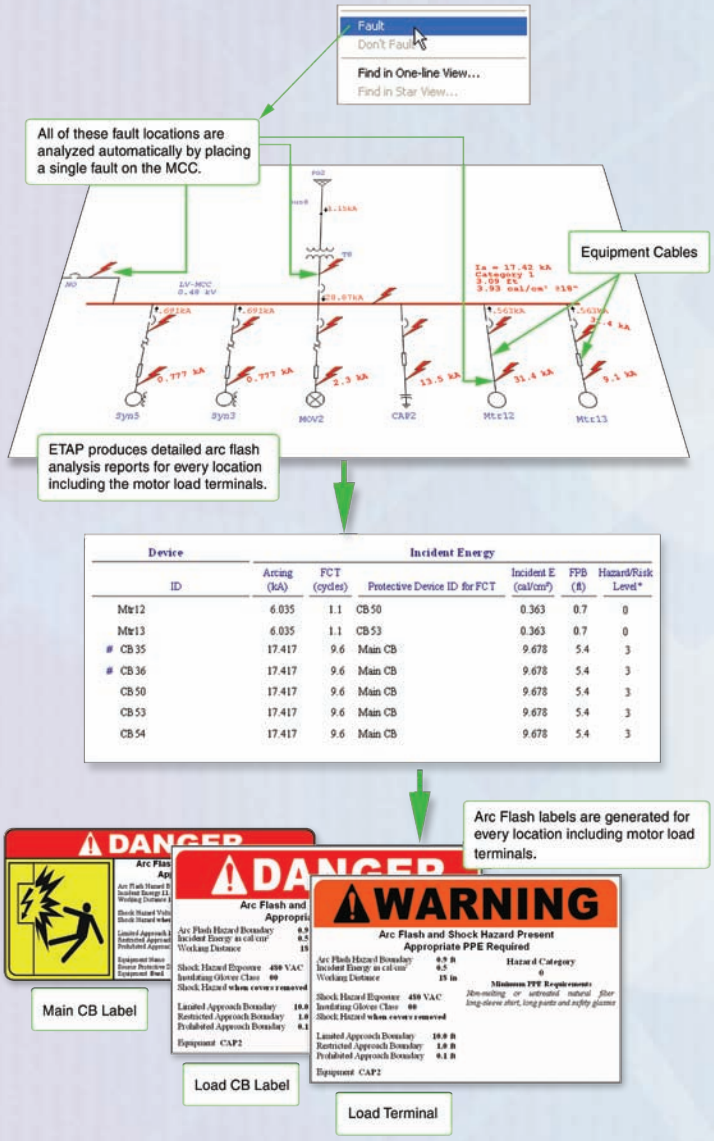
Without ZSIP

With ZSIP

Differential Relay Protection



Most Capable & User-Friendly Arc Flash Analysis Solution



Device ID	Incident Energy: Arcing (kA)	FCT (cycles)	Protective Device ID for FCT	Incident E (cal/cm²)	FPB (ft)	Hazard/Risk Level*
Mtr12	6.035	1.1	CB50	0.363	0.7	0
Mtr13	6.035	1.1	CB53	0.363	0.7	0
# CB35	17.417	9.6	Main CB	9.678	5.4	3
# CB36	17.417	9.6	Main CB	9.678	5.4	3
CB50	17.417	9.6	Main CB	9.678	5.4	3
CB53	17.417	9.6	Main CB	9.678	5.4	3
CB54	17.417	9.6	Main CB	9.678	5.4	3

One-Line Diagram to Reports to Labels: Calculate arc flash results at multiple locations automatically

Simple Operation

- Run multiple arc flash simulations with one-click & analyze all the different results in seconds
- Define your own parameters or use system-calculated results to determine the incident energy
- Use the Quick Incident Energy Calculator to analyze "what if" scenarios at every fault location

Automated Analysis

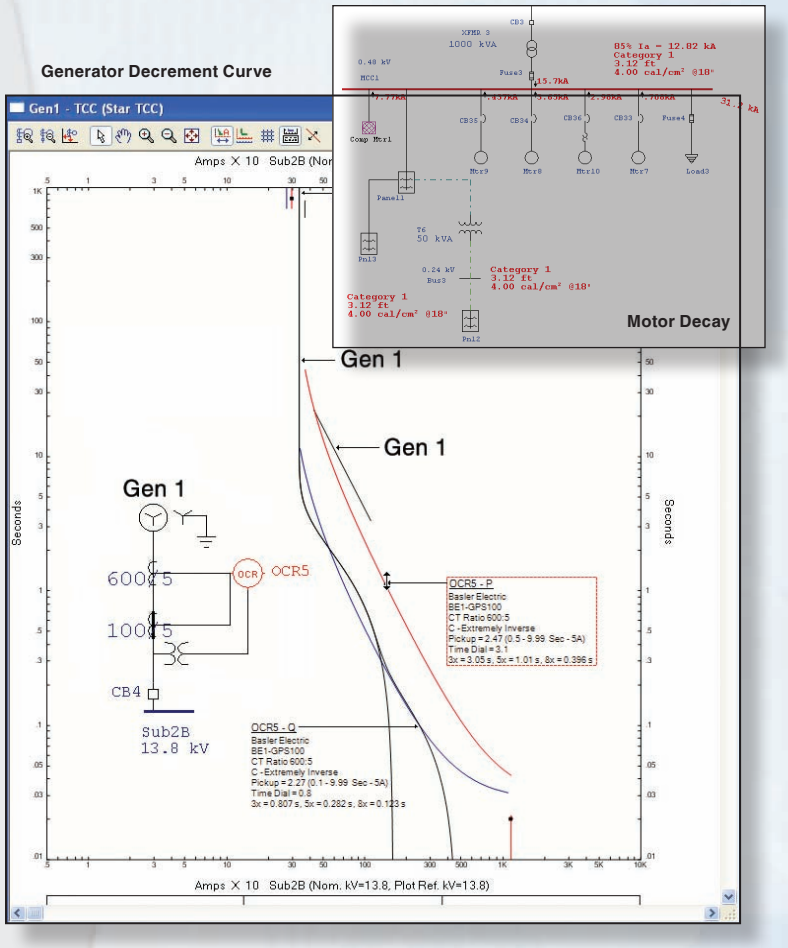
- Automatically determine the Arcing Fault Clearing Time
- Instant determination of the arc flash protection boundary
- Determine individual arcing current contributions
- Generate arc flash labels for every incoming main circuit breaker cubicle, load circuit breaker, & motor starter bucket
- Generate arc flash labels for every load terminal point including induction motors, synchronous motors, capacitor banks, & static loads

IEEE & NFPA Features

The following capabilities are available to comply with IEEE and NFPA guidelines:

- Limit the incident energy based on maximum fault clearing time (e.g., two seconds)
- Built-in empirical equation range limits alerts & grounding configurations
- Automatically distinguish between load & line side protective devices
- User-definable & typical IEEE Equipment Gap between conductors for buses & X-factors (based on IEEE 1584)
- Automatically handle Incident Energy calculation for low voltage buses (e.g., 208~240 volts or less)
- Automatically assign incident energy for low voltage equipment

Comprehensive Arc Flash Analysis Options



Global Data Entry for Equipment

Speed up data entry for your arc flash projects by globally applying arc flash analysis data based on equipment type and voltage rating.

- Global definition of arc flash analysis data eliminates the need to specify this information in each bus
- Global definition of working distance, bus gaps, approach boundaries, & voltage-rated glove classes
- Specify Arc Flash Analysis Data based on IEEE 1584 or user-defined values
- Globally select Shock Hazard Analysis Data based on NFPA 70E 2000, 2004, 2009, 2012 or user-defined settings
- Globally change the glove class settings given by ASTM D 120-02a Standard
- Globally define the main protective device isolation settings (IEEE 1584b-2011)

Motor Contributions & Low Voltage Equipment Handling

ETAP makes it easier to specify considerations that should be applied to low voltage equipment such as motors and transformers based on NFPA 70E & IEEE 1584.

- Consider motor fault current decay during the arc flash calculation
- Automatically exclude small motor contributions entirely from the simulation
- Automatically identify & exclude transformers with relatively low voltage & kVA
- Assign a hazard category to these types of equipments automatically based on fault current range

Comprehensive Arc Flash Safety Program

Custom Arc Flash Hazard Labels

ETAP allows you to create and customize arc flash safety labels.

Reduce Risk · Improve Safety · Enforce Compliance

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Quality Assurance Commitment

ETAP is Verified and Validated (V&V) against field results, real system measurements, established programs, and hand calculations to ensure its technical accuracy. Each release of ETAP undergoes a complete V&V process using thousands of test cases for each and every calculation module. ETAP Quality Assurance program is specifically dedicated to meeting the requirements of:

A3147

ISO 9001:2009	10 CFR 21	ASME NQA-1	CAN/CSA-Q396.1.2
10 CFR 50 Appendix B	ANSI/ASME N45.2	ANSI/IEEE 730.1	ANSI N45.22

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