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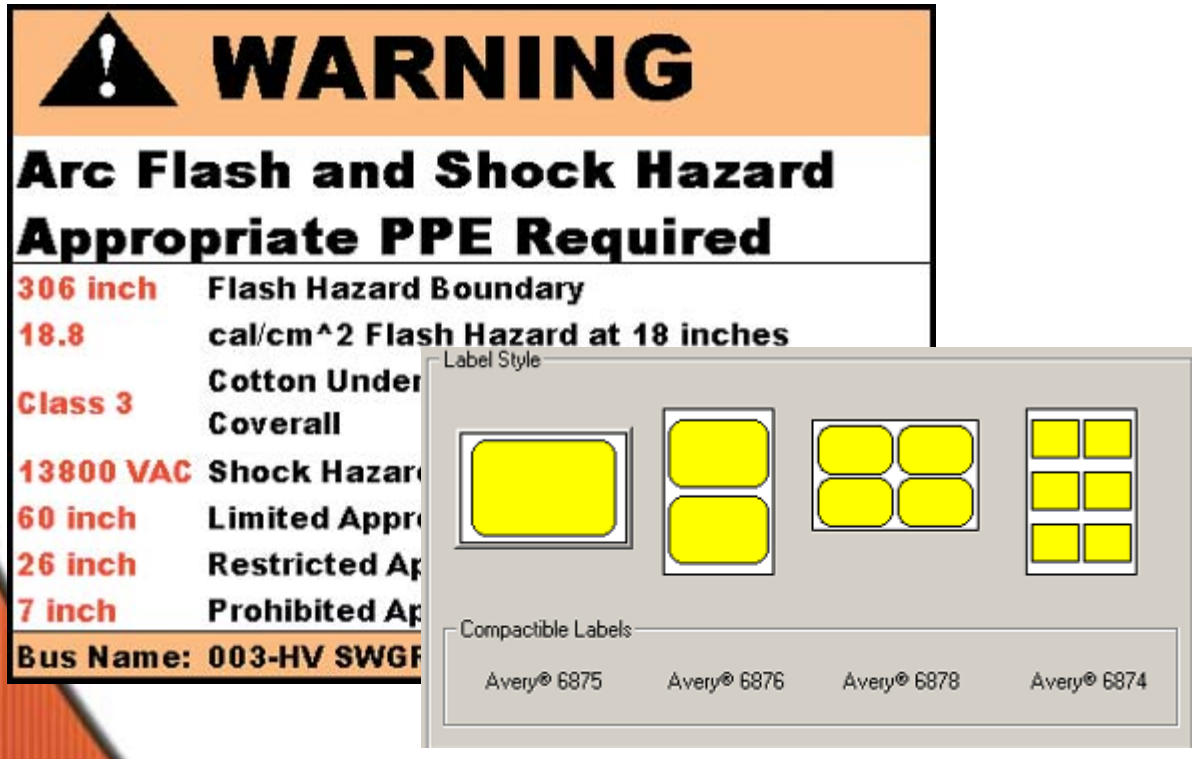
PTW Arc Flash Evaluation

Arc Flash Evaluation Studies

PTW Arc Flash Evaluation calculates the incident energy and arc flash boundary for each location in a power system. Arc Flash saves time by automatically determining trip times from the protective device settings and arcing fault current values. Incident energy and arc flash boundaries are calculated following the NFPA 70E and IEEE 1584 standards. Clothing requirements are specified from a user-defined clothing library. Clearing times can be automatically reduced based on current-limiting capabilities.

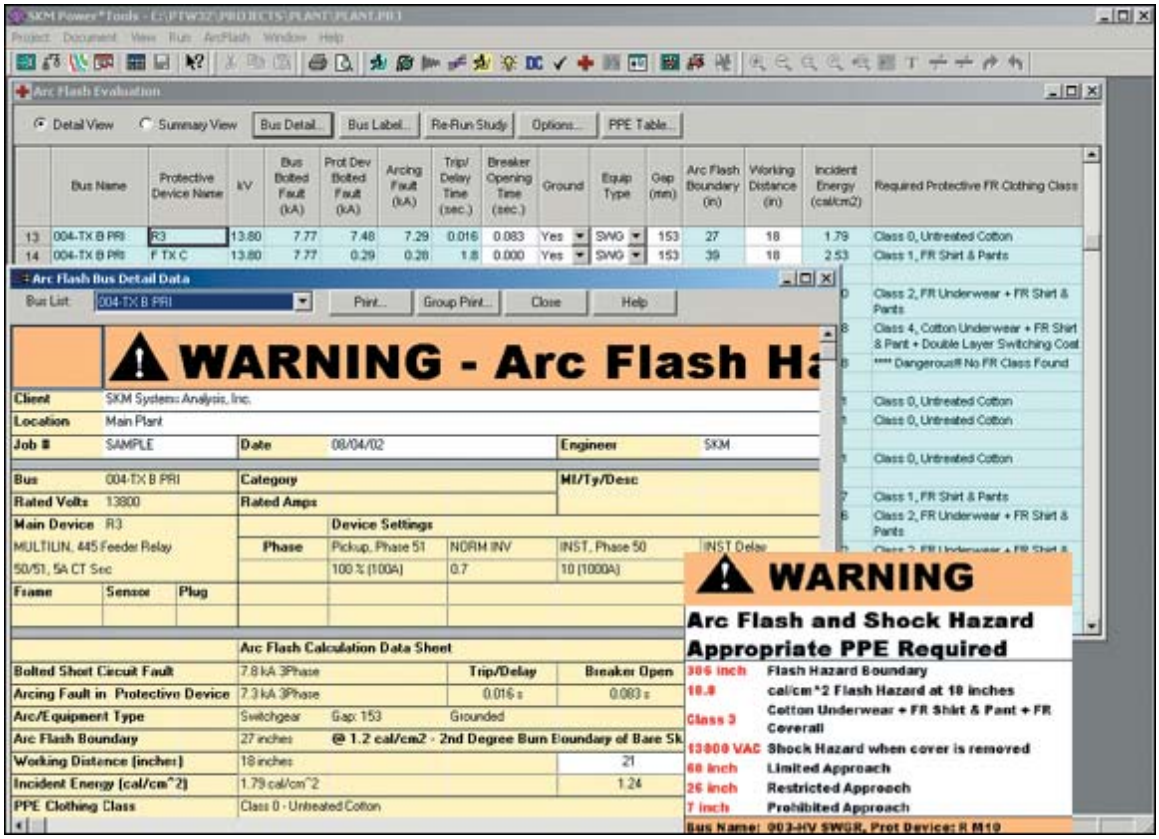
Benefits

- Design safer power systems while insuring compliance with NEC 110.16, OSHA, NFPA 70E and IEEE 1584 standards.
- Save time with the fully integrated Short Circuit, Over-Current Coordination, Equipment Evaluation and Arc Flash Evaluation modules working together with libraries of clothing levels, protective devices and bus ratings.
- Provide a safer working environment by specifying the proper level of clothing. Wearing inadequate clothing is dangerous for obvious reasons, but wearing too much clothing is dangerous due to limited mobility and visibility.
- Evaluate alternatives quickly and easily to establish an optimal design.



Interface Options

- Simple to use tabular interface for system design, PPE selection, and reviewing study results.
- Summary and detail view enables complete bus by bus examination of study data.
- Pre-populated library of protective clothing allows user-defined PPE additions.
- Bus and branch fault values are automatically read from the fault study, and protective device settings and trip times are read from the CAPTOR TCC drawings.
- Arc Flash labels are automatically produced to comply with NEC 110.16 labeling requirement. The labels can be printed to several standard size label sheets.



Study Options

- User may select option to follow the NFPA 70E or IEEE 1584 standard.
- User may select English or Metric units to report study results.
- Fuses may be modeled as Current Limiting or Standard.
- Induction motors can be included, excluded, or included for a user-defined time.

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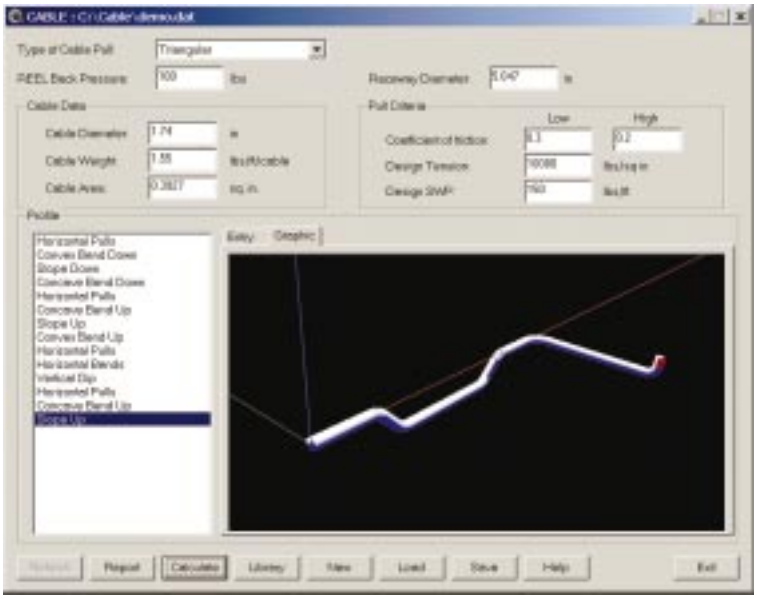
PTW CABLE 3D

Cable Pulling Analysis

CABLE quickly solves complex three-dimensional cable pulling tension and sidewall pressure calculations, allowing you to make rapid and accurate design decisions. Don't leave installation to chance.

Benefits

- Eliminate costly cable damage.
- Save time with graphical entry and display.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.
- CABLE is an important tool every power system engineer, designer and contractor needs.



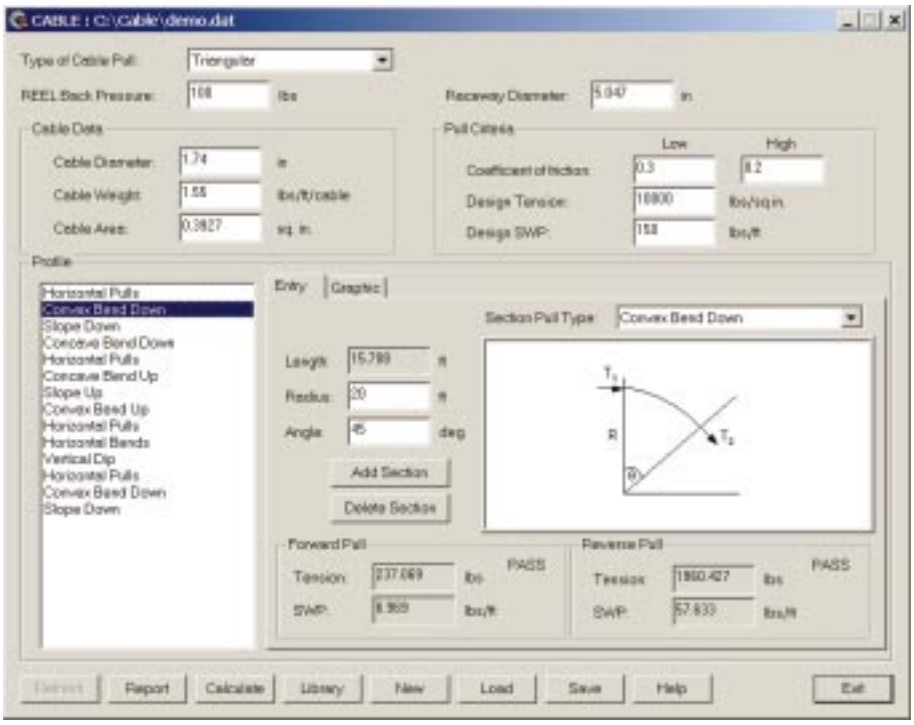
	FORWARD PULL				REVERSE PULL			
Section	Total Length	Total Pounds	SWP lbs/ft	PULL Limits	Total Length	Total Pounds	SWP lbs/ft	PULL Limits
1	50.0	182.0		PASS	452.1	2252.4		PASS
2	65.7	237.1	7.0	PASS	402.1	2170.4	63.8	PASS
3	85.7	194.5		PASS	386.4	1600.2		PASS
4	101.4	197.3	5.8	PASS	366.4	1511.2	44.4	PASS
5	201.4	361.3		PASS	350.7	1143.2		PASS
6	217.1	479.8	14.1	PASS	250.7	979.1	28.8	PASS
7	237.1	568.7		PASS	235.0	787.1		PASS
8	252.8	809.6	23.8	PASS	215.0	829.7	24.4	PASS
9	302.8	891.6		PASS	199.3	631.2		PASS
10	334.2	1554.7	45.7	PASS	149.3	549.2	16.1	PASS
11	434.2	2062.1	9.7	PASS	117.9	311.0	1.5	PASS
12	444.2	2078.5		PASS	17.9	147.0		PASS
13	452.1	3027.1	427.4	FAIL	7.9	130.6	15.4	PASS

Analysis Options

- Calculates cumulative pulling tension through each pull profile
- Calculates side wall pressure for each segment of the pull profile
- Calculates jam ratios, clearances and percent fills
- Automatically calculates forward and reverse pulls through each pull profile
- Simulates single, triangular, cradled and diamond cable configurations
- Suitable for any type of cable and pulling profile

Interface Options

- Unlimited pulling profiles
- Unlimited segments in each pulling profile
- Cable, raceway and lubricant library
- 3-D graphical display
- Extensive on-line help
- Simple single-screen interface



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PTW DC System Analysis

DC System Analysis Module

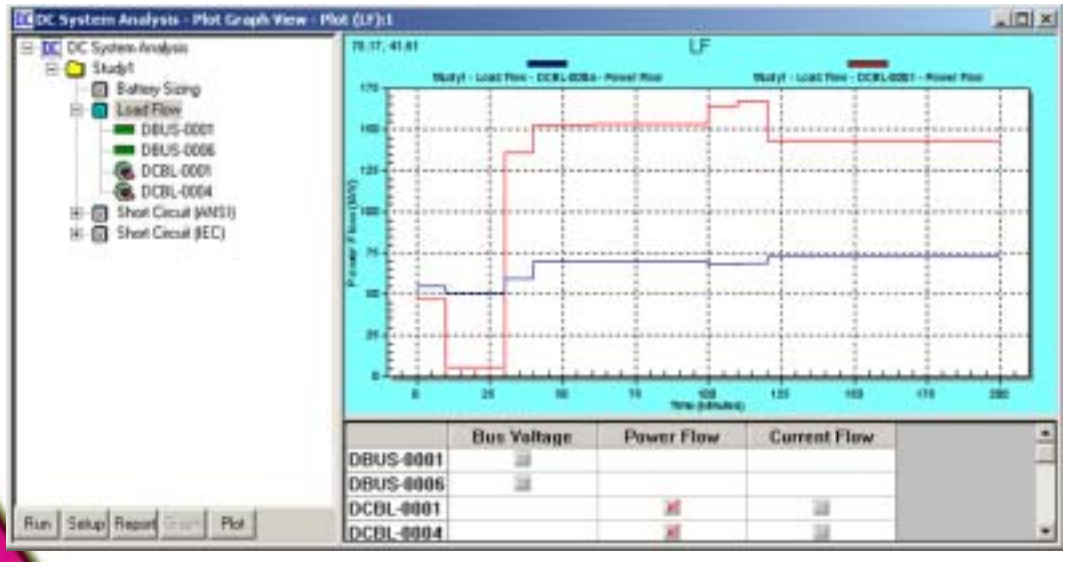
The DC System Analysis includes: Battery Sizing, DC Load Flow, DC Short Circuit (ANSI) and DC Short Circuit (IEC).

Comply with Industry Standards

- Battery Sizing - IEEE std. 485, determines the size of batteries to supply the worse case DC duty cycle loads and AC emergency loads.
- DC Load Flow - Calculate power, current and voltage drop profiles. Represent constant kW, I, and Z, load types and evaluate all loading conditions for duty cycle loads and AC emergency loads.
- DC Short Circuit - ANSI standard 399 and 946
- DC Short Circuit - IEC standard 61660, calculates the peak fault current, time constants, rate of rise, and steady state conditions.

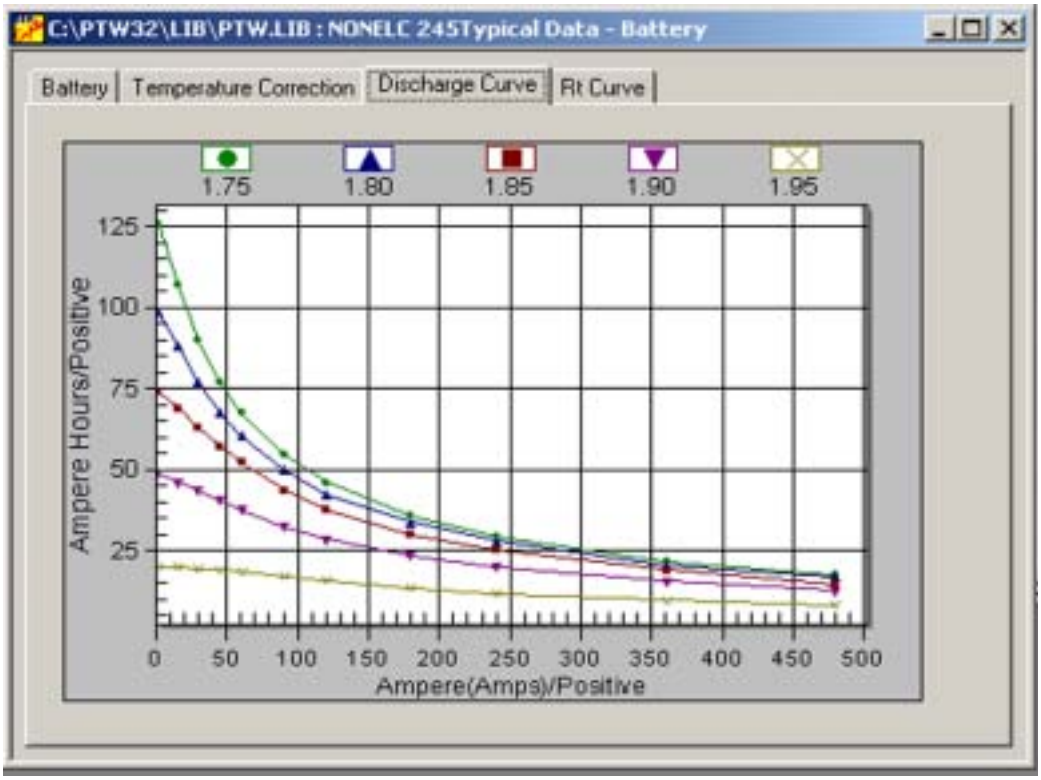
Benefits

- Save time with intuitive scenario manager interface.
- Communicate designs effectively with graphical and text base results.
- Improve decisions by quickly comparing resulting curves from different scenarios.
- Increase productivity by modeling both DC and AC systems in a single project.
- Reduce mistakes by evaluating all loading conditions and duty cycle loads.
- Battery Sizing and Load Flow automatically calculates AC emergency loads and their impact on the DC system to help you design safer and more reliable systems.



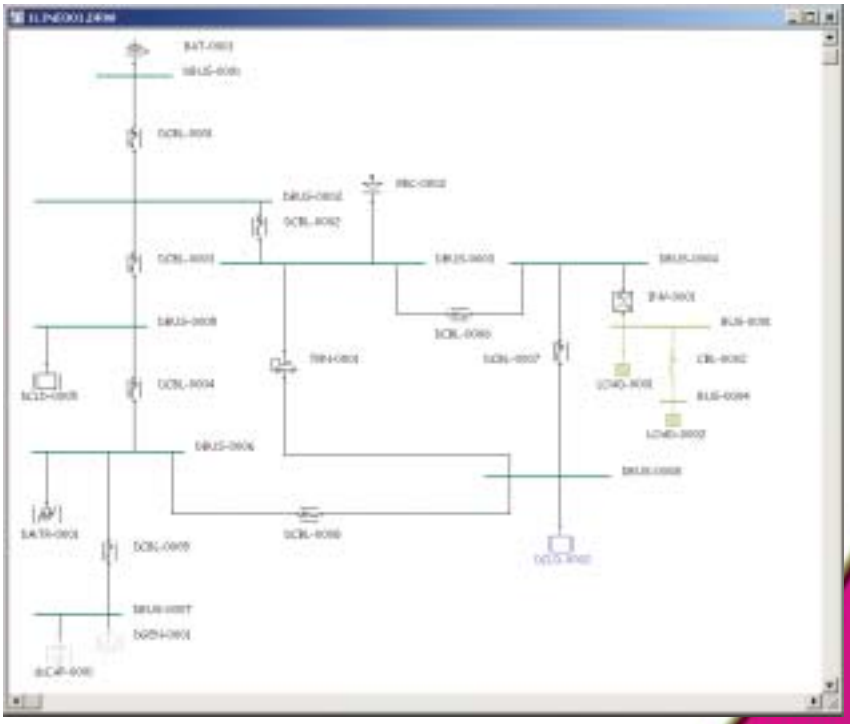
DC Equipment Library

- Battery Library - Rt Curve and Discharge Curve
- DC Generator Library - Name Plate data, Transient Resistance and Inductance
- DC Motor Library - Name Plate data, Transient Resistance and Inductance



DC Component Types

- Battery
- Rectifier
- DC Cable, Bus, Node
- DC Load, Motor, Train
- DC Generator
- Inverter/UPS
- DC-DC Converter
- DC Capacitor



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PTW Equipment Evaluation

Equipment Evaluation Studies

The Equipment Evaluation Study module compares protective device ratings with short-circuit calculations. The program also checks for missing input data and compares continuous ratings to calculated design and operating conditions. Equipment that fails the evaluation are reported in table form and color-coded by the one-line diagrams. As with all PTW study modules, Equipment Evaluation uses the same project database, integrating all balanced and unbalanced/single-phase study modules, and allowing you to examine existing projects without additional input requirements.

Benefits

- Helps you design safer and more cost effective power systems.
- Reduces mistakes by systematically comparing continuous and short circuit currents to equipment ratings.
- Saves you time by making all de-rating adjustments and by summarizing all of the necessary data into a single easy-to-read table.
- Saves you time by flagging the equipment that are in the marginal range or failed in the rating checks.
- Saves you time by running all related studies in one click.
- Increases flexibility by allowing user defined criteria for pass/marginal/fail.
- Increases flexibility by evaluating short circuit ratings, continuous ratings, or both.
- Communicate designs more effectively with professional reports and annotated one-line diagrams.

Interface Options

- Intuitive graphical interface enables navigation of device type and generation of study results and reports.
- Study Results can be printed in a concise Report format or exported to an Excel-compatible spreadsheet.
- Choose from Equipment Evaluation Reports and Datablocks or graphically identify equipment that fails the evaluation in a color-coded one line diagram.
- Clear and concise reporting of all equipment in a system enables easy diagnosis of potential problems. Sort results by device type, status, bus, voltage, ampacity, and more.
- Input data evaluation and reporting to identify missing data or errors in input data.

Study Options

- Continuous rating checks include cables, transformers, transmission lines, buses, generators, protective devices, panels, and protective devices on individual panel circuits.
- Short circuit interrupting and withstand rating checks for protective devices, buses and schedules.
- Choose between balanced and unbalanced study results, protection and non-protection device types.
- Choose between bus or branch fault study results from ANSI, IEC, or comprehensive fault analysis methods for evaluation.
- Equipment evaluations can be performed based upon user-defined limits or system defaults.

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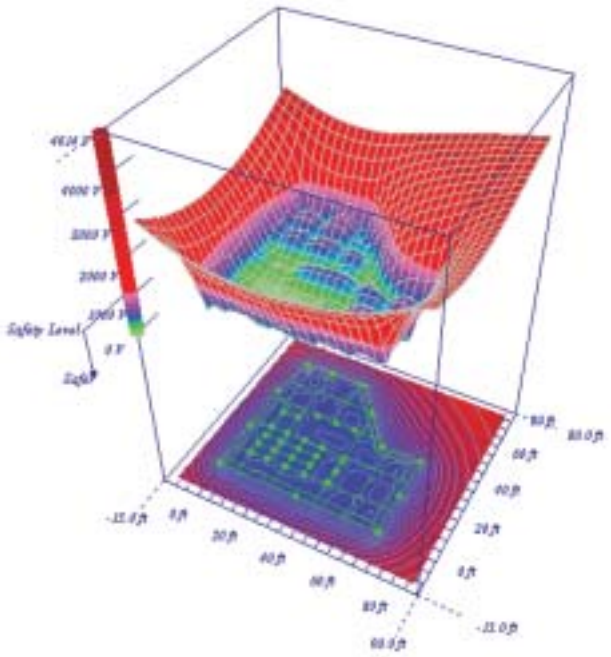
PTW GroundMat

Electrical Grounding Analysis

PTW GroundMat is a program for substation ground grid design and analysis. It is designed to help optimize grid design or reinforce existing grids of any shape. It uses a general-purpose finite element algorithm for potential analysis and graphical facilities to validate ground system efficiency.

Benefits

- Design safer and more cost effective ground grids.
- Save time with graphical entry and display.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.
- Save time with design wizard capabilities.
- PTW GroundMat is an important tool every power system engineer should have.



Solution Algorithms

- Finite element analysis of the ground conductors.
- Finite element analysis of the ground rods.
- Grid conductor current displacement using Matrix analysis.

Analysis Options

- Earth model analysis from field measurements.
- User specified fault current.
- Grid and Ground potential analysis.
- Ability to analyze multiple ground systems.
- Ability to analyze the potential rise for each ground system including neighboring passive grids or rods.
- Safety analysis including surface materials, based on body with and exposure time.
- Option IEEE Guide 80/IEC 490 for safety analysis.
- Calculation of maximum permissible touch and step voltages.
- Comprehensive report for grid and rod configuration.
- Comprehensive report for surface potential analysis featuring station data, and currents diffused to ground by the grid elements.
- Danger point evaluation.
- Touch and surface potential analysis.

Interface Options

- Create and store alternative designs with a simple copy/paste.
- Data entry for grid and rods in spreadsheet format.
- Data entry for earth model in spreadsheet format.
- Grid/rod/profile wizards to setup initial system.
- 3D/2D representation of grid and rod configuration.
- Report viewer.
- Cut, copy and paste grid/rod segments in spreadsheet.
- Range-checking for simulation parameters.
- User-defined thresholds for danger area evaluation.
- User-defined color coding for graphical safety analysis.
- Metric and English units.
- Group print function.

Project Setup Options

- Stores multiple study revisions for each project.
- Expanding tree structure to manage project revisions.
- Input data and output results saved for each study.
- Copy, paste and rename study revisions to compare alternative designs.
- Run studies for multiple study revisions as a single action.

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PTW IEC_61363 Short Circuit Study

IEC_61363 Short Circuit Studies

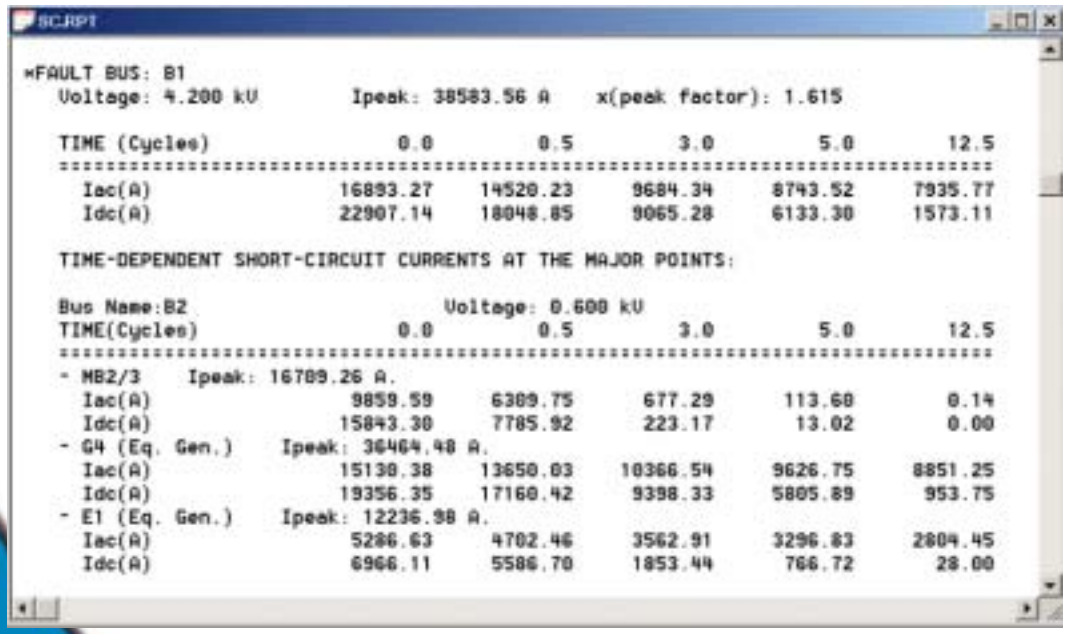
The IEC_61363 Short Circuit Study module calculates the current that flows in an electrical power system under abnormal conditions. These currents must be calculated in order to adequately specify electrical apparatus withstand and interrupt ratings and selectively coordinate time current characteristics of electrical protective devices.

The IEC_61363 Short Circuit study represents conditions that may affect typical marine or offshore installations more significantly than land-based systems, including more emphasis on generator and motor decay.

The calculation methods are intended for use on unmeshed three-phase a.c. systems operating at 50 Hz or 60Hz; having any system voltage specified in IEC 60092-201 table 2; having one or more different voltage levels; comprising generators, motors, transformers, reactors, cables and converter units; having their neutral point connected to the ship's hull through an impedance; or having their neutral point isolated from the ship's hull.

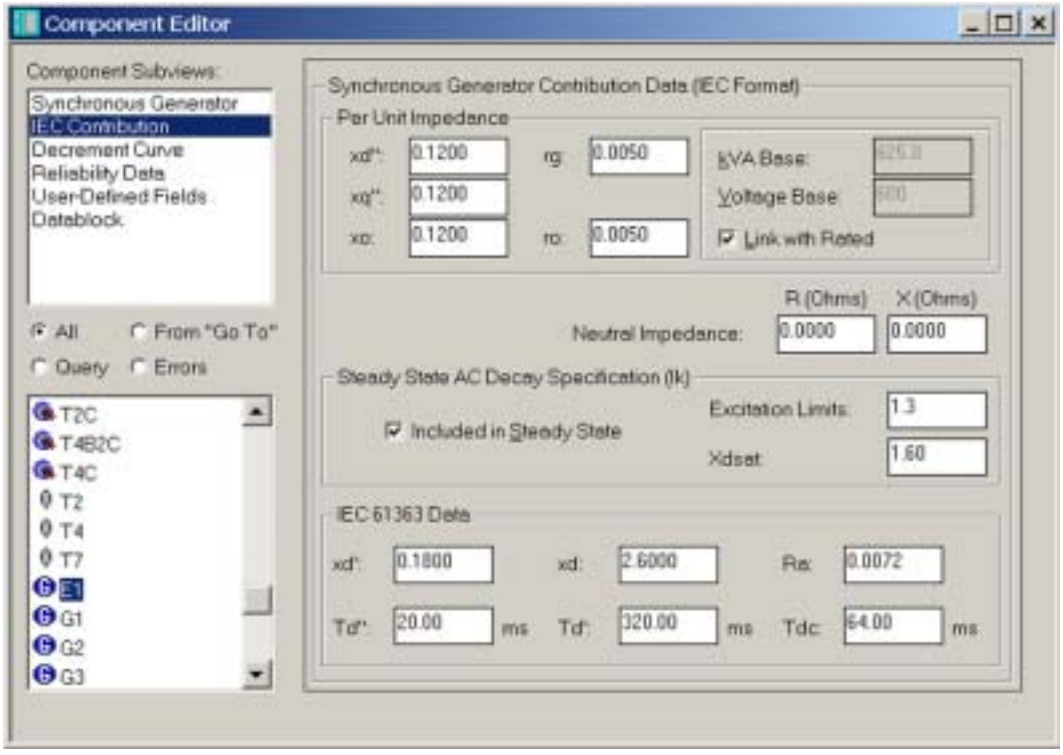
Benefits

- Save time by easily obtaining the short circuit magnitude at each point in the power system.
- Design safer systems by comparing the calculated fault current to the ratings of installed equipment.
- Increase design reliability by supporting proper selection of circuit protection equipment for protection and coordination.

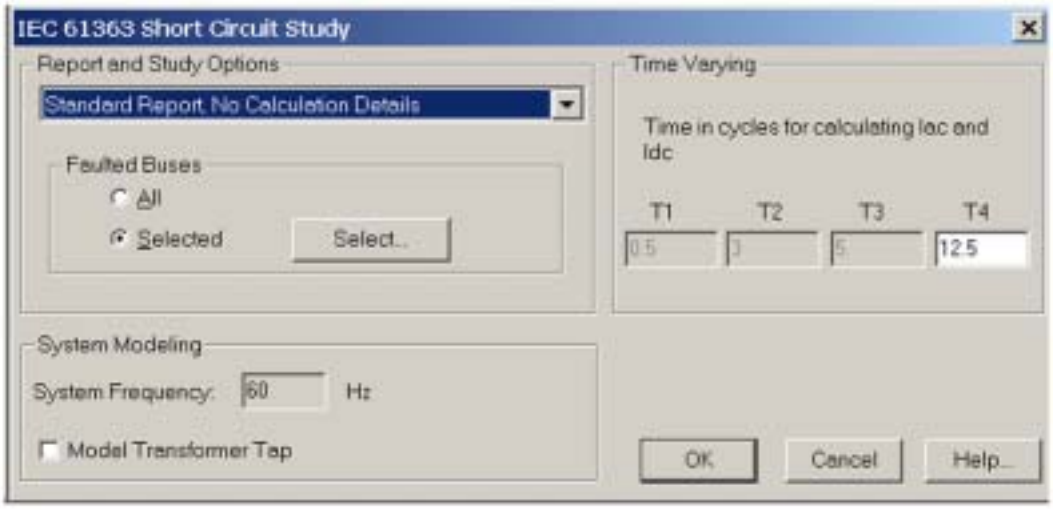


Interface Options

- Uses Existing IEC909 input data with minimum IEC363 specified data required.



- Study report options to include different levels of calculation detail.



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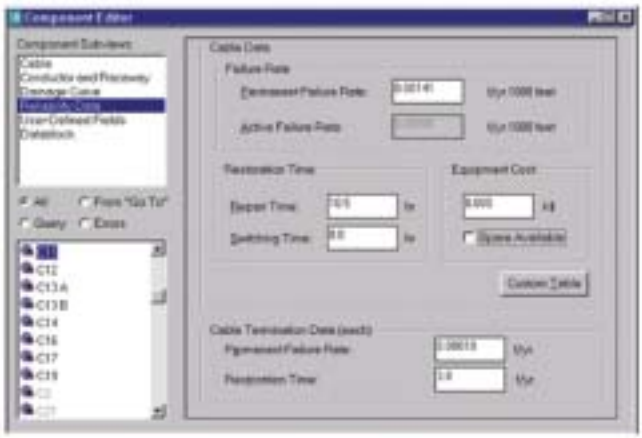
PTW Reliability

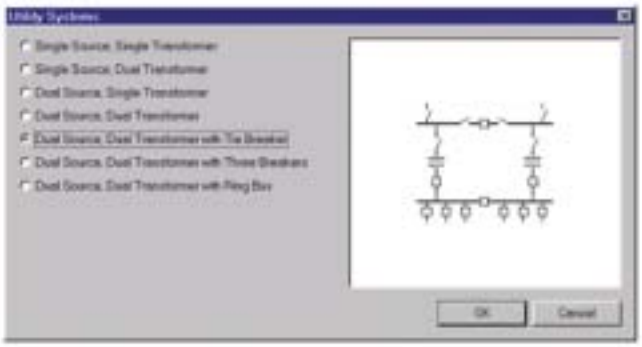
Reliability Studies

PTW Reliability Program calculates reliability indices and cost effects for alternative system designs. Calculations include alternative supplies, alternative network configurations, spare equipment, time to repair, and cost impact of lost production. Libraries for time-adjusted component failure rates and costs are provided to save time and simplify system modeling.

Benefits

- Design more reliable power systems.
- Save costs by identifying and correcting system weaknesses efficiently and systematically.
- Save time by using standard libraries of time-adjusted failure rates and costs.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.
- Save time with pre-defined utility system configuration selections.





Interface Options

- Shares common interface with balanced DAPPER studies, harmonic analysis, transient stability, equipment evaluation, reliability, and CAPTOR protective coordination modules.
- Expanding tree structure to manage and compare multiple cases.
- User-defined time-based cost function for each load lost in outage.
- Repair time specification for each system component.
- Replace time and cost of spare specification for each system component.
- Permanent, active and temporary failure rates for each transformer.
- Permanent and active failure rates for each cable and cable termination.
- User-definable library of standard component reliability data.
- User-definable library for default cost function for loads lost in outage.

Study Options

- Repair, replace and switching options automatically evaluated.
- Reliability indices reported at each load and each bus.
- IEEE indices reported at each protective device.
- Options to include or exclude switches, fuses and load reliability in calculations.
- Option to repair or replace transformers.
- Cost evaluations for standard utility supply configuration alternatives.
- User-defined weighting preferences for operation, reliability, maintenance, recovery and cost factors.
- Reliability reports include MTTF, Failure Rate, MTTR, Annual Outage, ENNS, ECOST.
- Cost evaluation reports include equipment lists and costs for utility and distribution systems.
- Cost evaluation reports include summary value based on user-defined weighting factors.

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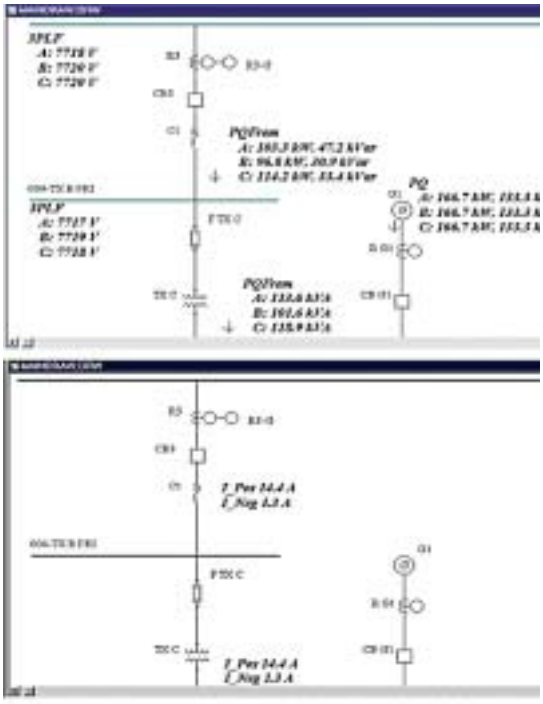
PTW Unbalanced Single Phase Studies

Unbalanced and Single Phase Studies

PTW Unbalanced Studies simulates systems with single-phase, two-phase and unbalanced three-phase load conditions. Phase and sequence currents can be displayed for different operating and load conditions including open-phase and simultaneous faults. Studies include demand load analysis, sizing, load flow/voltage drop and short circuit. Reports also include 3-phase and single-phase panel schedules. Modeling includes single-phase, two-phase and three-phase lines, transformers, loads, and capacitors as well as single-phase mid-tap transformers.

Benefits

- Design better systems where single-phase distribution and unbalanced conditions may exist.
- Identify undersized circuits caused by unbalanced loads before problems occur.
- Set negative sequence relays based on unbalanced fault and load simulations to identify problems that would otherwise go undetected until damage occurs.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.



Interface Options

- Display phase or sequence values with magnitude, magnitude and angle, magnitude and power factor, or real and imaginary.
- Display individual phase values, maximum phase, or phase summation.
- Represent any combination of 1-phase, 2-phase and 3-phase systems including systems with mid-tap transformers.
- Shares common interface with balanced DAPPER studies, harmonic analysis, transient stability equipment evaluation, reliability and CAPTOR protective coordination modules.

Analysis Options

- Connected, demand and design load analysis for each phase.
- Cable and transformer sizing based on design load of largest phase.
- Load flow and voltage drop through each 1-phase, 2-phase and 3-phase branch.
- Representation of transformer automatic Load-Tap-Change (LTC) options.
- Representation of transformer no-load losses.
- Short circuit calculations including individual or simultaneous faults at different locations and on any phase combinations.
- Optional capacitance to earth representation.
- Unbalanced load representation in three-phase and single-phase panels and sub-feeds.
- Cable parameter calculator.
- Sequence to Phase and Phase to Sequence impedance conversions.
- Transmission line parameter calculator including multiple circuits, bundling, transposition and line sag effects.

Typical Applications

- City distribution systems with three-phase and single-phase feeds.
- Rural utility distribution systems with three-phase and single-phase feeds.
- Campus distribution systems.
- Industrial plants to identify normal and abnormal unbalanced conditions.
- Commercial and institutional buildings with three-phase and single-phase loads and panels.
- Setting negative sequence relays to detect abnormal unbalanced conditions.
- Sizing equipment to projected design loads on largest phase.
- Short circuit, voltage drop or equipment sizing calculations for any single-phase, three-phase, or mixed-phase power system.

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