SKM Power*Tools
ELECTRICAL ENGINEERING SOFTWARE

PTW DAPPER®

DAPPER® Studies

DAPPER is an integrated set of modules for Three-Phase Power System Design and Analysis including rigorous load flow and voltage drop calculations, impact motor starting, traditional fault analysis, demand and design load analysis, feeder, raceway and transformer sizing, and panel, MCC, and switchboard schedule specification.

Benefits

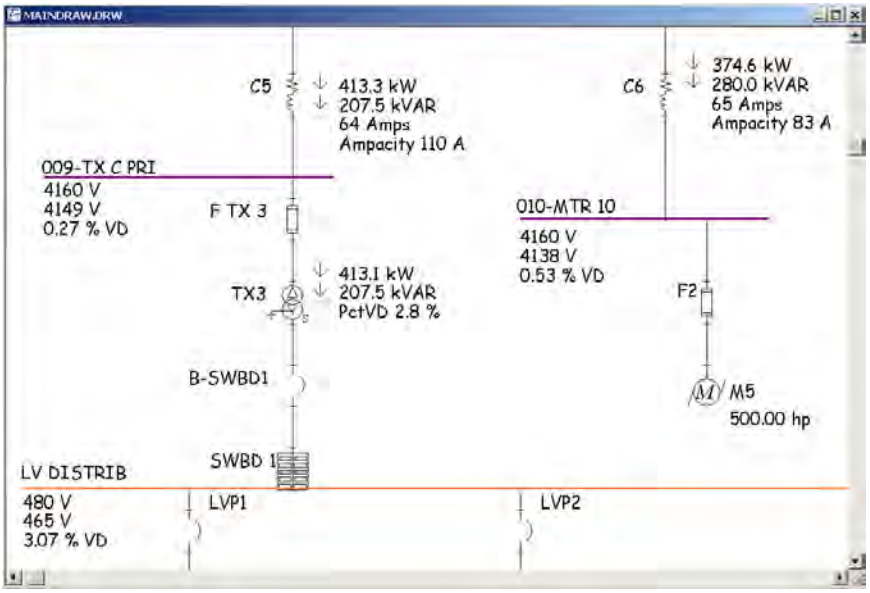
- Generate better designs by comparing alternatives quickly.
- Improve accuracy with DAPPER's rigorous solution methods.
- Save time by sharing a common project database and interface.
- Improve consistency with standard design libraries.
- Design safer systems by comparing calculations with short circuit and continuous ratings.
- Communicate designs effectively with presentation quality graphics, reports, and equipment schedules.

Load Flow/Voltage Drop

With DAPPER, users can calculate the voltage drop on each feeder and transformer branch, voltage on each bus, projected power flow, and losses in the power system.

This program may be used for conventional voltage drop analysis, loss analysis, power factor studies, capacitor placement, long-line charging effects, impact loading for motor starting studies, generator sizing, and for cogeneration analysis.

With DAPPER, a single load flow program models loop and radial power systems. Double precision sparse matrix current injection solutions are used for faster, more accurate convergence. This allows for better modeling of ill-conditioned systems.



Load flow study results are automatically displayed on the oneline diagram and in tabular report form.

DAPPER® Load Flow Features

- Models radial, loop, and multiple independent systems.
- Models utility and generator equivalent impedance calculated from short circuit duty.
- Models up to 50 utilities/swing bus generators.
- Models up to 400 regulated and unregulated co-generators.
- User definable per unit driving voltage at each utility and swing bus generator.
- Models transformer primary and secondary taps and off nominal rated voltages.
- Model load tap change transformer and zig-zag transformer.
- Model static var compensator, dynamic var compensator, and power factor correction equipment.
- Full transmission line modeling with built in line parameter calculators.
- Models any combination of motor and non-motor loads with global and/or local load factors.
- Models any combination of constant kVA, constant impedance and constant current loads.
- Reports bus voltage, voltage angle, and voltage drop at each bus.
- Reports branch voltage drop, power factor, and power flow in kW, kVAR, kVA, and Amps.
- Reports branch loss in kW, kVAR, kVA, and total system losses.
- User definable report criteria for bus and branch voltage drops.
- Percentage voltage drops based on system voltage per ANSI standards.
- Double precision calculations improve solution accuracy.
- Rapid solution convergence.
- Suitable for impact motor starting, capacitor placement and power factor studies.
- Load flow results validated to match with benchmark calculations and IEEE examples.

Comprehensive Fault Analysis

The DAPPER Comprehensive Fault Analysis program provides a network solution of three-phase, single-line to ground, line-to line, and double line to ground fault currents; RMS momentary fault currents; asymmetrical fault duties at three, five, and eight cycles; the positive, negative, and zero sequence impedance values between each fault location, and contributions from utilities, generators, and motors. At each fault location, the direction, X/R, and magnitude of fault currents are reported, thus providing a clear view of the conditions that exist during the fault.

Fault Location Bus Name	Bus Voltage	3-Phase Amps	3-Phase MVA	3-P X/R	SLG Amps	SLG MVA	SLG X/R	Mom Amps	--3P Asym Amps-- 3 Cycle	 5 Cycle	 8 Cycle
001-UTILITY CO	69,000	4,632	553.55	25.32	3,715	147.99	4.68	7,412	5,580	5,004	4,718
002-TX A PRI	69,000	1,847	220.73	14.93	1,169	46.57	9.60	2,809	1,989	1,874	1,849
003-HV SWGR	13,800	7,956	190.17	10.86	8,478	67.55	9.07	11,588	8,200	7,980	7,957
004-TX B PRI	13,800	7,770	185.71	5.48	8,157	64.99	4.39	9,937	7,778	7,770	7,770

DAPPER® Fault Analysis Features

- Symmetrical and Asymmetrical values reported at 1/2, 3, 5, 8, and 30 cycles.
- Asymmetrical values reported at user selected fault time.
- Asymmetrical values reported as peak or RMS values.
- Models two and three winding transformer taps, phase shift, and off nominal rated voltages.
- Asymmetrical exponential DC decay is based on X/R to each contribution.
- Reports Thevenin equivalent impedance and X/R at the faulted bus.
- Detailed and summary reporting options.
- Reports bus voltages and branch flows throughout the system for each faulted bus.
- Reports phase or sequence current and voltage.
- Reports ground return current for double line to ground faults.
- Models transformer and generator neutral grounding impedances.
- User-defined pre-fault voltage at each bus, using load flow results, no load with tap, or user-defined value.

Demand Load Analysis

The DAPPER Demand Load Analysis program provides a consistent summary of the loads throughout the power system. Connected, demand, and design loads are calculated for each load bus. All load calculations are based upon the global application of demand and design factors and the complex addition of loads, to properly account for the differences between load types. This method assures complete compliance with local and national electric code requirements while permitting flexibility in design for special applications.

The demand load information can be used directly by the DAPPER sizing and load flow modules. This data calculation procedure greatly simplifies the user interface while providing rigorous analytical results.

DAPPER® Demand Load Analysis Features

- Reports Connected, Demand, and Design loads.
- All load calculations account for individual load power factors.
- Automatically creates input load data for Load Flow and Voltage Drop Studies.
- Automatically creates loads for sizing feeders and transformers.
- System demand loads calculated using methods recognized by the NEC.
- Automatically tracks largest motor fed by each bus to meet NEC requirements.
- Automatic compliance with NEC and local codes for multi-level load diversity.
- Sensitivity studies, future load growth studies and load diversity studies by scaling load factors globally.
- "What if" analysis of loading conditions, i.e. light loading versus normal loading, or winter versus summer loading.
- Meet utility company requirements for providing a load summary by load type for connected, demand, and design loads at each utility bus.
- Generate sufficient information for sizing feeders, transformers, and other elements of the power system.

LOAD DESCRIPTION TYPE	UNITS	CONNECTED LOAD	DEMAND LOAD	DESIGN LOAD	POWER FACTOR
GENERAL LOADS	KW	55.3	55.3	55.3	
	KVAR	36.9	36.9	36.9	
	KVA	66.5	66.5	66.5	83.20 LAGGING
HEAT	KW	158.2	158.2	197.7	
	KVAR	0.0	0.0	0.0	
	KVA	158.2	158.2	197.7	100.00 UNITY
LTS	KW	216.8	216.8	271.0	
	KVAR	95.6	95.6	119.5	
	KVA	236.9	236.9	296.1	91.50 LAGGING
OFF EQ	KW	7.1	7.1	7.1	
	KVAR	4.4	4.4	4.4	
	KVA	8.3	8.3	8.3	85.00 LAGGING
ENERGY AUDIT Z	KW	237.5	237.5	237.5	
	KVAR	-3603.9	-3603.9	-3603.9	
	KVA	3611.7	3611.7	3611.7	-6.58 LEADING
KVA TYPE MTR	KW	12122.4	12122.4	12122.4	
	KVAR	5792.5	5792.5	5792.5	
	KVA	13435.2	13435.2	13435.2	90.23 LAGGING
LARGEST KVA MTR	KW	3885.4	3885.4	4856.8	
	KVAR	0.0	0.0	0.0	
	KVA	3885.4	3885.4	4856.8	100.00 UNITY
TOTAL LOADS	KW	16682.7	16682.7	17747.8	
	KVAR	2325.5	2325.5	2349.4	
	KVA	16844.0	16844.0	17902.7	
	% PF	99.0 LAGGING	99.0 LAGGING	99.1 LAGGING	

Feeder and Transformer Sizing

DAPPER will size feeder cables, ground wires, raceways, bus ducts, duct banks and transformers throughout the power system to the load requirements calculated by the Demand Load Analysis program.

Feeders are selected to meet user-defined criteria for conductor material, voltage level, insulation type, and environmental conditions. Transformer primary and secondary feeders are sized to the transformer full load as specified by the user. Feeders and transformers may be included, excluded or evaluated in the sizing study.

DAPPER® Feeder and Transformer Sizing Features

- AWG, Bus Duct, ACSR, or metric sizes may be used.
- Feeders and transformers with “Do Not Size” are evaluated for capacity.
- Feeder libraries permit user to include metric sizes and ampacity.
- Transformers can be sized to Demand or Design load.
- Option to comply with the IEE wiring regulations for international wiring installation.

		-----Raceway Information -----					----- Feeder Information -----				
Cable Name	From Bus To Bus	In/Out New/Exist.	Number Size	Duct Bank Material	Ground Size Neutral Size	Qty/Ph. Size	Conductor Insulation	Length (feet)	Ambient (deg C)	Design Load (Amps)	Derated Rating(Amps)
C1	003-HV SWGR 004-TX B PRI	In New	1 2 1/2"	D-7 Non-Magnetic	8 8	1 6	Copper XLP	200	30	46	115
C10	BLDG 115 SER 026-TX G PRI	In New	2 3"	NONE Non-Magnetic	2 3	2 1/0	Copper XLP	350	30	162	390
C11	BLDG 115 SER 025-MTR 25	In Existing	1 5"	NONE Non-Magnetic	2 3/0	1 500	Copper XLP	500	30	339	480
C12	022-DSB 2 023-MTR 23	In New	4 2 1/2"	NONE Non-Magnetic	3/0 3/0	4 300	Copper	100	30	937	1,140

Load Schedules

The DAPPER Load Schedule module provides detailed documentation of load fed through Panels, Motor Control Centers (MCCs) and Switchboards. Input is simplified through the use of libraries and copy and paste functions. The schedules can be displayed, printed, and exported in a variety of different formats.

DAPPER® Load Schedules Features

- Schedules are automatically updated with available short circuit values and sub-feed totals.
- Panel & switch board schedules are automatically generated from connected branch loads.
- MCC schedules can reference a default design library for automatic selection of feeder and raceway sizes, or the complete cable library for more detailed specification.

PANEL_S3

PANEL: PANEL S3 LOCATION: Penthouse FED FROM: 016-H2A REVISION: 1		OC DEVICE TYPE: Breaker DEVICE FAMILY: Bolt On		ENCLOSURE: NEMA 1 MOUNTING: Flush VOLTAGE: 480			MAINS(A): MLO WIRING: 3-Phase 3-Wire ITE		BUS RATING(A): 225 WITHSTAND(A): 10000 FAULT CURRENT(A) 7658				
OC AMPS P	NOTES	DESCRIPTION	DEMAND CODE	VA	CKT	PHASE LOADS VA A B C	CKT	VA	DEMAND CODE	DESCRIPTION	NOTES	OC AMPS P	
0 3		019-H3A	NONE	41383	1	32535	2	58197	HEAT	Heater		100 3	
""		""		-	3	32535	4	-		""		""	
""		""		-	5	32535	6	-		""		""	
0 3		L8	LTS	9700	7	7390	8	4157	LTS	Lights		20 1	
""		""		-	9	7390	10	4157	LTS	Lights		20 1	
""		""		-	11	7390	12	4157	LTS	Lights		20 1	
0 3		L7	LTS	8000	13	6809	14	4157	LTS	Lights		20 1	
""		""		-	15	6809	16	4157	LTS	Lights		20 1	
""		""		-	17	6809	18	4157	LTS	Lights		20 1	

ALL CONNECTED	KVA	AMPS	* PHASE TOTALS	VA	AMPS	BUS TOTALS	KVA		
TOTAL CONNECTED	139.74	168.1	* A-N	46578.6	168.1	CONNECTED	139.74	DATE:	17 Apr 2003
TOTAL DEMAND	139.74	168.1	* B-N	46578.6	168.1	DEMAND	139.74	TIME:	09:55:28
TOTAL DESIGN	172.71	207.7	* C-N	46578.6	168.1	DESIGN	172.71		

Panel is locked, use key #17-C

Systems Analysis, Inc.
P.O. Box 3376
Manhattan Beach, CA 90266
800.232.6789
www.skm.com
sales@skm.com