

# Electrc 2008 Sample reports

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## Electrc 2008 NEC Calculator

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**Electrc 2008 is a suite of tools that performs your most common electrical design calculations in full compliance with the 2008 National Electrical Code.**

**Conductor sizing:**

- Single or parallel (up to 12) conductors per phase
- Voltage drop, circuit type, ambient temperature and quantity of current carrying conductors derating
- Terminal temperature factoring
- New rooftop raceway derating
- Many built-in conductor types
- Custom conductors

**Conduit & Trough Fill:**

- Any combination of conductors per fill calculation including bare and custom conductors
- 13 raceway types plus trough
- Alternate raceway size option.

**Motor Calcs:**

- Motor conductor, overcurrent and overload sizing
- Single or parallel (up to 12) conductors per phase
- Voltage drop, circuit type, ambient temperature and quantity current carrying conductors derating
- Terminal temperature factoring
- New rooftop raceway derating
- Many built-in conductor types
- Custom conductors
- single phase motors up to 10 Hp
- Three phase motors up to 500 Hp.

### **Lighting Design:**

- Many built-in lighting fixtures and lamps
- Specify your own fixtures and lamps
- Reflectance and maintenance factor parameters
- Standard and reverse lighting calculations

### **Panel Directory:**

- Print panelboard directories in two sizes (4x6 or 6x8 inch)
- Optional footer text.

### **Transformer Sizing:**

- Solve for kva rating or load amperage
- Primary and secondary overcurrent protection
- Distribution and autotransformer types.

### **Fault Current Calcs:**

- Point to point method, up to 10 points on each distribution system.

### **Voltage Drop:**

- Calculates the voltage drop on existing or proposed resistive (100% power factor) circuits.

### **Power Factor Correction:**

- Calculates the existing power factor, and determines the quantity of capacitive Kvars needed to arrive at a new power factor
- Shows the amount of distribution system losses that would be freed-up at the new power factor.

### **Box Fill and Sizing:**

- Calculates the volumetric capacity, in cubic inches, of device or splice boxes, required for any quantity of conductors, devices, and fittings.

### **Quick-Reference Tables:**

- Reference tables from the NEC. Conductor ampacity, box volumes, equipment ground conductors, grounding electrode conductors, underground cover requirements, terminal temperature limitations, and more.

### **File Save/Load:**

- All program function allow you to save project files for future reference or reuse.

### **Professional, detailed printed reports:**

- Viewable in print preview, or sent to printer.

### **Quick-Calculators:**

- Ohm's Law
- AC/DC Formulas
- Cost to Operate (standard and demand metering)

### **Minimum System Requirements:**

Windows98 or greater  
Microsoft .Net Framework 2.0 or higher  
Electrc 2008 Setup will install the Framework if it is not already on your system  
1 Mb disk space (if Framework is already installed)  
83 Mb disk space (if Framework is not already installed)  
2 Mb Ram  
Mouse or pointing device.  
800 x 600 or higher screen resolution (1024 x 768 or higher is recommended)

A free 30 day trial version of Electrc 2008 is available for download at <http://electrc.net>

The trial version is fully functional and is identical to the licensed version, except that it will stop running after 30 days.

BOX FILL CALCULATION  
NEC Article 314

Quantity Of Conductors	Conductor Size	Volume Required For 1 Conductor ( Cubic Inches )	Total Volume Required
3	14	2.0	6.0
3	12	2.25	6.75

-----  
Total Conductor Volume (Cu.In): 12.75

Quantity Of Ground Conductors	Conductor Size	Volume Required For 1 Conductor ( Cubic Inches )	Total Volume Required
1	14	2.0	2.0
1	12	2.25	2.25

-----  
Ground Conductor Volume Based On Largest Conductor (Cu.In): 2.25

Device Strap #	Largest Conductor Connected To Strap	Volume Required For 1 Conductor ( Cubic Inches )	Total Volume Based On 2 Deductions
1	14	2.0	4.0
2	12	2.25	4.5

-----  
Total Device Strap Volume (Cu.In): 8.5

Box Fittings	Largest Conductor Contained In Box	Volume Required For 1 Conductor ( Cubic Inches )	Total Volume Based On 1 Deduction
Cable Clamps	12	2.25	2.25

-----  
Total Fittings Volume (Cu.In): 2.25

MINIMUM REQUIRED BOX VOLUME (Cu.In.) : 25.75

CONDUIT FILL CALCULATION  
NEC Chapter 9 Tables

QTY	SIZE	CONDUCTOR TYPE	AREA PER Sq. In	TOTAL AREA Sq. In
6	14	THHN	0.0097	0.0582
12	12	THHN	0.0133	0.1596
3	10	RHH	0.0437	0.1311
6	8	THW	0.0556	0.3336
1	8	Bare	0.017	0.017

-----  
Total Conductor Area (Sq. In.): 0.6995

Raceway Type: EMT      Electrical Metallic Tubing

SELECTED SIZE: 1 1/2 Inch

Ttl. Conduit Cross Section (Sq. In.) : 2.036  
Maximum Allowable Fill Percent      : 40.0

Max. Allowed Conductor Area (Sq. In) : 0.8144

Actual Conductor Area (Sq. In)      : 0.6995  
ACTUAL PERCENT FILL                    : 34.36

ALTERNATE SIZE: 2 Inch

Ttl. Alternate Conduit Cross Section (Sq. In.) : 3.356  
Maximum Allowable Fill Percent      : 40.0

Max. Allowed Conductor Area (Sq. In) : 1.3424

Actual Conductor Area (Sq. In)      : 0.6995  
ACTUAL ALTERNATE PERCENT FILL      : 20.84

Sam's Liquor Locker  
 Bid #: D1486  
 Client: Bud Atkins  
 Date Prepared: 9/09/2007

FAULT CURRENT CALCULATION

Point #2 Description: Point 2

Fault Current Available At Source ... : 14638  
 One Way Conductor Length (Ft) ..... : 50  
 Quantity Parallel Conductors Per Phase: 1  
 Conductor Size ..... : 4 Awg  
 Line To Line Voltage At This Point .. : 480  
 Phase ..... : 3  
 Conductor/Raceway: Copper conductors / Aluminum Raceway

POINT #	SOURCE S.C. AMPS	----- C	FACTORS F	----- M	SHORT CIRCUIT AMPS AT FAULT
2	14638	3448	0.7650492	0.5665565	8293

Formulas Used In This Calculation:

C Factor =  $1/Z \text{ Per Ft} = 1/.00029 = 3448$

F Factor =  $\frac{1.73 \times L \times I}{PC \times C \times E} = \frac{1.73 \times 50 \times 14638}{1 \times 3448 \times 480} = .7650492$

M Factor =  $\frac{1}{1 + F \text{ Factor}} = \frac{1}{1 + .7650492} = .5665565$

Short Circuit Amps At Fault =  $I \times M = 14638 \times .5665565 = 8293$

Legend:

- Z Per Foot = Conductor impedance per foot
- L = Conductor length in feet
- I = Fault current available at source
- PC = Quantity parallel conductors per phase
- C = C factor
- E = Line to line voltage

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FAULT CURRENT CALCULATION

Point #1 Description: Point 1

Fault Current Available At Source ... : 56000  
 One Way Conductor Length (Ft) ..... : 70  
 Quantity Parallel Conductors Per Phase: 1  
 Conductor Size ..... : 2 Awg  
 Line To Line Voltage At This Point .. : 480  
 Phase ..... : 3  
 Conductor/Raceway: Copper conductors / Steel Raceway

POINT #	SOURCE S.C. AMPS	----- C	FACTORS F	----- M	SHORT CIRCUIT AMPS AT FAULT
1	56000	5000	2.825667	0.2613924	14638

Formulas Used In This Calculation:

C Factor = 1/Z Per Ft = 1/.0002 = 5000

$$F \text{ Factor} = \frac{1.73 \times L \times I}{PC \times C \times E} = \frac{1.73 \times 70 \times 56000}{1 \times 5000 \times 480} = 2.825667$$

$$M \text{ Factor} = \frac{1}{1 + F \text{ Factor}} = \frac{1}{1 + 2.825667} = .2613924$$

Short Circuit Amps At Fault = I x M = 56000 x .2613924 = 14638

Legend:

- Z Per Foot = Conductor impedance per foot
- L = Conductor length in feet
- I = Fault current available at source
- PC = Quantity parallel conductors per phase
- C = C factor
- E = Line to line voltage

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LIGHTING DESIGN  
Zonal Cavity Method

Room Length .....: 50  
Room Width .....: 50  
Square Footage .....: 2500.0

Ceiling Height .....: 12  
Fixture Height .....: 10  
Work Height .....: 3

Ceiling Cavity Ratio .....: 0.4  
Ceiling Reflectance % .....: 80  
Ceiling Effective Reflectance %: 75.0

Room Cavity Ratio .....: 1.4  
Wall Reflectance % .....: 60

Floor Cavity Ratio .....: 0.6  
Floor Reflectance % .....: 40  
Floor Effective Reflectance % .: 38.0

Maintenance Factor .....: 0.8

Fixture Type .....: 2 Lamp F48 Surface  
Fixture CU .....: 0.77

Lamp Type .....: F48/T12/CW\*  
Lumens/Lamp .....: 2800  
Lamps/Fixture .....: 2  
Lumens Per Fixture: 5600

---

Quantity of Fixtures Selected: 36

Initial Installed Footcandles: 62.5

Maintained Footcandles: 50.0

MOTOR CALCULATION  
NEC Article 430

Motor Type ..... : 3 Phase - Wound Rotor  
Motor Voltage ..... : 480  
Motor Horsepower ..... : 25

Nameplate FLA ..... : 21.0  
Service Factor ..... : 1.15  
Temperature Rise (Deg.C) : 40.0

Overcurrent Type ..... : Instantaneous Trip Breaker

Conductor Type ..... : Sample Custom  
Conductor Material..... : Aluminum  
Conductor Location ..... : Dry or Damp  
Conductor Insulation Temperature : 75 °C

Rooftop Installation: NEC 310.15(B)(2)(c)  
Distance Above Roof ..... : 0 to 13 mm [0 to 1/2 inch]  
Average Outside Temp ..... : 70 Deg. F           21.1 Deg. C  
Temperature Adder ..... : 60 Deg. F           33 Deg. C

-----  
Adjusted Ambient Temperature ... : 130.0 Deg. F           54.1 Deg. C

Terminal Temperature Rating .... : 75 °C

Circuit Type : Three Phase 3 Wire (3 phase conductors)

Qty. of Circuit Current-Carrying Conductors : 3  
Additional Current-Carrying Conductors ..... : 4

-----  
Total Qty. Current-Carrying Conductors ..... : 7

Conductor Requirement

NEC Table FLA ..... : 34.0  
125% Multiplier ..... : 1.25  
Ambient Temp. Multiplier . : 1.49  
Qty. Conductors Multiplier : 1.43 [ Current Carrying Conductors/Raceway: 7 ]

-----  
Required Conductor Ampacity: 90.46

Terminal Requirement:

Full Load Amps ..... : 34.0  
125% Multiplier ..... : 1.25

-----  
Required Terminal Ampacity : 42.5

Selected Conductor:

Conductor Ampacity ..... : 100.0  
Ambient Temp. Derate ..... : 0.67  
Qty. Conductors Derate ... : 0.7

-----  
Adjusted Ampacity ..... : 67.0

SELECTED CONDUCTOR: 3 Awg

OVERLOAD RATING: 21.0 Amps x 1.25: 26.25 Amp

OVERCURRENT RATING

Calculated: 272.0 Amp           Standard .: 300 Amp

Sam's Liquor Locker  
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Main Service Panel	
Fed From: Utility Overhead Drop	
Volts: 120/240      Amps: 200      Phase: 3	
1	2
3	4
5 Bathroom GFCI	Basement Lights 6
7 Kitchen Counter Outlets	Kitchen Refrigerator 8
9 Dining Room Lights	Dining Room Outlets 10
11 Master BR Lights	Master BR Outlets 12
13 Hallway Lights & Outlets	Garage Door Opener 14
15 Attic Fan	Garbage Disposal 16
17 Dishwasher	Jennaire Cooktop   18
19	20
21	Guest BR Lights 22
23 Furnace	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
TriPhase Electric Inc 123 Main Street Washington NJ 07812 Phone: 973-123-4567	

Sam's Liquor Locker  
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POWER FACTOR CALCULATION

Phase of Load ..... : Three Phase  
Measured Line Voltage ..... : 201  
Measured Line Current (Amp) : 30  
Measured True Power (Kw) .. : 8.5

	Existing	Proposed
Power Factor (%)	81.48	95.0
Phase Angle (Deg)	35.4	18.15
KiloVoltAmps (Kva)	10.43	8.95
Line Current (Amp)	30.0	25.73
Kva Reactive (Kva)	6.04	2.79

Distribution System Losses Recovered At Proposed PF (Kva): 1.48

Capacitive Kvars Required For Proposed PF: 3.26

$$\begin{aligned} \text{Amps} &= (\text{Hp} \times 746) / (\text{Volts} \times \text{Eff} \times \text{Pf}) \\ 388.38 &= (1 \times 746) / (2 \times 0.98 \times 0.99) \end{aligned}$$

$$\begin{aligned} \text{Amps} &= (\text{Kw} \times 1000) / (1.732 \times \text{Volts} \times \text{Pf}) \\ 14.61 &= (5 \times 1000) / (1.732 \times 208 \times 0.95) \end{aligned}$$

$$\begin{aligned} \text{Amps} &= (\text{Kva} \times 1000) / \text{Volts} \\ 22.50 &= (2.7 \times 1000) / 120 \end{aligned}$$

$$\begin{aligned} \text{Kw} &= (\text{Amps} \times \text{Volts}) / 1000 \\ 0.04 &= (3 \times 12) / 1000 \end{aligned}$$

$$\begin{aligned} \text{Kva} &= (\text{Amps} \times \text{Volts} \times 1.732) / 1000 \\ 13.30 &= (16 \times 480 \times 1.732) / 1000 \end{aligned}$$

$$\begin{aligned} \text{Hp} &= (\text{Amps} \times \text{Volts} \times \text{Eff} \times \text{Pf} \times 1.732) / 746 \\ 5.07 &= (12 \times 208 \times 0.94 \times 0.93 \times 1.732) / 746 \end{aligned}$$

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TRANSFORMER  
NEC Article 450

Transformer Rating (Kva) ... : 75  
Primary Voltage ..... : 480  
Secondary Voltage ..... : 208  
Percent Impedance ..... : 3  
Phase ..... : Three

Overcurrent Protection ..... : Primary and Secondary Protection  
Primary Overcurrent Type ..... : Circuit Breaker  
Secondary Overcurrent Type ... : Circuit Breaker  
Transformer Type ..... : Distribution Transformer

Minimum Transformer Kva ..... : 75  
Transformer Rated Primary Amperage ..... : 90.32  
Transformer Rated Secondary Amperage ..... : 208.43  
Max. Primary Feeder Amps ..... : 225.79  
Next Standard Size Allowed ..... : n/a  
Maximum Secondary Overcurrent Protection Amperage . : 260.53  
Next Standard Size Allowed ..... : 300

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VOLTAGE DROP CALCULATION

Voltage ..... : 208  
Load Amperage ..... : 16  
Circuit Length (Ft) .. : 75  
Conductor Size ..... : 10 Awg  
Conductors Per Phase . : 1  
Conductor Material ... : Copper

Circuit Type .. : AC Single Phase 3 Wire

Voltage Drop between neutral and phase conductor

$$VD = \frac{(2 \times \text{Ohms per 1000 ft} \times \text{Length} \times \text{Amps})}{1000 \times \text{Qty Wires per Phase}} \times 0.5$$

$$VD = \frac{2 \times 1.24 \times 75 \times 16}{1000 \times 1} \times 0.5$$

Volts Dropped : 1.49

Volts At Load : 206.51

Percent Drop .: 0.72

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WIRE SIZING CALCULATION  
NEC Article 310

Full Load Amperage ..... : 34  
Source Voltage ..... : 480  
Length of Run (Feet) ..... : 100  
Load Duty ..... : Continuous

Conductor Application ..... : Conductors in Raceway, Cable or Earth  
Conductor Ampacity Table ..... : NEC Table 310-16  
Conductor Type ..... : THHN Copper  
Conductor Location ..... : Dry/Damp  
Conductor Insulation Temperature : 90 °C

Rooftop Installation: NEC 310.15(B)(2)(c)  
Distance Above Roof ..... : 0 to 13 mm [0 to 1/2 inch]  
Average Outside Temp ..... : 65 Deg. F      18.3 Deg. C  
Temperature Adder ..... : 60 Deg. F      33 Deg. C

-----  
Adjusted Ambient Temperature ... : 125.0 Deg. F      51.3 Deg. C

Terminal Temperature Rating .... : 75 °C

Circuit Type : Three Phase 3 Wire (3 phase conductors)

Qty. of Circuit Current-Carrying Conductors : 3  
Additional Current-Carrying Conductors ..... : 4  
-----  
Total Qty. Current-Carrying Conductors ..... : 7

Conductor Requirement:  
Full Load Amps ..... : 34.0  
Load Duty Multiplier ..... : 1.25  
Ambient Temp. Multiplier . : 1.32  
Qty. Conductors Multiplier : 1.43  
-----  
Required Conductor Ampacity: 80.14

Terminal Requirement:  
Full Load Amps ..... : 34.0  
Load Duty Multiplier ..... : 1.25  
-----  
Required Terminal Ampacity : 42.5

Selected Conductor:  
Conductor Ampacity ..... : 95.0  
Ambient Temp. Derate ..... : 0.76  
Qty. Conductors Derate ... : 0.7  
-----  
Adjusted Ampacity ..... : 50.54

SELECTED CONDUCTOR SIZE : 4 Awg

$$VD = \frac{0.866 \times 2 \times \text{Ohms/MilFt} \times \text{Length} \times \text{Amps}}{1000 \times \text{Qty Wires per Phase}} = \frac{0.866 \times 2 \times 0.308 \times 100 \times 80.14}{1000 \times 1} = 1.81$$

Volts At Load Terminals..... : 478.19  
Actual Percent Voltage Drop . : 0.38