

**NON RESIDENTIAL LOADS**

BASED ON THE 2008 NEC

PROJECT NAME

SAMPLE PROJECT

	L1	L2	L3
CALCULATED LOAD ( NEC 215.5 )	46,263 VA	52,715 VA	31,187 VA
CALCULATED LOAD WITH DEMAND FACTORS ( NEC 215.5 )			
GENERAL LOAD	3,900 VA	3,275 VA	3,602 VA
RECEPTACLE LOAD (NEC TABLE 220.44)			
1ST 10,000W	3,111 VA	6,025 VA	864 VA
REMAINDER @ 50%	8,075 VA	15,638 VA	2,243 VA
CONTINUOUS LOAD (NEC 215.2)	16,223 VA	8,000 VA	15,735 VA
PLUS 25% (L1, L2, L3)	4,056 VA	2,000 VA	3,934 VA
0% (NEUTRAL) NEC 215.2(A) EX NO. 2			
MOTOR LOAD (NEC 430.24)	5,380 VA	2,640 VA	3,700 VA
PLUS 25% OF LARGEST MOTOR	985 VA	660 VA	925 VA
KITCHEN LOADS (NEC 220.56)			
L1 ( 1,500 VA X 0.8 ) =	1,200 VA		
L2 ( 1,500 VA X 0.8 ) =		1,200 VA	
L3 ( 2,800 VA X 0.8 ) =			2,240 VA
TOTAL BALANCED LOAD (3-PHASE)	33,243 VA	33,243 VA	33,243 VA
TOTAL BALANCED LOAD (1-PHASE)	6,195 VA	6,195 VA	0 VA
TOTAL UNBALANCED LOAD (1-PHASE)	3,492 VA	0 VA	0 VA
LINE AMPS BALANCED (3-PHASE)	276.8 A	276.8 A	276.8 A
LINE AMPS BALANCED (1-PHASE)	59.6 A	59.6 A	0.0 A
LINE AMPS UNBALANCED (1-PHASE)	29.1 A	0.0 A	0.0 A
NON RESIDENTIAL LOAD	365.5 A	336.4 A	276.8 A

**RESIDENTIAL LOADS**

BASED ON THE 2008 NEC SECTION 220.84

TOTAL SQ FOOTAGE ( 9,000 SQ FT X 3 VA ) =	27,000 VA
APPLIANCE CIRCUITS ( 12 X 1,500 VA ) =	18,000 VA
LAUNDRY CIRCUITS ( 6 X 1,500 VA ) =	9,000 VA

RANGES ( 4 ON ANY 2 PHASES ) = 32,000 KVA	
PER PHASE DEMAND ( 32,000 VA ÷ 2 ) = 16,000 VA	
EQUIVALENT 3-PHASE LOAD ( 16,000 VA X 3 ) =	48,000 VA

DRYERS ( 4 ON ANY 2 PHASES ) = 30,000 KVA	
PER PHASE DEMAND ( 20,000 VA ÷ 2 ) = 10,000 VA	
EQUIVALENT 3-PHASE LOAD ( 10,000 VA X 3 ) =	30,000 VA

WATER HEATER LOAD	15,000 VA
MISC LOADS	7,200 VA
LARGEST HEATING OR COOLING LOAD	24,000 VA
TOTAL CONNECTED LOAD	178,200 VA

CONNECTED AMPS ( 178,200 VA ÷ 208 V ÷ 1.732 ) = 495 A

DEMAND FACTOR NEC TABLE 220.84 = 44%

ADJUSTED AMPS ( 495 A X 0.44 ) =	218 A
NON-RESIDENTIAL LOAD	366 A
SUBTOTAL	584 A

FUTURE FACTOR ( 584 A X 0.00 ) = 0 A

**SERVICE SIZE 584 A****NEUTRAL LOAD PER NEC 220.61**

TOTAL SQ FOOTAGE ( 9,000 SQ FT X 3 VA ) =	27,000 VA
APPLIANCE CIRCUITS ( 12 X 1,500 VA ) =	18,000 VA
LAUNDRY CIRCUITS ( 6 X 1,500 VA ) =	9,000 VA
TOTAL CONNECTED NEUTRAL LOAD	54,000 VA

FIRST 3,000 VA @ 100% ( 3,000 VA X 1.00 ) =	3,000 VA
3,000-120,000 VA @ 35% ( 51,000 VA X 0.35 ) =	17,850 VA
OVER 120,000 VA @ 25% ( 0 VA X 0.25 ) =	0 VA
SUBTOTAL	20,850 VA

**RANGE DEMAND**

PROHIBITED REDUCTION NEC 220.61(C)(1)	
100% OF TABLE 220.55 ( 21,000 VA X 1.00 ) =	21,000 VA

**DRYER DEMAND**

PROHIBITED REDUCTION NEC 220.61(C)(1)	
100% OF TABLE 220.54 ( 30,000 VA 0.75 VA X 1.00 ) =	22,500 VA

UNBALANCED 120 VOLT MISC. LOADS AT 100%	2,400 VA
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NEUTRAL LOAD VA	66,750 VA
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NEUTRAL LOAD ( 66,750 VA ÷ 1.732 ÷ 208 V ) =	185 A
NON RESIDENTIAL NEUTRAL LOAD	366 A
NEUTRAL LOAD AMPS	551 A

FURTHER DEMAND FACTOR - NEC 220.61(B)(2)

FIRST 200 A @ 100% ( 200 A X 1.00 ) =	200 A
REMAINDER @ 70% ( 351 A X 0.70 ) =	246 A

**MINIMUM NEUTRAL CONDUCTOR AMPACITY 446 A**

PANEL	CALCULATED LOAD			GENERAL LOAD			RECEPTACLE LOAD			CONTINUOUS LOAD		
	VA			VA			VA			VA		
	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
HP1	9,423		12,085	500		250	900		2,100	8,023		9,735
CP	27,380	44,940		1,000	1,000		18,000	36,000		4,000	5,000	
CP		7,775	8,802		2,275	2,152		1,300	1,450		3,000	2,500
CP	9,460		10,300	2,400		1,200	360		1,800	4,200		3,500
<b>TOTALS</b>	<b>46,263</b>	<b>52,715</b>	<b>31,187</b>	<b>3,900</b>	<b>3,275</b>	<b>3,602</b>	<b>19,260</b>	<b>37,300</b>	<b>5,350</b>	<b>16,223</b>	<b>8,000</b>	<b>15,735</b>

PANEL	MOTOR LOAD			LARGEST MOTOR LOAD			KITCHEN LOAD			# OF KITCHEN LOADS	HARMONIC LOAD VA	HARMONIC LOAD AMPS
	VA			VA			VA					
	L1	L2	L3	L1	L2	L3	L1	L2	L3			
HP1	0		0	0		0	0		0	0	0	0
CP	2,880	1,440		1,440	1,440		1,500	1,500		2	0	0
CP		1,200	1,200		1,200	1,200		0	1,500	1	0	0
CP	2,500		2,500	2,500		2,500	0		1,300	1	0	0
<b>TOTALS</b>	<b>5,380</b>	<b>2,640</b>	<b>3,700</b>	<b>3,940</b>	<b>2,640</b>	<b>3,700</b>	<b>1,500</b>	<b>1,500</b>	<b>2,800</b>	<b>4</b>	<b>0</b>	<b>0</b>

**NOTE #1**

HARMONIC CURRENT CALCULATION ( NEC 310.15 (B) 4 (C) &amp; NEC TABLE 310.15 B (2) A

( Harmonic Load 0 A ÷ Design Load 584 A ) X 100 = 0 %

Harmonic Load Does Not Exceed 50% of Total Load

## VOLTAGE DROP CALCULATIONS

PROJECT NAME

SAMPLE PROJECT

FEEDERVOLTAGE DROPVOLTAGE DROP PERCENTAGE

SERVICE POINT TO MAIN PANEL

$$(2 \times 50' \text{ L} \times 0.0212 \text{ R} \times 584 \text{ A} \div 1,000 \times 0.866) = 1.1 \text{ VD}$$

$$(0.4 \text{ VD} \div 208 \text{ V} \times 100) = 0.2 \% \text{ VD}$$

MAIN PANEL TO HP1

$$(2 \times 20' \text{ L} \times 0.0766 \text{ R} \times 136 \text{ A} \div 1,000 \times 1) = 0.4 \text{ VD}$$

$$(0.4 \text{ VD} \div 208 \text{ V} \times 100) = 0.2 \% \text{ VD}$$

MAIN PANEL TO DP

$$(2 \times 30' \text{ L} \times 0.2530 \text{ R} \times 98 \text{ A} \div 1,000 \times 1) = 1.5 \text{ VD}$$

$$(1.5 \text{ VD} \div 208 \text{ V} \times 100) = 0.7 \% \text{ VD}$$

MAIN PANEL TO DP

$$(2 \times 30' \text{ L} \times 0.2530 \text{ R} \times 98 \text{ A} \div 1,000 \times 1) = 1.5 \text{ VD}$$

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## KEY

A - Amps

L - Length

R - Conductor Resistance

VD - Voltage Drop

FAULT CURRENT CALCULATIONS

PROJECT NAME

SAMPLE PROJECT

SERVICE POINT TO MAIN PANEL  $(( 30,000 \text{ AFC} \times 1.1 \text{ UA} ) + 0.0 \text{ MC} ) \times ( 1 \div ( 1 + ( 1.732 \times 30 \text{ L} \times (( 30,000 \text{ AFC} \times 1.1 \text{ UA} ) + 0.0 \text{ MC} )) \div ( 18,756 \text{ C} \times 2 \text{ N} \times 208 \text{ V} ))) = 24,153 \text{ CLC}$   
 MAIN PANEL TO HP1  $(( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} ) \times ( 1 \div ( 1 + ( 2.000 \times 30 \text{ L} \times (( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} )) \div ( 12,844 \text{ C} \times 1 \text{ N} \times 208 \text{ V} ))) = 17,738 \text{ CLC}$

MAIN PANEL TO DP  $(( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} ) \times ( 1 \div ( 1 + ( 2.000 \times 30 \text{ L} \times (( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} )) \div ( 4,699 \text{ C} \times 1 \text{ N} \times 208 \text{ V} ))) = 9,729 \text{ CLC}$   
 MAIN PANEL TO DP  $(( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} ) \times ( 1 \div ( 1 + ( 2.000 \times 30 \text{ L} \times (( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} )) \div ( 4,699 \text{ C} \times 1 \text{ N} \times 208 \text{ V} ))) = 9,729 \text{ CLC}$   
 MAIN PANEL TO DP  $(( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} ) \times ( 1 \div ( 1 + ( 2.000 \times 30 \text{ L} \times (( 24,153 \text{ AFC} \times 1.0 \text{ UA} ) + 0.0 \text{ MC} )) \div ( 4,699 \text{ C} \times 1 \text{ N} \times 208 \text{ V} ))) = 9,729 \text{ CLC}$   
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KEY

AFC - Available Fault Current  
 C - Conductor Constance  
 CLC - Conductor Let Through Current

L - Length  
 MC - Motor Contribution  
 N - Number of Conductors

UA - Utility Adjustment  
 V - Volts