

RESIDENTIAL ELECTRIC LOAD CALCULATION (SIMPLE METHOD)

Revision Date: 01/09/2024

Name: ADU Calculations - Original	<i>HINT: USE TAB KEY OR SHIFT+TAB TO MOVE BETWEEN CELLS</i>																																																																																																			
Address:																																																																																																				
STEP 1 Estimate General Electric Load Excluding Heating and AC																																																																																																				
Square Footage of Structure # of Small Appliance Circuits (2 min.) # of Laundry Circuits (1 min.) New Construction?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 100px;">999</td> <td>General Lighting Load</td> <td style="width: 100px;">3</td> <td>Watts per square foot</td> <td>=</td> <td style="width: 100px;">2,997</td> <td>Final Watts (Volt Amps)</td> </tr> <tr> <td>2</td> <td>Small Appliance Circuits</td> <td>1,500</td> <td>Watts each</td> <td>=</td> <td>3,000</td> <td>3,000</td> </tr> <tr> <td>1</td> <td>Laundry Circuits</td> <td>1,500</td> <td>Watts each</td> <td>=</td> <td>1,500</td> <td>1,500</td> </tr> <tr> <td colspan="4" style="text-align: right;">Step 1 Total =</td> <td></td> <td>7,497</td> <td>7,497</td> </tr> </table>	999	General Lighting Load	3	Watts per square foot	=	2,997	Final Watts (Volt Amps)	2	Small Appliance Circuits	1,500	Watts each	=	3,000	3,000	1	Laundry Circuits	1,500	Watts each	=	1,500	1,500	Step 1 Total =					7,497	7,497	NOTE: this is for new construction* 10k base load. Do these calcs again using existing buildings method It is typical to only have 2 small appliance circuits. Unless specified specifically by electrical engineer, I would suggest only two here. side note: this may have been three because of the hardwired patio heaters. Suggesting to remove these heaters.																																																																						
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STEP 2 Estimate Heating/AC Electric Load		NOTE: this is for new construction* 10k base load. Do these calcs again using existing buildings method Can choose one heat pump or the other -- noncoincident loads, heating and cooling will not be on at the same time. remove the 4520 value, and keep the 6090 value, the larger of the two																																																																																																		
A/C Condenser & Fixed Space Heating A/C Heat up to 8 kW A/C Heat up to 15 kW A/C Heat up to 20 kW Cond/Heat Pump to 2 T Cond/Heat Pump to 4 T Cond/Heat Pump to 5 T (heat pump, buffer, wshr) avg Other Electric Heating Device	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 100px;">Circuit Shared / Paused With (please select all shared)</th> <th style="width: 100px;"># of units</th> <th style="width: 100px;">Watts (Volt Amps)</th> <th style="width: 100px;">Volt Amps from Label</th> <th style="width: 100px;">Preliminary Watts (Volt Amps)</th> <th style="width: 100px;">Final Watts (Volt Amps)</th> <th style="width: 100px;">Common Values</th> </tr> </thead> <tbody> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>8,300</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>14,000</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>22,400</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>2,500</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>5,500</td> </tr> <tr> <td></td> <td>x</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>7,000</td> </tr> <tr> <td></td> <td>x</td> <td>6,090</td> <td>6,090</td> <td>6,090</td> <td>6,090</td> <td>1,500</td> </tr> <tr> <td colspan="4" style="text-align: right;">Step 2 Total =</td> <td></td> <td>6,090</td> <td>6,090</td> </tr> </tbody> </table>	Circuit Shared / Paused With (please select all shared)	# of units	Watts (Volt Amps)	Volt Amps from Label	Preliminary Watts (Volt Amps)	Final Watts (Volt Amps)	Common Values		x			0	0	8,300		x			0	0	14,000		x			0	0	22,400		x			0	0	2,500		x			0	0	5,500		x	0	0	0	0	7,000		x	6,090	6,090	6,090	6,090	1,500	Step 2 Total =					6,090	6,090																																				
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STEP 3 Estimate Other Electric Load		use more typical disposal power, could even go lower																																																																																																		
Dedicated Equipment Electric Water Heater Refrigerator Freezer Dishwasher Disposal Range Hood Microwave Mini Fridge Instant Hot Water Unit Jacuzzi Tub EVSE Res. Elevator	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 100px;">Circuit Shared / Paused With (please select all shared)</th> <th style="width: 100px;"># of units</th> <th style="width: 100px;">Watts (Volt Amps)</th> <th style="width: 100px;">Volt Amps from Label</th> <th style="width: 100px;">Watts (Volt Amps)</th> <th style="width: 100px;">Final Watts (Volt Amps)</th> <th style="width: 100px;">Common Values</th> </tr> </thead> <tbody> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>4,500</td> </tr> <tr> <td>Not Available to Share</td> <td>1</td> <td>1,800</td> <td>1,800</td> <td>1,800</td> <td>1,800</td> <td>1,400</td> </tr> <tr> <td>Not Available to Share</td> <td></td> <td></td> <td></td> <td>0</td> <td>0</td> <td>600</td> </tr> <tr> <td></td> <td>1</td> <td>1,800</td> <td>1,800</td> <td>1,800</td> <td>1,800</td> <td>1,200</td> </tr> <tr> <td></td> <td>1</td> <td>800</td> <td>800</td> <td>800</td> <td>800</td> <td>800</td> </tr> <tr> <td></td> <td>1</td> <td>1,200</td> <td>1,200</td> <td>1,200</td> <td>1,200</td> <td>600</td> </tr> <tr> <td></td> <td>1</td> <td>1,650</td> <td>1,650</td> <td>1,650</td> <td>1,650</td> <td>1,500</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>900</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>N/A</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>800</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>N/A</td> </tr> <tr> <td>Not Available to Share</td> <td></td> <td></td> <td></td> <td>0</td> <td>0</td> <td>N/A</td> </tr> <tr> <td colspan="4" style="text-align: right;">Step 3 Total =</td> <td></td> <td>7,250</td> <td>7,250</td> </tr> </tbody> </table>	Circuit Shared / Paused With (please select all shared)	# of units	Watts (Volt Amps)	Volt Amps from Label	Watts (Volt Amps)	Final Watts (Volt Amps)	Common Values		x			0	0	4,500	Not Available to Share	1	1,800	1,800	1,800	1,800	1,400	Not Available to Share				0	0	600		1	1,800	1,800	1,800	1,800	1,200		1	800	800	800	800	800		1	1,200	1,200	1,200	1,200	600		1	1,650	1,650	1,650	1,650	1,500		x			0	0	900		x			0	0	N/A		x			0	0	800		x			0	0	N/A	Not Available to Share				0	0	N/A	Step 3 Total =					7,250	7,250	
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STEP 4 Estimate Major Equipment Load		4500 more typical value																																																																																																		
Major Equipment Cook Range (NEC 220.55: 9,600=8,000 Watts) Cook Oven Clothes Dryer Pool Motor Pool Heater Pool-Light HRV Patio Heaters	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 100px;">Circuit Shared / Paused With (please select all shared)</th> <th style="width: 100px;"># of units</th> <th style="width: 100px;">Watts (Volt Amps)</th> <th style="width: 100px;">Volt Amps from Label</th> <th style="width: 100px;">Watts (Volt Amps)</th> <th style="width: 100px;">Final Watts (Volt Amps)</th> <th style="width: 100px;">Common Values</th> </tr> </thead> <tbody> <tr> <td></td> <td>1</td> <td>8,000</td> <td>8,000</td> <td>8,000</td> <td>8,000</td> <td>8,000</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>5,000</td> </tr> <tr> <td></td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>5,000</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>N/A</td> </tr> <tr> <td></td> <td>x</td> <td></td> <td></td> <td>0</td> <td>0</td> <td>N/A</td> </tr> <tr> <td></td> <td>1</td> <td>290</td> <td>290</td> <td>290</td> <td>290</td> <td>300</td> </tr> <tr> <td></td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1,500</td> </tr> <tr> <td colspan="4" style="text-align: right;">Step 4 Total =</td> <td></td> <td>8,290</td> <td>8,290</td> </tr> </tbody> </table>	Circuit Shared / Paused With (please select all shared)	# of units	Watts (Volt Amps)	Volt Amps from Label	Watts (Volt Amps)	Final Watts (Volt Amps)	Common Values		1	8,000	8,000	8,000	8,000	8,000		x			0	0	5,000		0	0	0	0	0	5,000		x			0	0	N/A		x			0	0	N/A		1	290	290	290	290	300		0	0	0	0	0	1,500	Step 4 Total =					8,290	8,290																																				
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STEP 5 Determine If Electric Service Panel Requires Upgrade		remove hard wired patio heaters- use 120V plug in versions instead																																																																																																		
Total General Load excl Heating/AC (Add Steps 1, 3 and 4 Totals) Heat Pump Water Heater Electrical Load General Service Load (Add Box 1 + Box 2) First 10,000 Volt Amps counted at 100% Remaining General Service Load at 40% (Box 3 - 10000) x 40% Heating/Cooling Load at 100% (from Step 2 Total) TOTAL ADJUSTED HOUSE LOAD (Add Box 4 + Box 5 + Box 6) Minimum Service Ampacity (Box 7 divided by 240) Enter Your Existing or Proposed Electrical Service Size (amps)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 100px;">23,037</td> <td>(Box 1)</td> </tr> <tr> <td>4,500</td> <td>(Box 2)</td> </tr> <tr> <td>27,537</td> <td>(Box 3)</td> </tr> <tr> <td>10,000</td> <td>(Box 4)</td> </tr> <tr> <td>7,015</td> <td>(Box 5)</td> </tr> <tr> <td>6,090</td> <td>(Box 6)</td> </tr> <tr> <td>23,105</td> <td>(Box 7)</td> </tr> <tr> <td>96</td> <td>(Box "A")</td> </tr> <tr> <td>100</td> <td>(Box "B")</td> </tr> </table>	23,037	(Box 1)	4,500	(Box 2)	27,537	(Box 3)	10,000	(Box 4)	7,015	(Box 5)	6,090	(Box 6)	23,105	(Box 7)	96	(Box "A")	100	(Box "B")	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;"> <p>You do not need to upgrade your service panel</p> </div>																																																																																
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NOTE: For One-Family Dwellings, the service disconnecting means shall have a rating of not less than 100 amps, 3-wire.																																																																																																				

Existing dwelling load calculation for main house per NEC 220.83(A)

Reason for choosing 220.83(A) - an existing dwelling where no new air conditioning/electric heating equipment will be added to the main house

			VA
Baseload			8000
	Home square footage	VA/square foot	
General Lighting and General-use receptacles			8322
	VA per Circuit	Number of Circuits	
Small Appliance Branch Circuits			3000
Laundry Circuit			1500

Agreed

Equipment

Load	VA (or Watts)	Notes
Dryer (not on the laundry circuit)	6240	verified by nameplate
Fridge (removed from load calc's per meeting)	0	verified by nameplate
Freezer (Built-in unit)	320	verified by nameplate
Range		gas
Garbage Disposal (x2)	1080	verified by nameplate
Dishwasher	1440	verified by nameplate
Kitchen Hood	600	estimated, Palo Alto typical value
Microwave (fastened into place)	1670	verified by nameplate
Water Heater		gas
Air Handler	1200	verified by nameplate (gas furnace, no heat pump)
Air Conditioner	4080	verified by nameplate
EV Charger	7200	30amp charger

Version 1

		Demand Factor	Adjusted VA
Baseload	8000	100%	8000
All other loads	36652		
All other loads minus baseload	28652	40%	11461
Total Adjusted VA			19461
Service Voltage			240
Service Amperage Main House			81
Service Amperage ADU			118.9
Integration Capacity for Service Amperage ADU (round up: NEC 220.5(B))			119.0
Overcurrent protection device (OCPD) amperage:			149
Size up to nearest OCPD (NEC Table 240.6(A))			150
Target: Largest amount of amps to stay on 150 amp breaker			120

Version 2 - with counting EVSE at 125%

		Demand Factor	Adjusted VA
Baseload	8000	100%	8000
EVSE	7200	125%	9000
All other loads	29452		
All other loads minus baseload	21452	40%	8581
Total Adjusted VA			25581
Service Voltage			240
Service Amperage Main House			107
Service Amperage ADU			93.4
Integration Capacity for ADU Service Amperage (round up: NEC 220.5(B))			93.0
Overcurrent protection device (OCPD) amperage:			116
Size up to nearest OCPD (NEC Table 240.6(A))			125
Target: Largest amount of amps to stay on 125 amp breaker			100

required by city of PA

Pin Header Table 240.6(A) Standard Ampere Ratings for Fuses and Inverse Time Circuit Breakers

Standard Ampere Ratings				
10	15	20	25	30
35	40	45	50	60
70	80	90	100	110
125	150	175	200	225
250	300	350	400	450
500	600	700	800	1000
1200	1600	2000	2500	3000
4000	5000	6000	-	-

220.82 Dwelling Unit.
with an ampacity of 100 or greater.

			VA
Baseload			10000
General Lighting and General-use receptacles		Home square footage 999	VA/square foot 3 2997
Small Appliance Branch Circuits		VA per Circuit 1500	Number of Circuits 2 3000
Laundry Circuit		1500	1 1500

assume typical value, only two small appliance branch circuits

Load	ORIGINAL (Corrected)	RE Recommendation A: Target 125-Amps	RE Recommendation B: Target 100-Amps	Notes
	VA (or Watts)	VA (or Watts)		
Dryer (not on the laundry circuit)	1800			remove washing machine/dryer, already included in laundry circuit
Fridge	1800	0		Removed per peer review recommendation
Freezer				
Range	9600	8000	8000	NEC 220.18(C) and Table 220.55
Garbage Disposal	1440	864	864	spec 1/3 HP garbage disposal
Dishwasher	1800		1800	
Kitchen Hood	1200		1200	
Microwave (fastened into place)	1650		1650	
Heat Pump Water Heater (Dual 900W aux. heating elements)	7200	1800	1800	use AO smith 120V dedicated heat pump water heater: https://www.hotwater.com/products/decarbonization-heat-pump-voltex-120/hptv-80-200/100361944.html
ERV	290		290	double check this- spec sheet value
Minisplit	6090	0	5,918	Removed noncoincidental load. Reduced number to 5,918W, based on spec sheet.
Hydronic Equipment - Heat Pump	13560	5760	0	Removed noncoincidental load.
Hydronic Equipment - Buffer Tank	0	6000	0	Included in the Hydronic heat pump load. Removed buffer for hydronic, not needed in PA climate.
Patio heater [(2665W fixed ER heaters) (x2)]*0.65	5310	3452	0	65% DF applied to 2665W heaters: NEC 220.82(C)(4) or removed from calc's
EV Charger				

	ORIGINAL (Corrected)	RE Recommended with Hydronic Buffer and Patio Heaters	RE Recommended
Baseload @ 100%	10000	10000	10000
1. Air conditioning @ 100% (NEC 220.82(C)(1))	6090	0	5918
2. Central electric space heating @ 100% + ER @ 65% (NEC 220.82(C)(3))	13560	9660	0
All other Loads @ 40% (NEC 220.82(b))	11835	6621	5240
Total Adjusted VA (add the larger of 1 or 2: NEC 220.82(C))	35395	26281	15240
Service Voltage	240	240	240
Service Load Amperage	147.5	109.5	63.5

Only higher of the two AC and heating load needs to be included
Reduced by removal of hydronic system buffer