Service and Feeder Calculations

The electrical code gives us guidelines to anticipate the current we will need to draw through our conductors to supply the loads in a typical residence. The service conductors and feeders to each panel must be sufficient to serve the connected load. In general, conductors must be sized to 125% of the continuous loads and 100% of the noncontinuous load. However, in calculating a residence, consideration is given that not all possible loads will be operated at the same time, and the code allows us to consider demand factors. Therefore, residential loads are not considered continuous.

Table 5 • Sizing Electric Services			
Gen. lighting & receptacle loads (NEC 220-3b10):			
Sq.ft. x 3W			1
Small appliance & laundry loads (NEC 220-16a,b):			
Two small appl. circuits	3,000		2
Addl. small appl.			3
Laundry circuit	1,500		4
Subtotal gen. light, small appliances & laundry			5
1st 3,000W @100%	3,000	3,000	6
Balance @35%			7
Special appliance loads:			
Range (NEC 220-19)	8,000 up to 12kW nameplate		8
Dryer (NEC 220-18)	5,000 or nameplate if >		9
Heating or AC @100%			10
Appliances fastened in place (NEC 220-17):			
Water heater 4,500*			11
Microwave 1,300*			12
Dishwasher 1,500*			13
Compactor 900*			14
Disposer 800*			15
Attic fan 1,600*			16
Spa—per manu			17
Other			18
Subtotal:			19
If <four appliances, enter subtotal @100% OR			20
If ≥four appliances, enter subtotal x 75%			21
Largest motor x 25%			22
Total load:			23
Total load ÷ 240V = SERVICE AMPS			24
*Common ratings—use actual nameplate rating of appliances.			

	1999	2002
☐ Continuous load = 3hr. or more	[100]	{100}
☐ Service conductors must be sufficient for load	[230-42]	{230.42}
☐ Feeders must be sufficient for load	[215-2a]	{215.2A1}
☐ Branch circuits must be sufficient for connected load	[210-19a]	{210.19A1}
☐ Min. service capacity 100amps for SFD	[230-79c]	{230.79C}
☐ Min. feeder size 30amps to subpanel	[215-2b]	{215.2A2}
☐ If >2 circuits, min. feeder 60amps	[225-39d]	{225.39D}

Steps for Sizing a Service

1. Determine the square-foot area of the residence and multiply by 3watts (exclude garage and covered patios) [220-3a] {220.3A}
2. Min. of two 1,500watt small-appliance circuits req'd [220-16a] {220.16A}
3. Each additional small appliance circuit (2nd kitchen) at 1,500 watts per circuit [220-16a] {220.16A}
4. Min. one 1,500watt laundry circuit [220-16b] {220.16B}
5. Total small appliance loads and general lighting (enter in middle column) [220-11] {220.11}
6. Subtract 3,000watts from line 5 [T220-11] {T220.11}
7. Enter difference in middle column, multiply middle column by 35%, and enter in right column [T220-11] {T220.11}
8. Range loads are calculated at nameplate rating. If a single range is over 8,000watts and <12,000watts it still counts as 8,000. Beyond 12,000watts, add 5% of each additional 1,000watts of nameplate load. The nameplates of a counter-mounted range and up to two wall ovens can be added together and computed as if they were one range. Enter in column 3 [220-19] {220.19}
9. Enter dryer nameplate rating or 5,000watts, whichever is greater, in column 3 [220-18] {220.18}
10. Enter the larger of the fixed space heating or AC load at nameplate rating in column 3 [220-21] {220.21}

11-18. Enter the nameplate ratings of appliances that are fixed in place. To determine the load of appliances rated in amps, multiply by the voltage. Enter the actual nameplate ratings; the numbers in the first column are typical examples [220-17] {220.17}

19. Enter the total of fixed appliances in the middle column [220-17] {220.17}
20. If there were <four fixed appliances, enter the number from line 19 in the right column [220-17] {220.17}
21. If there were four or more fixed appliances, multiply line 19 by 75% and enter in the right column [220-17] {220.17}
22. Add 25% of the largest motor load. If a nameplate rated air conditioner is the largest load, this number has already been factored in, and this step is omitted [220-14] {220.14}
23. Add the numbers in the third column [220-10] {220.10}
24. Divide line 23 by 240 to find required min. amperage [220-10] {220.10}