Determining Minimum Service Entrance Requirements for a Home

Calculation of the service requirement consists of three parts:

* General lighting and receptacles. Computed at 3 watts per square foot.
* Required circuits in kitchen and laundry.
* Single serving circuits like the range, clothes dryer, and heating.

Since it is unlikely that all loads would be on at one time the first 10,000 VA (watts) will be weighted at 100% and the remainder at 40%. The exception to this is heating and air conditioning which are computed at 100%. See NEC Article 220-82 for requirements.

Example:

|  |  |  |
| --- | --- | --- |
| Line | Type of Load | Load in Volt-Amps (watts) |
|  | Home size 2000 sq. ft. Multiply 2000 sq.ft. by 3 watts | 6000 |
|  | Two kitchen circuits @ 1500 VA | 3000 |
|  | 1 laundry circuit @ 1500 VA | 1500 |
|  | Electric Range/Oven 30A @ 240V | 7200 |
|  | Electric Car Charger 30A @ 240V | 7200 |
|  | Electric Hot Water Heater 30A @ 240V | 7200 |
|  | Electric Dryer 24A @ 240V | 5760 |
| 1 | TOTAL Volt-Amps | 37860 |
| 2 | Subtract 10,000 VA | 27860 |
| 3 | Multiply above by .4 (40% load) | 11144 |
| 4 | Add 10,000 to Line 3 | 21144 |
| 5 | Heating and Air Conditioning 60A @ 240V at 100% | 14400 |
| 6 | Total Lines 4 and 5 | 35544 |
|  | Total Ampacity Divide line 6 by 240 | 148.1 |

Select a minimum of 150A SEP. Note: Using an oversized SEP (ex. 200A) is often a better choice since it allows for expansion and has the capacity for more breakers.

Complete the calculations for the home below.

|  |  |  |
| --- | --- | --- |
| Line | Type of Load | Load in Volt-Amps (watts) |
|  | Home size 2500 square feet x 3 watts/sq.ft. (lighting load) |  |
|  | Three kitchen circuits @ 1500 VA |  |
|  | 1 laundry circuit @ 1500VA |  |
|  | Electric Range/Oven 50A @ 240V |  |
|  | Electric Car Charger 30A @ 240V |  |
|  | Electric Hot Water Heater 40A @ 240V |  |
|  | Electric Dryer 24A @ 240V |  |
|  | Well Pump 20A @ 240V |  |
|  |  |  |
| 1 | TOTAL Volt-Amps |  |
| 2 | Subtract 10,000 VA (first 10kW at 100% load) |  |
| 3 | Multiply above by .4 (40% load) |  |
| 4 | Add 10,000 to Line 3 |  |
| 5 | Heat Pump (heating and air conditioning) 70A @ 240V - 100% |  |
| 6 | Total Lines 4 and 5 |  |
|  | Total Ampacity Divide line 6 by 240v |  |

Select a minimum SEP size (circle) 100A, 125A, 150A, 200A, 225A, 300A, 400A

# Choosing Circuit Breakers

Kitchen and laundry circuits are required to be 20A circuits.

For single serving circuits like an electric range the load will determine the breaker size. For example if the nameplate load is 24A then a 30A breaker would be used.

For general lighting circuits the home is generally broken up into zones and each zone placed on a separate breaker. These are commonly 15A circuits. Note that a 15A circuit can handle 1800 VA. A starting place for the number of circuits is to divide the lighting load by 1800. Note that Arc Fault breakers are generally required for all “living” areas. Ground Fault Circuit Interrupters (GCFI) are required in any “wet” area such as kitchens, bathrooms, laundries, exterior receptacles, garages. GFCI requirements are commonly met by using GFCI outlets, not breakers.

Once you determine the number of breakers required you can choose a panel with the appropriate breaker capacity.