



# Single Family Dwelling Requirements and Calculations

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**Table 220.12 General Lighting Loads by Occupancy**

Type of Occupancy	Unit Load	
	Volt-Amperes per Square Meter	Volt-Amperes per Square Foot
auditoriums		
Banks	35 <sup>b</sup>	3 <sup>1/2</sup> <sup>b</sup>
Barber shops and beauty parlors	33	3
Churches	11	1
Clubs	22	2
Court rooms	22	2
Dwelling units <sup>a</sup>	33	3
Garages — commercial (storage)	6	1/2
Hospitals	22	2
Hotels and motels, including apartment houses without provision for cooking by tenants <sup>a</sup>	22	2
Industrial commercial (loft) buildings	22	2
Lodge rooms	17	1 <sup>1/2</sup>
Office buildings	35 <sup>b</sup>	3 <sup>1/2</sup> <sup>b</sup>
Restaurants	22	2
Schools	33	3
Stores	33	3
Warehouses (storage)	3	3/4
In any of the preceding occupancies except one-family dwellings and individual dwelling		

**Table 220.42 Lighting Load Demand Factors**

Type of Occupancy	Portion of Lighting Load to Which Demand Factor Applies (Volt-Amperes)	Demand Factor (Percent)
Dwelling units	First 3000 or less at	100
	From 3001 to 120,000 at	35
	Remainder over 120,000 at	25
Hospitals*	First 50,000 or less at	40
	Remainder over 50,000 at	20
Hotels and motels, including apartment houses without provision for cooking by tenants*	First 20,000 or less at	50
	From 20,001 to 100,000 at	40
	Remainder over 100,000 at	30
Warehouses (storage)	First 12,500 or less at	100
	Remainder over 12,500 at	50
All others	Total volt-amperes	100

\*The demand factors of this table shall not apply to the calculated load of feeders or services supplying areas in hospitals, hotels, and motels where the entire lighting is likely to be used at one time, as in operating rooms, ballrooms, or dining rooms.

# Allowed Demands

General Lighting Load

Table 220.12

Cooking Equipment Load

Table 220.55

Fixed or Fastened in  
place Appliances

220.53

Dryer load

Table 220.54

# General Lighting Load

**Table 220.12** : Dwelling = 3 va per sq. ft.

2400 Sq. Ft. X 3 va = **7,200** va

*Sq. Ft. is outside dimensions excluding open porches, garages, carports, and unfinished basements, or unused or unfinished spaces not adaptable for future use.*

# Required Circuits

- 210.11(c)(1) 2 small appliance circuits (20 amp)
- 220.52(a) 2- small appliance circuits
  - Rated 1500 va each
- 210.11(c)(2) 1 laundry circuit (20 amp)
- 220.52(b) 1- laundry circuit
  - Rated 1500 va each
- 210.11(c)(3) 1-bathroom circuit (20 amp)
- No calculation required (appendix D, pg 1)

# Required circuit calculations

**220.52(a)** = 2 X 1500 va = **3000** va small appliance

**220.52(b)** = 1 X 1500 va = **1500** va laundry





# Clothes Dryer

One 4.5 kw @ 240 v = 5000 kw min. (220.54)  
Neutral @ 70% = 3500 kw (220.61(B)(1) & (2))

# Other Fixed Appliances

- Appliances

- Disposal (6 amps) 120v X 6 = 720 va
- Dishwasher (1.5 kw) = 1500 va
- Water Heater (5 kw) = 5000 va
- Vent-a-hood (4.4 amps,120v) = 528 va
- Compactor (960 watts) = 960 va
- 8708 va
- 4 or more appl. 75% demand = 6531 va

*220.53 4 or more fastened in place appliances = 75% demand*

# Dwelling Range Calculation

- One 14 kw range
  - T.220.55: 1 range Col. A = 8000 va
  - 14kw exceeds 12kw by 2 kw
  - Note 1 T.220.55 – 2 x .05 = 10 % increase
  - 8,000kw X 1.10 = 8,800 va or 8.8 kw
  - 220.61(B) Neutral = 70% = 6160 va or 6.16kw

# Compare Heat against A/C

- Heating
  - 4 strip heaters X 500 w = 2000 va
  - 2 heaters X 750 w = 1500 va
  - TOTAL heating demand = 3500 va
- A/C
  - 3 hp @ 240v = FLI = 17 amps
  - VA = 240 X 17 = 4080 va
- Omit Smaller (non-coincident loads) NEC 220.60

# Increase Largest Motor 25%

- Largest Motor NEC (430.24)
  - A/C Motor (7.5 hp, 240v) largest used
  - 4080 va X 25% = 1020 va
- This is added back into calculation
- Standardized tests = include largest motor in calculation

# Optional Calculation

- 220.82(A) & (B)
- 1500 va for each small appl. Circuit
  - 1500 va for the laundry circuit
  - 3 va Sq. Ft. General lighting
  - Nameplate rating of all fixed in place appl.
  - Name plate or kva rating of all motors

# Optional Calculation

- 220.82(C)
- Heat and A/C
  - 100% of name plate heat and A/C
  - 100% of name plate Heat pump and supplemental heating if operates at same time
  - 100% of name plate of electric thermal storage, etc. where load considered cont.

# Optional Calculation

- Heat and A/C continued:
  - 65% of name plate ratings of central electric space heating
  - 65% of name plate ratings of electric space heating if **less than four separately controlled units**
  - 40% of name plate for electric space heating if **four or more separately controlled.**



# Dwelling Calculations Summary

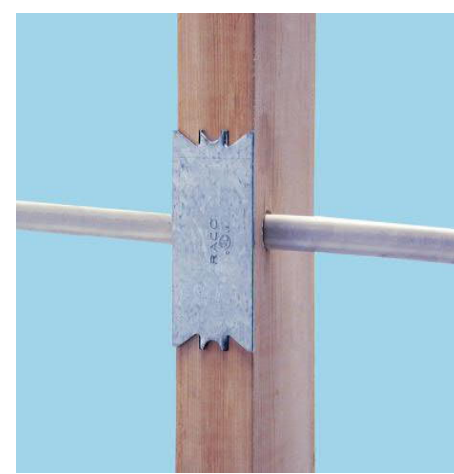
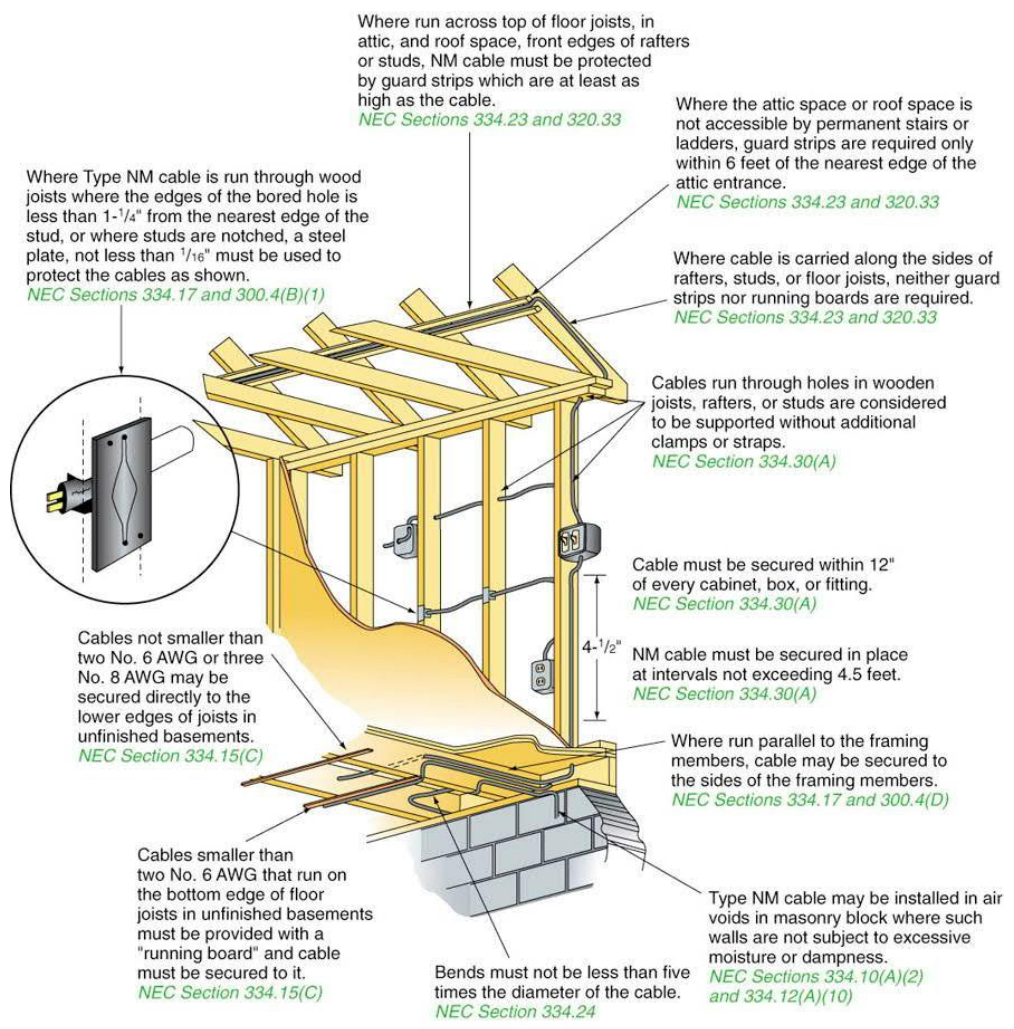
- General Method
  - T.220.12 Dwelling 3va per sq.ft.
  - 220.52(A) Small Appl 3000va (2)
  - 220.52(B) Laundry 1500va
  - T.220.42 Lighting Demand
  - 220.60 AC/Heat Comparison
  - 220.53 4 or more Appliances
  - 220.54 Dryer (5KW MIN)
  - T.220.54 Dryer Demand
  - T.220.55 Cooking Equip. Demand
  - T.310.15b6 Dwelling Service Conductors

# Dwelling Calculations Summary

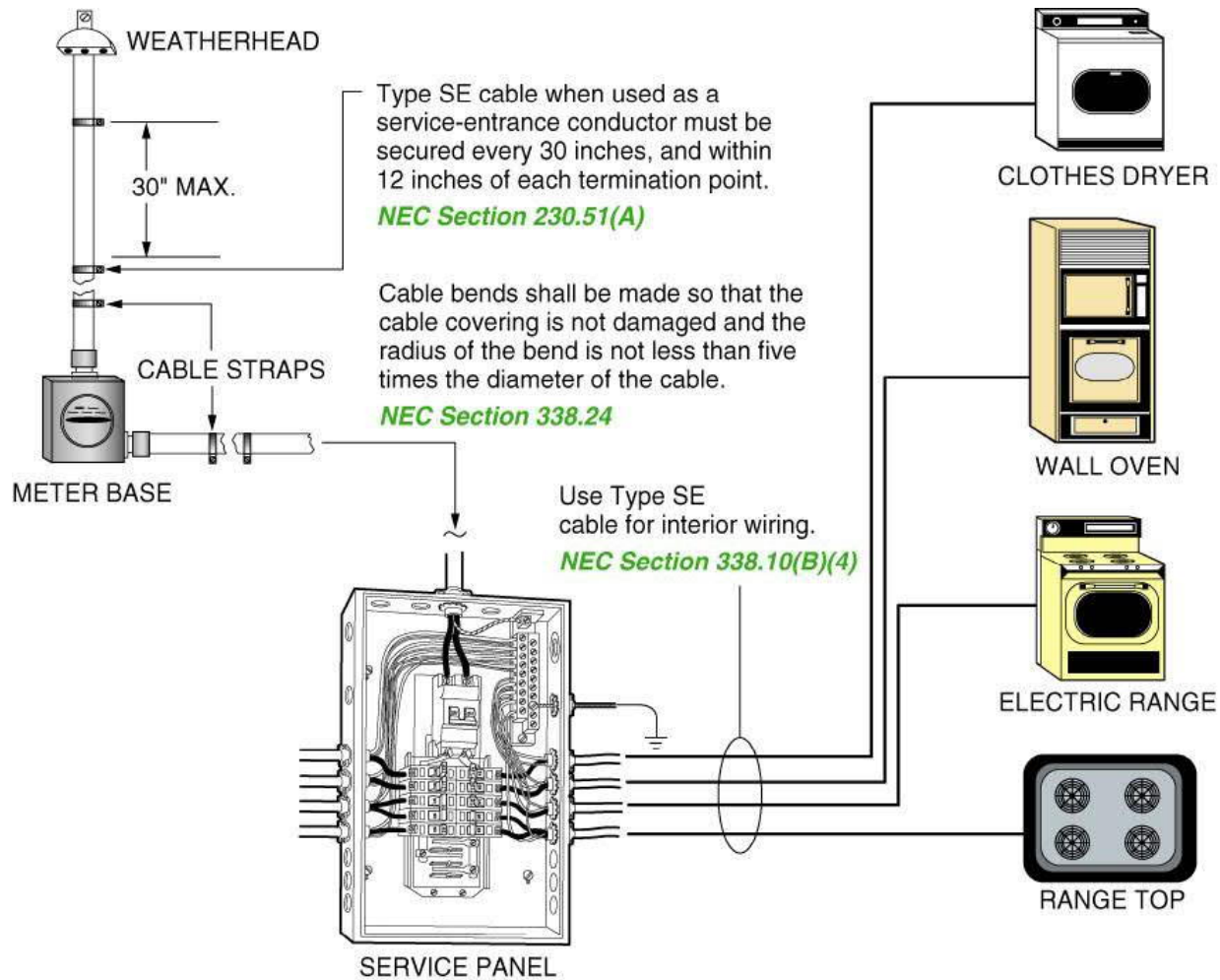
- Neutral
  - 220.61                      70% reduction Cooking Equip.  
70% clothes Dryers  
  
70% unbalanced load in  
excess of 200Amps
- Grounding Electrode Conductor
  - Table 250.66
- Equipment Grounding Conductor
  - Table 250.122

# Dwelling Optional Calc

- 220.40 Single family dwelling (GEN)
- 220.82 Single family dwelling (OPT)
- 220.84 Multifamily dwelling
- 220.84c3 Dryers, water heaters etc.  
nameplate ratings 100%
- T.220.84 Demand 3 or more units



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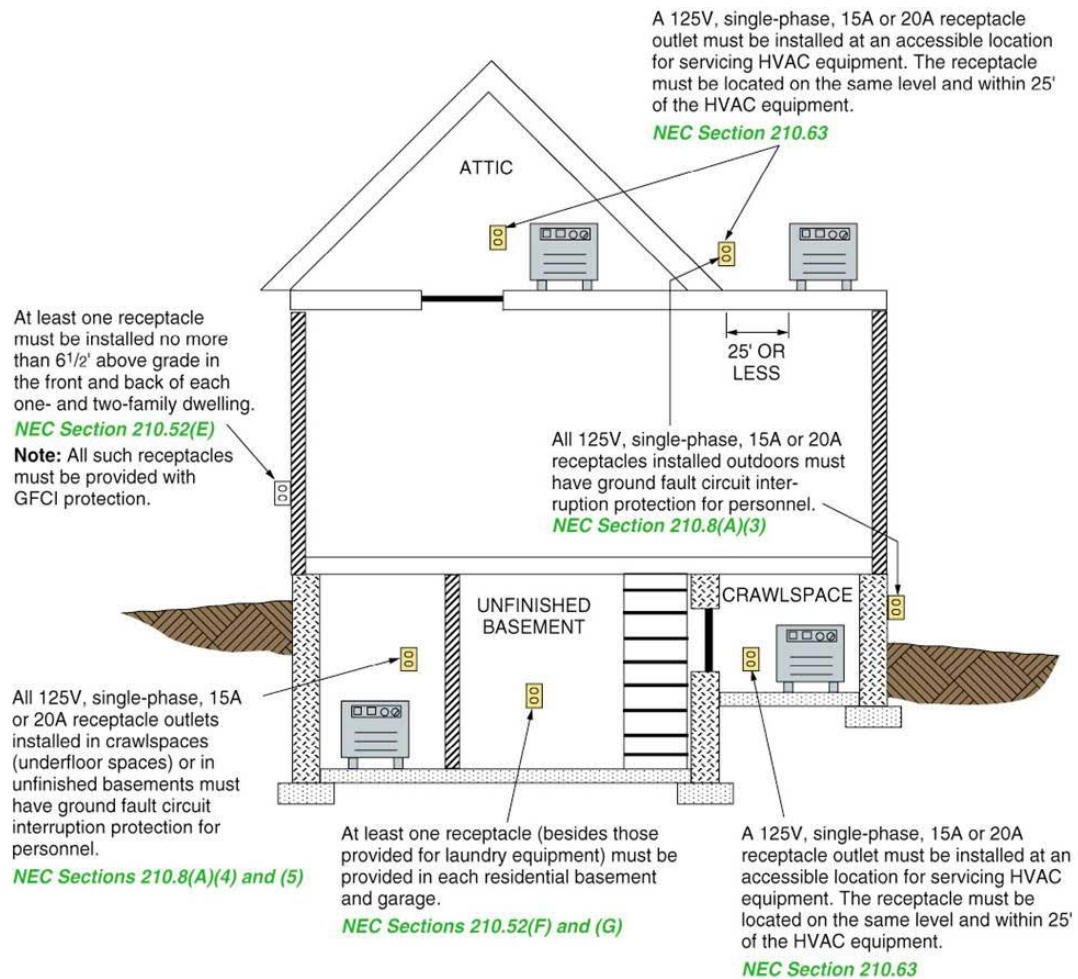


Type SE cable when used as a service-entrance conductor must be secured every 30 inches, and within 12 inches of each termination point.  
**NEC Section 230.51(A)**

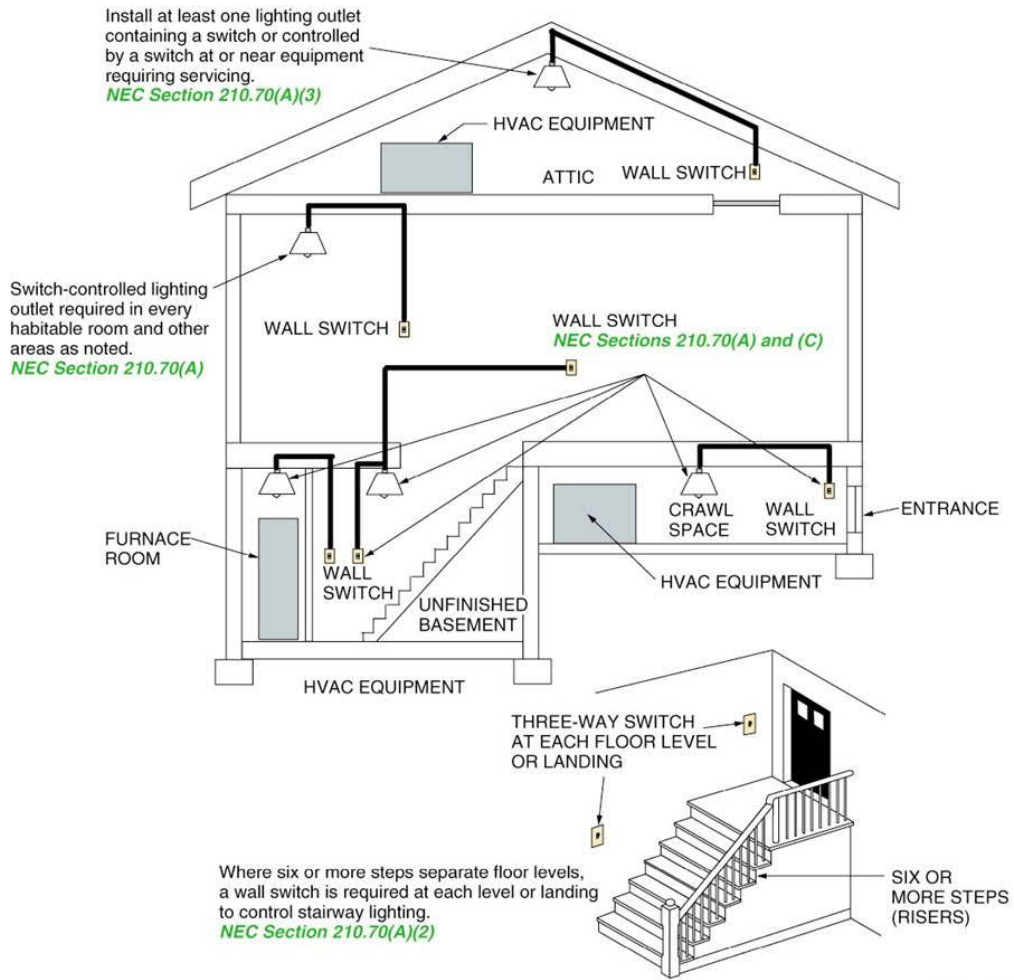
Cable bends shall be made so that the cable covering is not damaged and the radius of the bend is not less than five times the diameter of the cable.  
**NEC Section 338.24**

Use Type SE cable for interior wiring.  
**NEC Section 338.10(B)(4)**

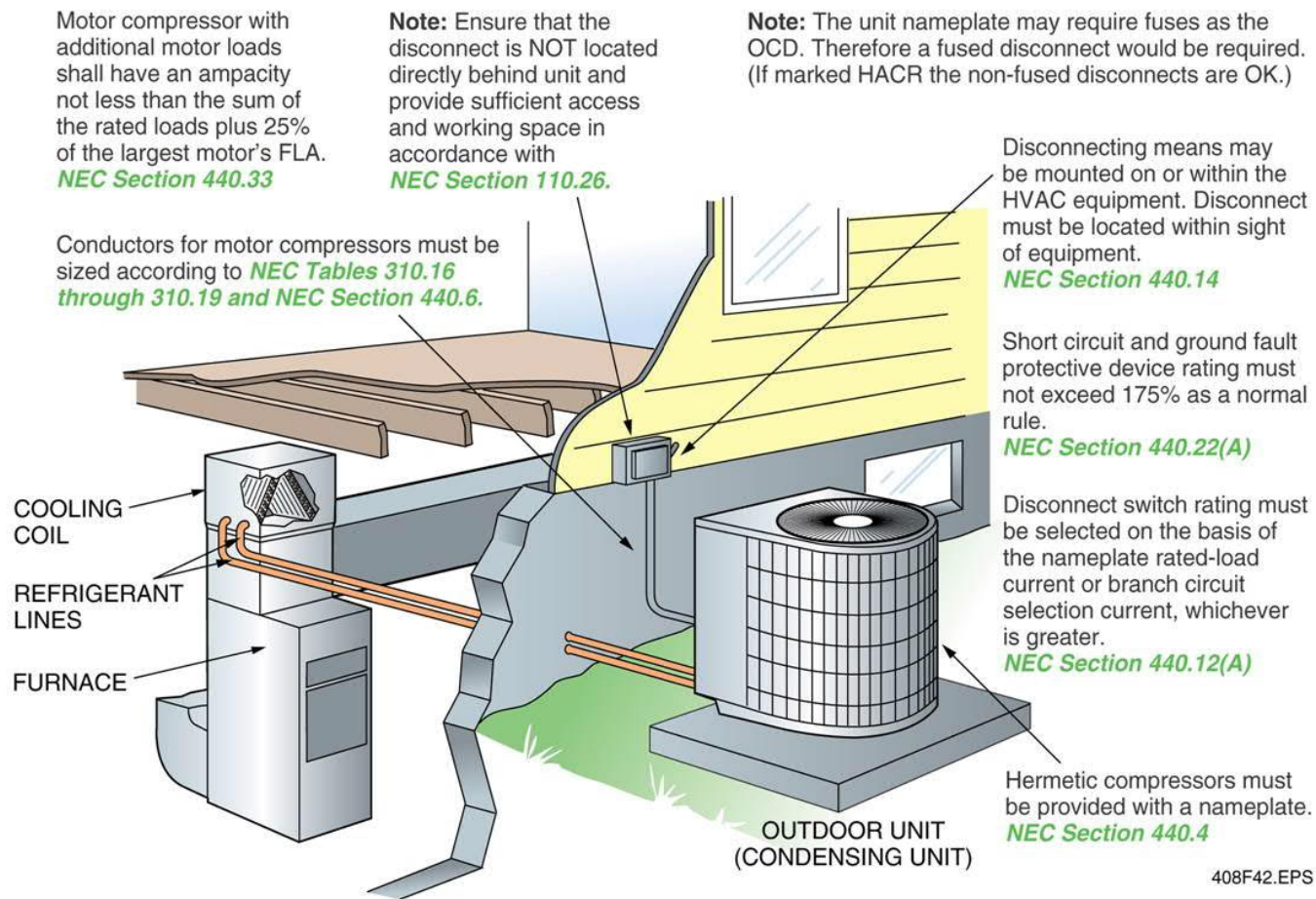
**All branch circuits and feeders must have an insulated neutral per NEC Section 338.10(B)(1).**



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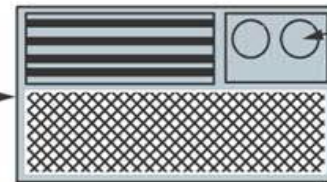


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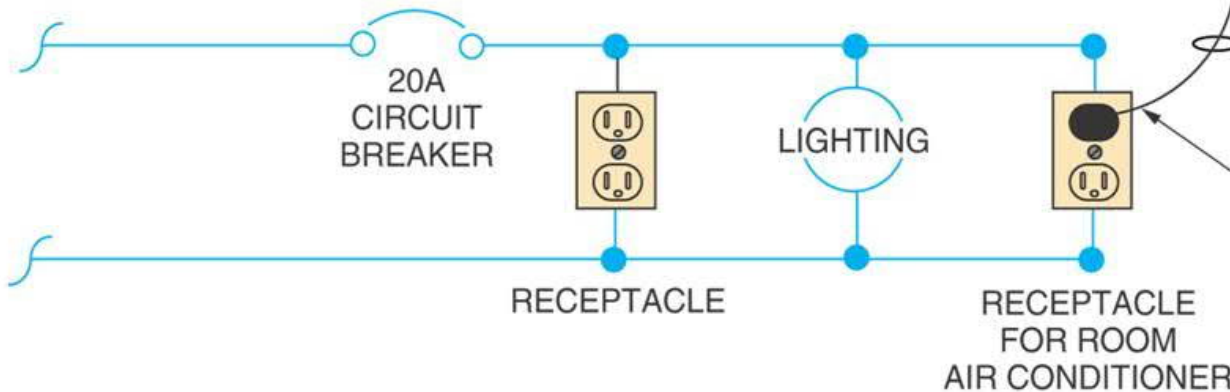
When lighting or other loads are on the same circuit, the total rating of a room air conditioner on a 20A circuit may not exceed 50% of the branch circuit rating unless interlocked to prevent simultaneous operation.

**NEC Section 440.62(C)**



Manual controls must be readily accessible and located within 6' of the floor.

**NEC Section 440.63**



Maximum length of cord: 10' for 120V; 6' for 208V or 240V.

**NEC Section 440.64**

Attachment plug and receptacle are permitted to serve as the disconnecting means.

**NEC Section 440.63**

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# Dwelling Service Questions

30 Minutes

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