BULLETIN #251: *ELECTRIC SERVICE AND FEEDER WORKSHEET*

PURPOSE

This bulletin accompanies the Residential Service and Feeder Load Calculation Worksheets. The worksheets are provided as a standardized tool to assist designers in preparing residential electrical load calculations and to facilitate consistent and efficient plan review. This bulletin and the accompanying worksheets are intended for residential projects with up to four dwelling units on a single lot, consistent with current ADU development allowances. When a worksheet is used as the basis for sizing a service or feeder, the completed worksheet shall be incorporated into the electrical plan set.

BACKGROUND

Article 220 of the 2025 California Electrical Code (CEC) establishes methods for calculating feeder and service loads. The accompanying worksheets are based on CEC Section 220.82 for an individual dwelling unit and CEC Section 220.84 for qualifying multifamily dwelling feeders and services. CEC Section 220.85 provides the method for a feeder or service supplying two dwelling units. Where the conditions for an optional calculation are not met, use the applicable standard calculation provisions of Article 220.

The worksheets are calculation aids and do not replace the CEC. The designer is responsible for selecting the applicable calculation method and entering complete and accurate load information.

1. SINGLE DWELLING UNIT

1.1 Individual dwelling service or feeder — CEC 220.82: For a service or feeder supplying the total connected load of one dwelling unit, the CEC 220.82 worksheet may be used when the installation qualifies for the optional method. This includes a one-family dwelling service and, where applicable, an individual dwelling-unit feeder within a duplex or multifamily building.

2. TWO DWELLING UNITS

2.1 Individual dwelling feeders – CEC 220.82: Where each dwelling unit is supplied by an individual feeder, the CEC 220.82 worksheet may be completed separately for each dwelling unit when the conditions of Section 220.82 are satisfied.

2.2 Common service or feeder — CEC 220.85: A common service or feeder supplying two dwelling units shall be evaluated in accordance with CEC Section 220.85. Section 220.85 permits the lesser

of the calculated load under Part III of Article 220 or the load for three identical dwelling units calculated under Section 220.84, when the Part III calculation exceeds the Section 220.84 result.

Accordingly, the results of two separate Section 220.82 dwelling-unit calculations should not be added together and used to determine the calculated load for the common two-dwelling service or feeder.

The accompanying Section 220.84 worksheet may be used for purposes of the Section 220.85 comparison. The designer *may* also calculate the load for the actual two dwelling units in accordance with Part III of Article 220 and the lesser calculated load is permitted to be used for sizing the common service or feeder.

3. THREE OR MORE DWELLING UNITS

3.1 Individual dwelling feeders — CEC 220.82: The load calculation for an individual dwelling feeder is separate from the calculation for the common multifamily service or feeder. Where permitted, the CEC 220.82 worksheet may be used for each individual dwelling feeder even when the common service or feeder is calculated using Section 220.84.

3.2 Common multifamily service or feeder — CEC 220.84: For a feeder or service supplying three or more dwelling units of a multifamily dwelling, the CEC 220.84 worksheet may be used when the installation satisfies the conditions of Section 220.84. Do not calculate each dwelling unit separately under Section 220.82 and then add the reduced optional-method results to determine the common multifamily service load. The Section 220.84 calculation is performed for the aggregate dwelling-unit loads supplied by the common service or feeder.

4. WORKSHEET SELECTION

Project Condition	Equipment Being Sized	Worksheet / Method
1 dwelling	Dwelling service or feeder	220.82 worksheet
2 dwellings	Each dwelling feeder	220.82 worksheet
2 dwellings	Common service or feeder	220.84 worksheet*
3-4 dwellings	Each dwelling feeder	220.82 worksheet
3-4 dwellings	Common service or feeder	220.84 worksheet

**Refer to section 2.2 for further information.*

5. PLAN SUBMITTAL REQUIREMENTS

5.1 When the worksheet is used, the plan set shall include the following:

1. The completed applicable load calculation worksheet incorporated into the plan set.
2. A site plan identifying the locations and ratings of all electrical service equipment, panels, subpanels, and disconnects, including the routing and sizes of service-entrance conductors, feeder conductors, and associated raceways/conduits.

3. A single-line diagram identifying the electrical distribution system, service and feeder ratings, overcurrent protection, disconnects, and panel locations.

6. LIMITATIONS

6.1 The worksheets are intended for residential projects with up to four dwelling units on a single lot and do not address every possible electrical system configuration or load condition. Additional calculations or supporting information may be required for projects exceeding four dwelling units or for loads and systems not fully addressed by the worksheets. At the discretion of the plan reviewer, an evaluation and supporting calculations prepared by a licensed electrical engineer or other appropriately licensed design professional may be required.

OPTIONAL METHOD: INDIVIDUAL DWELLING

2025 CEC 220.82 - Optional Feeder and Service Load Calculation

Project Address | **Permit Number** | **Date**

System 120/240 V, 1-phase, 3-wire

CEC 220.82(A) applicability: ☐ Single phase 3-wire service or feeder conductors with an ampacity 100A or greater

General Lighting and General-Use Receptacles - CEC 220.82(B)(1) *Enter the total floor area calculated from the outside dimensions of the dwelling unit. The calculated floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use.* **3 VA/ft2 x** ____ ft2	1	0
Small-Appliance Branch Circuits - CEC 220.82(B)(2) *Enter the number of small appliance branch circuits for receptacle outlets.* **1,500 VA x** ____ circuits (minimum 2)	2	0
Laundry Branch Circuit(s) - CEC 220.82(B)(2) *Enter the number of laundry branch circuits for receptacle outlets.* **1,500 VA x** ____ circuits (minimum 1)	3	0
General Loads - Appliances, Cooking, Dryers, Water Heating, Motors - CEC 220.82(B)(3)-(4) *Enter connected/nameplate VA. Do not include heating or air-conditioning here. Convert nameplate amperes to VA using rated voltage.* ** The EVSE load shall be calculated at either 7200 VA or the nameplate rating of the equipment, whichever is larger. Overall rating of the installation can be limited through controls as permitted by 625.42(A) or (B).CEC 220.57; 625.42* Water heater ____ VA; Dishwasher ____ VA; Disposer ____ VA; Range / oven ____ VA; Clothes dryer ____ VA; Microwave ____ VA Motors ____ VA; Pool equipment ____ VA; EVSE* ____ VA; Other fixed load ____ VA; Other fixed load ____ VA; Other fixed load ____ VA	4	0
Apply CEC 220.82(B) General-Load Demand *100% of first 10,000 VA + 40% of remainder of Lines 1 through 4.* **Subtotal:** 0 VA	5	0
Heating and Air-Conditioning Load - CEC 220.82(C) *Use the largest nameplate VA of the following six calculated selections.* a) 100% air-conditioning and cooling ____ VA x 100% = 0 b) 100% heat pump without supplemental electric heat ____ VA x 100% = 0 c) 100% heat-pump compressor + 65% supplemental electric heat ____ VA x 100% = ____ VA x 65% = 0 ☐ Compressor prevented from operating with supplemental heat d) 65% electric space heat, fewer than 4 separately controlled units ____ VA x 65% = 0 e) 40% electric space heat, 4 or more separately controlled units ____ VA x 40% = 0 f) 100% electric thermal storage / other heating system full-nameplate value ____ VA x 100% = 0	6	0
Total Calculated Demand Load *Line 5 + Line 6*	7	0
Calculated Load Current *Total VA / system line-to-line voltage.* *Selected service/feeder must be greater than the calculated load current.* 0.0 A **SELECTED SERVICE / FEEDER**	8	100A
Service / Feeder Conductors *Enter the service / feeder conductors based on CEC 310.12 for a service rated 100 amperes through 400 amperes.*	10	
Neutral Conductor *Enter the neutral conductor calculated based on CEC 220.61.*	11	
Grounding Electrode Conductors *Enter the grounding electrode conductor based on CEC 250.66.*	12	

OPTIONAL METHOD: MULTIFAMILY DWELLINGS

2025 CEC 220.84 - Optional Feeder and Service Load Calculation

Project Address | **Permit Number** | **Date**

System 120/240 V, 1-phase, 3-wire

CEC 220.84(A) applicability:

☐ 2+ units ☐ One feeder per unit ☐ Equipped with electric cooking equipment. *See CEC 220.84(A)(2) exception where applicable.* ☐ Equipped with either electric space heating or air conditioning, or both.

Number of Dwelling Units			
General Lighting and General-Use Receptacles - CEC 220.84(C)(1) *Enter cumulative total area of habitable space **for all units**. Exclude open porches, garages, and unused/unfinished spaces.*	**3 VA/ft2 x**	1	0
Small-Appliance Branch Circuits - CEC 220.84(C)(2) *Enter cumulative total number small appliance circuits **for all units**.*	**1,500 VA x** total circuits	2	0
Laundry Branch Circuits - CEC 220.84(C)(2) *Enter cumulative total number of laundry circuits **for all units**.*	**1,500 VA x** total circuits	3	0
Appliances and Motors - CEC 220.84(C)(3) and (4) *Enter nameplate/connected VA for fixed appliances, cooking equipment, dryers, and permanently connected motors and total quantity **for all units**.* ** The EVSE load shall be calculated at either 7200 VA or the nameplate rating of the equipment, whichever is larger. Overall rating of the installation can be limited through controls as permitted by 625.42(A) or (B).CEC 220.57; 625.42*	Water heaters VA x = 0 Dishwashers VA x = 0 Disposers VA x = 0 Clothes dryers VA x = 0 Ranges / ovens VA x = 0 Built-in microwaves VA x = 0 Motors VA x = 0 EVSE* VA x = 0 Other fixed loads VA x = 0 Other fixed loads VA x = 0	4-12	0
Heating or Air-Conditioning - CEC 220.84(C)(5) *Enter the cumulative total nameplate/connected VA for A/C and fixed electric heating **for all units**. Only the larger of the two loads is included.*	**A/C** VA **Fixed electric heat** VA	13	0
Total Dwelling Connected Load and Table 220.84(B) Demand *Sum Lines 1 through 13, then apply the Table 220.84(B) factor based on dwelling-unit count.*	**Connected Load** 0 VA x 0 % =	14	0
House / Common Loads - calculate under Article 220, Part III *Do not apply Table 220.84(B) to these loads.*	Common lighting VA Elevator VA Common HVAC VA Common EVSE VA Pool equipment VA Other common load VA	15	0
Total Calculated Demand Load and Load Current *For total VA: Line 14 + Line 15. For load current: total VA / system line-to-line voltage. Selected service/feeder must be greater than the calculated load current.*	0 **VA** 0.0 **A** **SELECTED SERVICE / FEEDER**	16	100A
Service / Feeder Conductors *Enter the service / feeder conductors based on CEC 310.12 for a service rated 100 amperes through 400 amperes. Otherwise use applicable ampacity provisions in Table 310.16.*		17	
Neutral Conductor *Enter the neutral conductor calculated based on CEC 220.61.*		18	
Grounding Electrode Conductors *Enter the grounding electrode conductor based on CEC 250.66.*		19	

Table 220.84(B): 3-5 45%; 6-7 44%; 8-10 43%; 11 42%; 12-13 41%; 14-15 40%; 16-17 39%; 18-20 38%; 21 37%; 22-23 36%; 24-25 35%; 26-27 34%; 28-30 33%; 31 32%; 32-33 31%; 34-36 30%; 37-38 29%; 39-42 28%; 43-45 27%; 46-50 26%; 51-55 25%; 56-61 24%; 62+ 23%.