SERVICE LOAD CALCULATION

CEC PART I 2024, RULE 8-210 (OTHER OCCUPANCIES) · 120/208 V, 3 PH, 4 W

LOAD	RULE / BASIS	QUANTITY	CONNECTED W	DEMAND	CALCULATED W
Basic load: lighting and receptacles	Rule 8-210(a), Table 14 (office), whole floor area	1,080 m² × 50 W/m²	54,000	70 %	37,800
RTU-1 (10 t)	Rule 8-210(b); nameplate MCA		16,644	100 %	16,644
RTU-2 (10 t)	Rule 8-210(b); nameplate MCA		16,644	100 %	16,644
RTU-3 (7.5 t)	Rule 8-210(b); nameplate MCA		12,970	100 %	12,970
MAU-1 fan	Rule 8-210(b); FLA		3,819	100 %	3,819
AC-1 compressor (7.5 hp)	Rule 8-210(b); FLA		8,718	100 %	8,718
EVSE-1 to EVSE-4 (4 × 32 A)	Rule 8-210(b); no EVEMS, 100 %		26,624	100 %	26,624
WH-1 water heater	Rule 8-210(b)		6,000	100 %	6,000
OHD-1, OHD-2 operators	Rule 8-210(b)		2,352	100 %	2,352
CU-1 IT split system	Rule 8-210(b)		2,496	100 %	2,496
EF-1, EF-2 exhaust fans	Rule 8-210(b)		500	100 %	500
Exterior lighting and sign	Rule 8-210(b); outside the floor area	480 W + 1,200 W	1,680	100 %	1,680
UH-1, UH-2 electric unit heaters	Section 62, 75 % (not interlocked with cooling: Rule 8-106(3) not applied)	2 × 7,500 W	15,000	75 %	11,250
TOTAL					**147,497**

Calculated load 147,497 W ÷ (√3 × 208 V) = 409.4 A

Service 600 A, 80 % rated: 600 × 0.8 = 480 A ≥ 409.4 A OK

Service conductors 2 × 350 kcmil Cu RW90 per phase: 2 × 310 A = 620 A at 75 °C (Table 2) ≥ 600 A OK

Spare capacity at 80 %: 71 A, about 15 % of the continuous rating

FEEDER CALCULATIONS

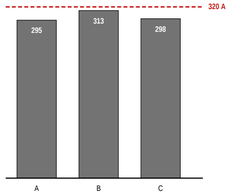
TAG	TO	BASIS	W	AMPS	OCPD	80 %	CONDUCTORS	AMPACITY	BOND	
F1	PANEL A	Connected load of every circuit at 100 % (feeder demand factors not applied)	108,771	301.9	400 A	320 A	2 × 3/0 Cu RW90	400 A	#3 Cu	OK
F2	PANEL B	Table 14 basic load at 100 % + CU-1 + exhaust fans + exterior lighting and sign	58,676	162.9	225 A	180 A	1 × 4/0 Cu RW90	230 A	#4 Cu	OK

Feeder demand factors from Table 14 are not applied: Panel A carries every connected load at 100 %, and Panel B carries the Table 14 basic load of the whole floor at 100 %, which is more than its connected receptacle and lighting load (36.7 kVA). Conductor ampacities from Table 2 at 75 °C; bonding conductors from Table 16.

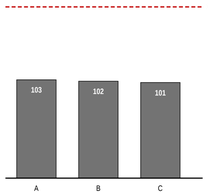
ASSUMPTIONS FOR THE MASTER ELECTRICIAN TO CONFIRM

1. Whole floor area (1,080 m²) taken as office occupancy in Table 14: 50 W/m², 70 % demand for the service. The warehouse would justify less; this errs high.
2. Rooftop units at nameplate MCA (already includes 125 % of the largest motor); gas heat, so the cooling load governs.
3. UH-1 and UH-2 are not interlocked with the rooftop units' cooling, so both heating and cooling are included (Rule 8-106(3) not used).
4. EV chargers at 100 % of their 32 A rating, no energy management system. EVSE-5 and -6 excluded (rough-in only).
5. Utility fault level 22 kA at the service is an assumption until ENMAX confirms it in writing.

PHASE LOADING AGAINST 80 % OF THE BUS



PANEL A (400 A)



PANEL B (225 A)

Amps per phase at 120 V from the connected loads on E-301. Dashed line: 80 % of the bus rating.

VOLTAGE DROP

RULE 8-102: NOT MORE THAN 3 % IN A FEEDER OR BRANCH CIRCUIT, 5 % FROM THE SERVICE TO THE LOAD

RUN	AMPS	LENGTH m	COPPER	VOLTS	THIS RUN %	TO SERVICE %	
Service S1 (2 × 350 kcmil)	409.4	15.0	2 × 350	0.92	0.44	0.44	OK
Feeder F1 to Panel A	301.9	9.5	2 × 3/0	0.72	0.34	0.79	OK
Feeder F2 to Panel B	162.9	21.0	4/0	1.44	0.69	1.14	OK
Branch RTU-1	46.2	41.4	#6	4.78	2.30	3.09	OK
Branch AC-1	24.2	45.9	#8	4.36	2.09	2.88	OK
Branch UH-2	20.8	39.5	#10	5.14	2.47	3.26	OK
Branch EVSE-4	32.0	17.2	#8	2.50	1.20	1.99	OK
Branch OHD-2	9.8	40.5	#10	2.86	2.38	3.17	OK
Branch B-15 warehouse lighting	6.2	38.0	#12	2.65	2.21	3.34	OK
Branch B-19 exterior poles	4.0	45.0	#10	1.30	1.08	2.22	OK

Method: VD = k × I × L × Z, with k = √3 for 3-phase and 2 for single-phase runs, and Z the effective impedance of copper in steel conduit at 0.85 power factor. Lengths are routed lengths including drops. Longest runs only; every other circuit is shorter or lighter.

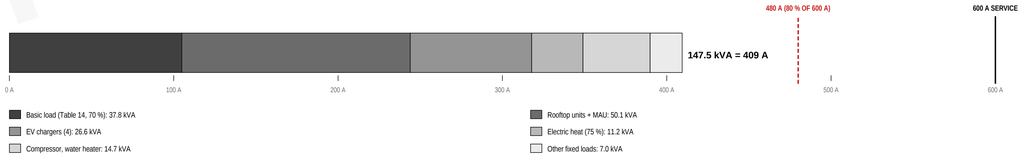
WHAT CHANGED THE DESIGN

OHD-1, OHD-2	On #12 Cu the 40 m run drops 3.7 %, over the 3 % branch limit. Upsized to #10 Cu: 2.4 %.
B-19 exterior	Pole lights 45 m from Panel B: #10 Cu keeps the drop at 1.1 %.
Panel A phases	EV chargers and the water heater moved between phases so no phase exceeds 80 % of 400 A (highest 313 A).
Panel B phases	Microwave, dishwasher and IT rack 2 swapped between phases: 103 / 102 / 101 A.
Future chargers	EVSE-5 and -6 would push Panel A to 339 A, over 320 A: rough-in only, EVEMS required.

REFERENCES

- CEC Part I 2024 (CSA C22.1:24): Rules 8-102, 8-104, 8-106, 8-210; Tables 2, 14, 16. In force in Alberta since April 1, 2025.
- City of Calgary: Electrical permits for contractors; PL 1219 plans examination checklist (R2025-04).
- Fault current: point-to-point method, Eaton Bussmann Selecting Protective Devices (C values, copper, steel conduit).

CALCULATED LOAD AGAINST THE SERVICE



SAMPLE

SAMPLE · FICTIONAL JOB · NOT FOR CONSTRUCTION

Shows the format of an AI-drafted set. A real set uses your title block and your standards.

YOUR LOGO

YOUR COMPANY ELECTRIC LTD.

ELECTRICAL CONTRACTOR

Calgary, Alberta

Your address, phone, email

Master Electrician: your name, No.

REVIEW AND SIGNATURE

MASTER ELECTRICIAN SIGNATURE

P.ENG. SEAL (WHERE REQUIRED)

SAMPLE: NOT REVIEWED, NOT SIGNED, NOT SEALED

PROJECT

OFFICE / SHOWROOM / WAREHOUSE FIT-OUT AND 600 A SERVICE

CALGARY, ALBERTA · FICTIONAL SITE. NO REAL ADDRESS.

OWNER: EXAMPLE OWNER LTD. (FICTIONAL)

PROJECT NO. AS-24-0247

REVISIONS

NO.	DATE	DESCRIPTION
0	2026-09-04	ISSUED FOR PERMIT
1	2026-10-23	CO-07: TWO RECEPTACLES ADDED IN OFFICE 110, NEW CIRCUIT B-37

DRAWN	AI DRAFT (ALPHA SEED)
CHECKED	ESTIMATOR / DESIGNER
REVIEWED	MASTER ELECTRICIAN
SCALE	NTS
DATE	2026-10-23

SHEET TITLE

LOAD CALCULATION AND VOLTAGE DROP

CEC Rule 8-210 · feeders · Rule 8-102

SHEET

E-302

PROJECT NO. AS-24-0247