

**PV DESIGN WORKSHEET WITH MICRO INVERTERS**

**Based on the 2016 CEC**

PROJECT ADDRESS: \_\_\_\_\_ PLAN CHECK# \_\_\_\_\_

Breaker maximum sizes: #14 – 15A, #12 – 20A, #10 – 30A, #8 – 50A, #6 – 60 A, #4 – 80A

Voc \_\_\_\_\_ Isc \_\_\_\_\_

**Table 310.15 (B) 16 (See Art. 110.14 C)**

**1. MAX PV VOLTAGE AND CURRENT CALCULATIONS:**

**Wire Size      Max Ampacity**

14                      20

a.    Max PV system voltage (per NEC. 690.7):                      **12**                      **25**

Check voltage rating in Micro inverter specs. Should be **240 V**    **10**                      **35**

**8**                      **50**

!!! Sec. 690.7C requires the Max PV voltage to be                      **6**                      **65**  
Less than 600 volts

\*1 voltage correction factor section 690.7

b.    Max PV current (NEC 690.7) 1.12 X max output ampacity of micro Inv. X # of micro Inverters.

So, 1.12 x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_ amps

**2. AC CONDUCTOR AMPACITY CALCULATIONS: (array to combiner box) NEC310.15**

a. Expected wire temp. = \_\_\_\_\_ (See Rule K. then use table 310.15 (B) (2) (a))

b. Temp. correction = .58 (refer to table 310.15 (B) (2) (a)).

c. # of current carrying conductors = \_\_\_\_\_

d. Conduit fill de-rating: .80 (for more than 3 conductors per table 310.15(B)(3)(a) ) If 3 or less: use "1"

e. Circuit conductor size: \_\_\_\_\_ awg

f. Circuit conductor ampacity (310.15(B)(16)): \_\_\_\_\_ amps

g. Required Circuit conductor ampacity per NEC 690.8 A info note.

1.25 x M.I. output x # of M.I.'s= \_\_\_\_\_ amps

1.25 x \_\_\_\_\_ X \_\_\_\_\_ = \_\_\_\_\_ amps

h. Derated ampacity of circuit conductor per CEC 310.15 (B) (2) (a)

Temp. corr. (refer to table 310.15 (B) (2) (a)). x conduit fill corr. (per table 310.15(B)(3)(a)) x  
circuit conductor ampacity (CEC 310.15 (B) (16) = \_\_\_\_\_ amps

.58 x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_ amps

**Note: H must be larger than G Yes \_\_\_ No \_\_\_ (check one)**

**3. AC CONDUCTOR AMPACITY CALCULATIONS (from combiner box to main panel OR j-box to main panel )**

- a. Ambient temp. adjustment, expose conduit (CEC 310.15 (B) (2) (a) + 22 degrees  
Expected wire temp. (C deg.) (CEC table 310.15 (B) (2) (a)): 41 deg. + 22 deg. = 63 deg.  
Temp. correction per table 310.15 (B) (2) (a): .58  
# or current carrying conductors: \_\_\_\_\_  
Conduit fill correction (NEC 310.15B.3.a) \_\_\_\_\_ .80 (for more than 3 conductors per table 310.15(B)(2)(a) ) If 3 or less: use "1"  
Circuit conductor size: \_\_\_\_\_ awg  
Circuit conductor ampacity: \_\_\_\_\_ amps
- b. Required circuit conductor ampacity (NEC 690.8 A info note)  
1.25 x M.I. max output X # of M. I.'s in parallel  
1.25 x \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_ amps
- c. Derated ampacity of circuit conductor (NEC 310.15 B 2 a)  
Temp. correction (NEC table 310.16) x conduit fill correction (NEC 310.15B.2.a) x circuit conductor ampacity = \_\_\_\_\_ amps  
.87 x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_ amps

**Note:** C must be larger than B Yes \_\_\_ No \_\_\_ (check one)

**RULES:**

- A. AC BREAKER: to be no more than the next standard breaker size up from (calculation 4B).
- B. Bus Rating: Article 705.12D(2) states that the sum of the ampere ratings of the overcurrent devices n circuits supplying power to a busbar or conductor shall not exceed 120% of the rating of the busbar or conductor.
- C. Maximum of 18 inches can cantilever beyond the standoff connection
- D. AC BREAKER: to be rated to protect the conductor per table 310.16 and Art 240.4.D/240.6.A-
- E. CONDUIT(S) SHALL BE PAINTED TO MATCH SURFACE AND SHALL BE INSTALLED MORE THAN ½"(INCHES) ABOVE ROOF SURFACE
- F. ALL EQUIPMENT TO BE LISTED FOR THE PURPOSE.
- G. Provide SOLAR PANEL COPPER LAY-IN GROUNDING LUG, TIN PLATED, 14-4, STAINLESS STEEL SCREW, SUITABLE FOR DIRECT BURIAL
- H. Use #8 bond wire from Service panel to rooftop, then #6 on rooftop where exposed. ( NEC 250.120).
- I. Prior to the installation of the solar panels, the Contractor shall schedule an anchorage inspection for all standoffs.
- J. **SMOKE DETECTORS SHALL BE INSTALLED:**
- a- Centrally located in corridor (or area) leading to sleeping areas, and inside each sleeping room.
  - b On ceiling of upper level in close proximity to the stairway when sleeping areas are on an upper level.
  - c On each floor level and in basement.

- d In the adjacent room (or area) where the ceiling height exceeds that of the hallway by 24" or more.
- e Battery operated smoke detector permitted in existing construction.

**CARBON MONOXIDE SHALL BE INSTALLED:**

- a. Outside of each separate dwelling unit sleeping area in the immediate vicinity of the bedroom(s).
  - b. On every level of a dwelling unit including basements.
  - c. Battery operated carbon monoxide detector permitted in existing construction.
  - d. Where a fuel-burning appliance is located within a bedroom or its attachment bathroom, a carbon monoxide alarm shall be installed within the bedroom.
- K. The ASHRAE (90.1) 2% Temperature should be used for all starting ambient temperatures. This is the temperature that is likely exceeded during 14 hours (not necessarily continuous) over a summer month (June through August). The rooftop temperatures for conduit are then adjusted for rooftop conditions. So in Ontario the 2% temperature is 37°C or 98.6°F. NEC table 310.15(B)(3)(c) then shows us we need to add 22°C or 40°F to conduit that is placed ½" to 3-1/2" above the roof surface. The rooftop temperature measurement then becomes 59°C or 138.2°F.

**Definitions:**

**Combiner box:** used where long runs of wire occur in order to reduce cost of installing many smaller wires.

**Junction box:** used to change type of wire from "roof cable" to THWN-2