Homework Problem #1

Consider an array of 20 BP3220 modules, two parallel strings of 10 series-connected modules. Use the attached NEC tables and cut sheets answer the following questions. (show your work for partial credit)

a) What is the maximum source circuit current for each string in the array?

8.4A * 1.25 = 10.5A

b) What is the maximum source circuit current for the PV output circuit (after the source cicuit combiner box)?

8.4A *1.25 * 2 = 21A

c) What is the required over current device rating for the PV output circuit?

21A *1.25 = 26A Next higher fuse size = 30A

d) What is the required PV output circuit conductor ampacity?

21A *1.25 = 26A

e) Based on the circuit requirements, select an acceptable conductor for the PV output circuit. Assume 90C rated insulation and THWN-2 conductors.

Use 310.16 or 310.17 table to select conductor based on Required amapacity - 12AWG THWN-2 in conduit

Homework Problem #1

f) If the PV output conductors are in conduit with an ambient temperature of 137F and there are a total of 4 current carrying conductors in the conduit, what is the de-rated ampacity of the conductor?

Two de-rate factors, temp and conduit fill
30A * .80* .71 = 17A

g) What is the conductor that you would recommend to satify all NEC ampacity requirements?

12AWG THWN-2 not acceptable, 17A < 21A – de rate < continuous current

Try next larger conductor, 10AWG THWN-2:
Ampacity = 40A, de rate = 40A * .80 * .71 = 23A:

10AWG THWN-2 not acceptable, 23A < 30A - de rate < over current rating

Try next larger conductor, 8AWG THWN-2:
Ampacity = 55A, de rate = 55A * .80 * .71 = 31.2A

8AWG THWN-2 provides sufficient ampacity to account for continuous Current after de rating and exceeds over current device rating

- *What if over current device terminal rating is 60C?*
- *What if we do not have over current device in the circuit?*

Homework Problem #2

Consider an array of 20 BP3220 modules, four parallel strings of 5 series-connected modules. Use the attached NEC tables and cut sheets answer the following questions. (show your work for partial credit)

a) What is the maximum source circuit current for each string in the array?

8.4A * 1.25 = 10.5A

b) What is the maximum source circuit current for the PV output circuit (after the source cicuit combiner box)?

8.4A *1.25 * 4 = 42A

c) What is the required over current device rating for the PV output circuit?

42A *1.25 = 52.5A Next higher fuse size = 60A

d) What is the required PV output circuit conductor ampacity?

42A *1.25 = 52.5A

e) Based on the circuit requirements, select an acceptable conductor for the PV output circuit. Assume 90C rated insulation and USE-2 conductors.

Use 310.16 or 310.17 table to select conductor based on Required amapacity - 8AWG USE-2 in free air

Homework Problem #2

f) If the PV output conductors are in free air and operating at an ambient temperature of 155F, what is the de-rated ampacity of the conductor?

One de-rate factors, temp and conduit fill
80A * .58 = 46A

8AWG USE-2 not acceptable, 46A < 60A – de rate < over current rating

Try next larger conductor, 6AWG USE-2:
Ampacity = 105A, de rate = 105A * .58 = 61A

g) The over current device has a terminal rating of 60C and the device is operating at an ambient temperature of 40C. What is the conductor that you would recommend to satify all NEC ampacity requirements?

Look at ampacity of the same conductor with lower temp rating of the Over current device. That ampacity must exceed over current device ampacity

6AWG USE-2 provides sufficient ampacity to account for continuous current after de rating and exceeds over current device rating