

**Switchgear Class 1 – Drawing Reading Assignment**

All questions should be able to be answered using the ANSI Device #'s sheet and the 4 GPO Pre-purchase drawings.

1. Important ANSI/IEEE Device Numbers for electrical switchgear prints (copy definitions here):
  - a. 12 \_\_\_\_\_
  - b. 21 \_\_\_\_\_
  - c. 25 \_\_\_\_\_
  - d. 27 \_\_\_\_\_
  - e. 32 \_\_\_\_\_
  - f. 40 \_\_\_\_\_
  - g. 43 \_\_\_\_\_
  - h. 46 \_\_\_\_\_
  - i. 50 \_\_\_\_\_
  - j. 51 \_\_\_\_\_
  - k. 52 \_\_\_\_\_
  - l. 59 \_\_\_\_\_
  - m. 79 \_\_\_\_\_
  - n. 81 \_\_\_\_\_
  - o. 83 \_\_\_\_\_
  - p. 86 \_\_\_\_\_
  - q. 87 \_\_\_\_\_
  
2. Less often used ANSI/IEEE Device Numbers, but may run across them in controls drawings:
  - a. 11 \_\_\_\_\_
  - b. 20 \_\_\_\_\_
  - c. 23 \_\_\_\_\_
  - d. 24 \_\_\_\_\_
  - e. 26 \_\_\_\_\_
  - f. 47 \_\_\_\_\_
  - g. 49 \_\_\_\_\_

h. 62 \_\_\_\_\_

i. 63 \_\_\_\_\_

j. 71 \_\_\_\_\_

3. What does GPO stand for?

4. How do you know that the 4 drawings you have are the complete set?

5. Who is the design engineering firm for this set of bid drawings?

6. Where are they located?

7. Where is the GPO located?

8. Define the following acronyms:

a. AT, AF \_\_\_\_\_

b. AIC \_\_\_\_\_

c. ATC \_\_\_\_\_

d. ATS \_\_\_\_\_

e. CT \_\_\_\_\_

f. MCB, MLO \_\_\_\_\_

g. NC, NO \_\_\_\_\_

h. NTS \_\_\_\_\_

i. SA \_\_\_\_\_

j. ST \_\_\_\_\_

k. SWBD \_\_\_\_\_

l. SWGR \_\_\_\_\_

m. XFMR \_\_\_\_\_

9. How can you tell whether a receptacle is wall mounted or ceiling mounted?

10. What does DMM in a box mean?

11. What does TVSS in a box mean?

12. How can you tell whether a circuit breaker is drawout or fixed?

13. What is an "EO" circuit breaker?
14. Draw a transformer, then an isolation transformer.
15. How do you tell the difference between a utility meter and a motor?
16. How does RTKL distinguish fused from non-fused disconnects?
17. How does RTKL distinguish between 480/277V and 208/120V panelboards?
18. What is an interlock (answer not on drawings)?
19. Where will the new switchgear be located?
20. Substation room is medium voltage (13.2kV) area, Switchgear room is all 480V (low voltage). What is the direction of power flow on the plan view drawings on sheet E-110?
21. What does "MV CB 'A'" stand for?
22. What 2 components are in the PEPCO metering cubicles?
23. What's the ATC for between metering cubicles and transformers?
24. What's the rating of the substation transformers? How can they be dual rated?
25. What do output breakers "LV-A" and "LV-B" feed?
26. Where are the surge arrestors located?
27. What model number protective relay is specified by the engineer?
28. Why is drawing note 4 on sheet E-110 problematic?
29. What will most commonly be plugged into the ceiling mounted receptacles (not on dwgs)?
30. What does CRAC stand for (not on dwgs)?
31. Why would there be 2 CRAC's in the substation room?
32. What are the battery racks and chargers be used for?
33. Assume the higher x'fmr rating (3000kVA). What is the maximum primary current at 13.2kV? ( $VA = V * A * \sqrt{3}$ )  
 $\text{sqrt}(3) = V * A * 1.732$ )

34. Does your answer make sense, given the trip rating for the primary breakers?
35. Assume 3000kVA x'fmrs again, what's the maximum secondary current at 480V?
36. Does your answer make sense, given the trip rating for the secondary breakers?
37. What's the impedance of the substation transformers?
38. What's the fault current rating of SWGR A and SWGR B?
39. How many conduits/conductors are between breakers 52-MA and 52-UA (4000A)?
40. Why is 52-TA NC, while 52-TB is NO? (Answer not on dwgs) Think about it.
41. The four 4000A breakers create a Main-Tie-Tie-Main arrangement. Normally this is simplified as merely a M-T-M. Why do we need 2 tie breakers in this case? (Answer not on dwgs) Think about it.
42. A M-T-M (or M-T-T-M) arrangement is also known as a "healthy source selection" or "autothrowover" scheme. This one is automated. What performs the automatic sequencing?
43. Why are there DMM's when utility metering is already provided?
44. What's an EPMS (not on legend, Google it)?
45. How many 4000A breaker pair connections are there that travel outside of equipment?
46. What are the largest frame size load breakers in SWGR A and SWGR B?
47. What size are most of the load breakers in SWGR A and SWGR B?
48. Can the 6-color press and the 7-color press run simultaneously?
49. What protections are in effect on the MV Circuit Breakers?
50. What medium voltage cables are specified?
51. What DMM(s) are specified?
52. Why is the N-G bond made ONLY in SWGR A?
53. What's wrong with Drawing Note 11?
54. What purpose do glow tubes serve? (Not on drawings)