

One-Line / Riser Diagrams

Drawings are not reviewed prior to submission. Because of this we find the following:

1. One Line or Riser shows a panel sizes but the panel schedule have a different size.
2. Feeder sizes not shown on One Line or Riser Diagram.
3. Overloaded panels and Switchboards. Load established for feeder but down the line, at transfer switch, a smaller capacity switch is shown. Transfer switch to be sized based on the Normal Power load, not just the Emergency load.
4. Undersized feeders, panel schedules show the load but its not carried over to the One-Line or Riser.
5. Schedule uses a letter matrix in lieu of actual conductor sizes. A schedule with feeders is easier than letters representing wire sizes. Anyone working with the drawing has to convert from the letters back to actual conductors.

Grounding

“Ground Per Code” statement used.

1. Transformer connection to Grounding Electrode not sized on drawing.
2. On Separately Derived Systems, the Supply Side Bonding Jumper is not correctly shown. Often a Bonding Jumper is size based on the aggregate in lieu of conductor per raceway. Or, are based on the breaker size on the secondary of the transformer.
3. Feeders, the Equipment Grounding Conductor not sized per 250.122.

Fault Current

Fault current values used for calculations don't match Riser or One Line Diagram.

1. Size of conductors are not the same.
2. Length of feeder is off, often too short. (140' used for apparent 40' length.)
3. Fire Pump, Fault Current Calculations have one length and Voltage Drop calculations have another size.
4. Fault Current to Elevator is too high for equipment. Elevator states to provide a system which will provide a maximum of below 10,000 AIC. This does not come out in the review but is addressed after the field FAILS the inspection.
5. Fault Current Calculations at the service tend to include the extra length of conductor ask for by the utility for terminations. Seattle City Light, for example states this length is not to be used for Fault Current Calculations (because they may be cut off.) An example is switchgear is back to back with the SCL vault and length of Service is 80'???
6. Fault Current calculations, One Line shows 12 sets of conductors, calculations call out 5 sets, etc.
7. Transformer impedance not indicated or shown. When checking the calculations, I need this to see the let through for the transformer or know the impedance of the transformer.

Calculations

1. Calculations for “Non Coincidental Loads” not clearly indicated. Diversities of 40%, 50% or 60% given but no explanation of why the engineer thinks the equipment non-coincidental or how selected a diversity or % decrease in loads. Under Engineering Supervision, it may be allowed, but typically this is for a factory, Article 215.2(B)(3).
2. Transformers – K13 etc use 5 wire secondary or increased Neutral size secondary. This implies the neutral to be current carrying. This creates 4 or more current carrying conductors in raceway, thus 80% adjustment factor. Conductors are adjusted, larger conductors have to be used. 310.15(B)(3)(a).
3. Residential calculations – Dwelling units vs Sleeping rooms or Apartments without provisions for cooking. These are different calculations. Use appropriate calculations then add the two together.
4. Cooling towers loads very confusing. Given 12 motors, starters, pan heaters etc. It may be a one-point connection, or multi connections. Identify what is to be installed. What are the requirements from Mechanical?
5. Load calculations not shown for panels. Unable to confirm loads on the panel. Bottom of the panel shows a load but no breakdown for continuous or non-continuous. We need loads to evaluate load on panel.
6. Heat Pumps are shown as non-coincidental with supplemental heating loads, however what about defrost mode?
7. Dwelling units, using the optional calculations (220.84,) should use actual Range load 220.82(C)(3), not just 8kW. If just Basic range, may be OK with 8kW but often if better unit, higher kW actual. Provide a cut sheet of the range to be used. Not a big deal if 4 or 5 units but with 70 units on a Meter Center may make a difference.
8. Calculations, show your work. If calculations are based on watts per square foot, then show square feet and the watts per square foot on the calculations along with the total value used in the calculations.
9. Calculations for residential units don't match
 - a. Number of units in calculations don't match number of actual units
 - b. Loads don't comply with 220.52 i.e. either calculations are OK or way off.
10. Meter Centers are shown with center connection and bus on either size is reduced. Show calculations for each side to show the sides are not overloaded.
11. Article 220.87 for metering existing loads on building. Then taking calculated loads from the metered loads.
12. Motor circuit conductors, calculations, 125% of FLC for the feeder or branch circuit.
13. Load for motors to use 430.250 for the motor loads not on name plate rating of motor. 430.6(A)(1).

14. Equipment loads on panel schedules don't match mechanical equipment schedules. (Not a MCA vs Load on unit issue, schedule will show 20kVA and calculations will have 10kVA on the calculations.)
15. Delta service calculations dividing by the 3 phase voltage in lieu of the single phase loads, plus the 3 phase loads.

Motors

1. Motors – Full Load Current is per 430.250 but uses 460 as a multiplier for VA in lieu of the building nominal voltage. If 460 volt is used in lieu of 480 volt then when converting back to amps use 460 volt, not 480. Amps are the important issue.
2. Motor calculations, Elevators and Fire Pumps are motors, largest at 125% for calculations.

Transformers

1. Look at 5 items for a transformer. -
 - a. Protection for a transformer, either primary at 125% or primary plus secondary at 250% primary and 125% secondary. 450.3(A) or 450.3(B).
 - b. Load on transformer, show the transformer is not overloaded. Seattle 450.20.
 - c. Secondary of transformer conductors shall be protected at 100% of capacity 240.21(C) (240.4(B) not allowed.)
 - d. Panels require over current protection, at the panel or prior to the panel 408.36.
 - e. Bonding of transformer. Transformer shall have System Bond size based on aggregate of all conductors on secondary side, 250.102(C)(1). And from the secondary side of the transformer, the Supply Side Bonding Jumper shall be based on the wire in the conduit. 250.102(C)(1).
2. Transformers are overloaded. All too often one looks at the conductor size in lieu of the kVA of the transformer.
3. No "Over Current Protection" on the secondary of a transformer.
4. Grounding on secondary of transformer too small, often sized per 250.122, the breaker at the end of the circuit, or is way oversized based on the aggregate of all the parallel feeder.
5. Transformers Grounding not indicated.
6. Secondary side of transformer, not using full size conductors to the secondary overcurrent device. Code does not allow use of 240.4(B).

Fire Pumps –

1. Main Bond not sized or indicated. Typically, Fire pump has its own service.
2. Seattle requires a 3 phase, 4 wire service. Grounded (neutral) conductor minimum size based on 250.102(C)(1).
3. If a Service Disconnect is installed prior to the Fire Pump, the Equipment Grounding Conductor may be sized too small. The actual Breaker is sized to carry Locked-Rotor indefinitely, thus the

EGC shall be based on 250.122 on the size of the OCP, but all too often the size of the EGC looks like it was sized from an imaginary breaker which typically would be used to protect the size of wire installed. Typically, I see 1,000, 1,200, and 1,600 Amp breakers for fire pumps in HighRise.

4. Fire Pump controller shows a "Main Bond" but have a service disconnect by the vault.
5. Fire Pump Service Disconnect by the Vault is not sized it for locked rotor. Disconnect has to carry LRC (Locked Rotor Current) but is undersized. Refer to Code Letter on the motor to determine LRC or it may be stated on the fire pump. You need to get hold of the Sprinkler contractor to obtain LRC or Code Letter, 695.4(B)(2)(a), Table 430.7(B).

Plans / Drawings

1. Stamped drawings, Drawings are stamped but not signed. WAC 196-23-070
2. Comments on plans state "Lighting to match the lighting shown on the Architectural drawings" and nothing is showing on plans.
3. Drawings stamped "Preliminary Not for Construction"
4. Electrical equipment Rooms – don't comply with 110.26 with Large Equipment for clearance for larger gear, for entrance and exit at each end of the gear or double working clearance etc. 110.26(C)(2). We understand the final physical size of the equipment will not be known until the gear is ordered, however the actual room will not be approved unless they have the required clearance. It's a safety issue.
5. Electrical rooms don't have doors that open OUT for 800 amp and over. 110.26(C)(3)
6. Location of Gear and clearances – Fire Pump Service too close to normal service. Legally Required service is too close normal service. 695.695.4(B)(3), 701.12(E) shall be sufficiently separated to minimize simultaneous interruption of power.
7. 701 Tap ahead of main in same compartment as Main in lieu of separate compartment.
8. Electrical Layout on plans - recessed electrical gear shown recessed in rated walls, i.e. electrical panels in corridor walls or shaft wall.
9. Busway locations - busway shown in vertical shaft, no way to inspect or maintenance.
10. Busway locations - Bus or feeders run through or in Exit Enclosures.
11. Feeders crossing property lines. Code is Premises Wiring.

Generator's

1. Inherent Overcurrent Protection on the unit not indicated.
2. Generators, without inherent overcurrent protection don't show the feeder at 115% to overcurrent protection.
3. Load analysis is unclear for the generator.
4. Generator Room has equipment beyond the EPSS. (NFPA 110.7.2)
5. Generator – 3 pole transfer switches, generator is not a separately derived service, and does not require System Bond, or 4 pole transfer switches shown but generator is not shown with Supply Side Bonding Jumper or System Bond.

6. Generator over 1,200 amp, 480 volt, not shown with Ground Fault Indication (no inherent overload on generator.)
7. Generator input receptacle with no overcurrent protection, for a roll up generator.

Multiple Buildings

1. Article 225 – multiple building on one size, not limiting to one feeder to the building. Seattle has not endorsed the State 6 feeders into a building.
 - a. Allowed are the addition of Emergency and Legally Required power.

Elevator's

1. Elevators, no motor information is given, loads not indicated.
2. Elevators in Highrise buildings, which elevators are on at the same time and which elevators are ok to not be on emergency.
3. Elevators are motors, and when creating calculations are subject to the largest motor @ 125%.

Elevator Machine Room

4. Equipment shown in elevator machine room feeding equipment other than elevator or running through the elevator machine room.
5. Elevator Machine Rooms, typically cannot have a transformer installed in the room. Heat and space constraint.
6. Location of elevator disconnect not indicated or shown. Not an electrical inspection issue, but elevator inspector issue. Refer to WAC 296.96.02460 within 24" of the strike side of the door.

Accessible Means of Egress

1. Accessible Means of Egress Elevator, which elevator is the AME? Show clearly. Confirm if elevators are Accessible Means of Egress.

Emergency Systems

1. 700 systems missing SPD's. (700.8)
2. Battery powered pathway lights on dedicated circuit in lieu of lighting circuit serving the space.
3. Sub-Duct systems not indicated on plans. Mechanical created in lieu of Fire Smoke Dampers..

"By others"

1. Call me with their phone number.....