Key Study Concepts for the Final Exam
12-5-2018

Read NEC 110.14(C)

Volt Amps, or VA
Amps X Volt = VA (Volt Amperes, Single Phase), 35 X 230 = 8050 VA
Amps X Volt X 1.732 = (Volt Amperes, 3 Phase), 35 X 480 X 1.732 = 29,098 VA

Min Circuit Size (Read NEC 210.19 and 210.20A)
Amps X 1.25 = Amps X 125% = 25A X 1.25 = 31.25A

NEC Table 310.15(B)(16)

Temperature Derating (See NEC Table 310.15(B)(2)(a))

Adjustment Factors for more than 3 current carrying conductors (See NEC Table 310.15(B)(3)(a))

Derating Example:
Amps X 0.70 = Amps X 70% = 80A X 0.80 = 64A
This figures the maximum ampacity of a wire after derating.

Voltage Drop
Constant for copper = 12.9
Constant for aluminum = 21.2
VD = 2 X K X I X L / CM
VD = 1.732 X K X I X L / CM
http://www.risingedgeservices.com/voltageDrop.html

Solving for Circular Mils
CM = (2 x K x I x L) / VD
CM = (1.732 x K x I x L) / VD

Amps from VA
Single Phase = VA / V = Amps
3 Phase = VA / (V X 1.732)

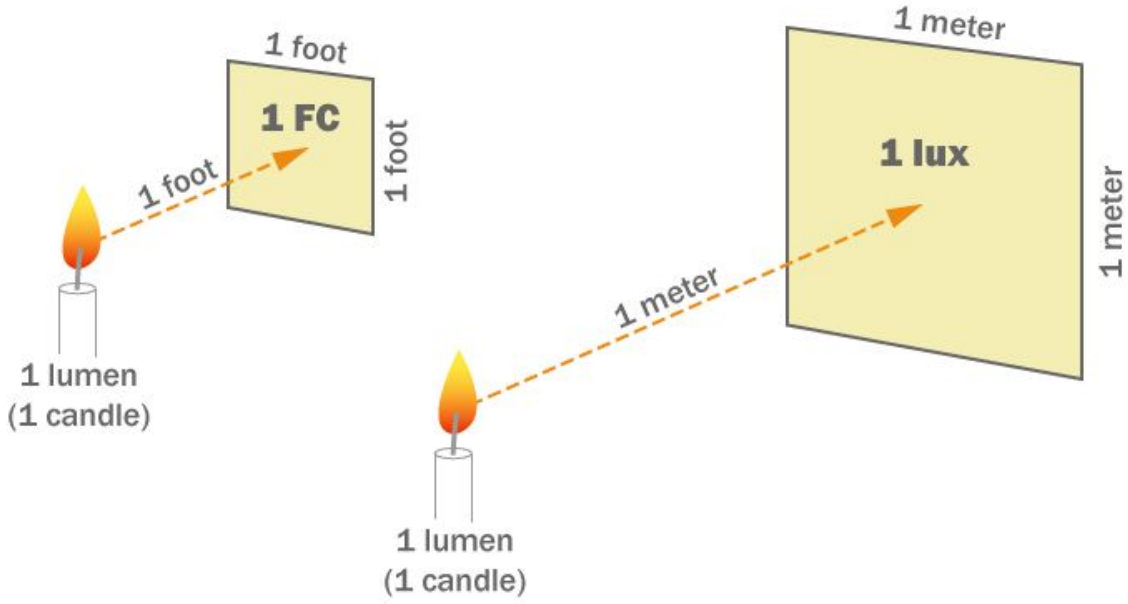
What's the ampacity of three, 5.6 kW, 3 phase, 480VAC, immersion heaters?
What's the Min. Circuit Ampacity?
(5.6 x 1000) / (480 x 1.732) = 6.74A
6.74A x 3 fixtures = 20.22A

20.22A x 1.25 = 25A

Lighting Loads

What's the minimum lighting load for a 4,200 sq/ft home?
4200 x 3VA = 12600W = 12600W/240VAC = 52.5A

Lighting



1 Foot-Candle = 10.7639 Lux
1 Lux = 0.092903 Foot-Candles

1 Meter = 3.28084 Feet
1 Foot = 0.3048 Meters

NEC 110

- Listing 110.3
- Mounting and Cooling 110.13
- Electrical Connections 110.14
- Illumination around Switchboards, and similar equipment 110.26
- Illumination around High Voltage Equipment 110.34(D)

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NEC 210

- Branch Circuit Voltage Limitations 210.6
- Bathrooms 210.10(C)(3)
- Lighting Outlets Required 210.70

NEC 410

- Closets 410.2
- Live Parts 410.5
- Listing 410.6
- Wet and Damp 410.10
- Bathtubs 410(D)
- Roof Decking 410(F)
- Clothes Closet 410.16(A)
- Means of Support 410.36
- Grounding 410.40
- Polarization of Screw Shell 410.50
- Disconnecting Means 410.130(G)(1)
- Track Lighting 410.151
- Low Voltage Lighting 411.1

A 100w bulb put out about 1600 lumens. How many Foot Candles reached the 36" desk if the bulb was 8 feet off the floor?

$$E = \frac{1600\ lumens}{(5\ ft)^2} = 64\ Foot - Candles$$

Hazardous Locations

Read the instructions for pouring Crouse Hinds seals with Chico. See the class web page to download those instructions.

What's a Class 1 Location? Gases and Vapors

What's a Class 2 Location? Combustible Dust

What's a Class 3 Location? Fibers

Draw an explosion proof seal so you can explain it to a customer.

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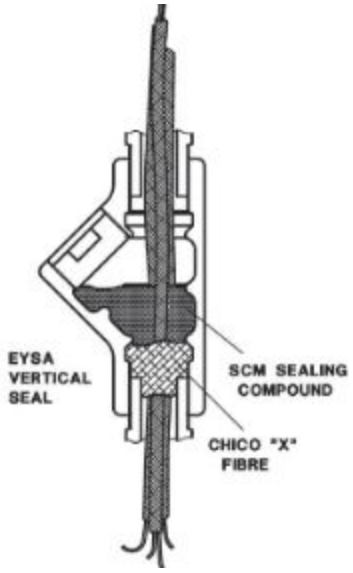

Draw the fire triangle. Hint: Fuel, Heat, and Oxygen

What does LEL mean? Lower Explosive Limit

What does UEL mean? Upper Explosive Limit

"An explosion proof seal shall be installed within ____ inches of the enclosure in each conduit entry into a pressurized enclosure …"

a. 10"
b. 8"
c. 15"
d. 18"

How thick should explosion proof seals be? They shall be at least as thick as the nominal conduit trade size. In a ½ inch conduit, they should be at least ⅝" thick.

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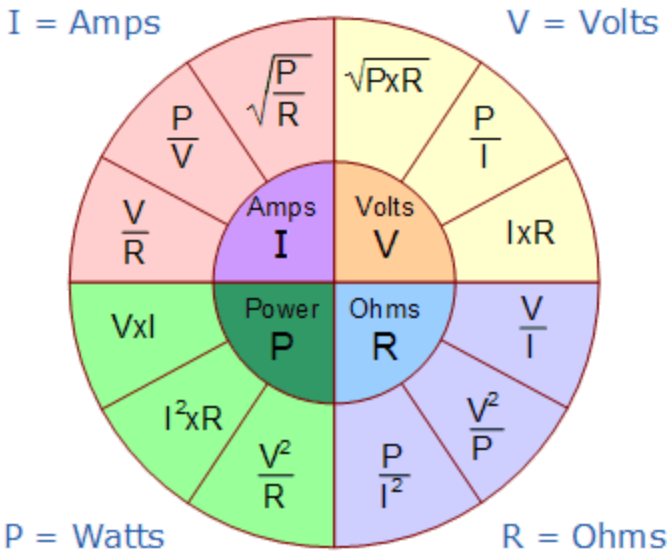
Transformer Ampacity Calculation

150 kVA Transformer, 3 Phase, 480 VAC Primary, 240/120 VAC Secondary

Primary Amperes, for 3Ø Transformer = 180.4 = (150 X 1000) / (480 X 1.732) = (KVA X 1000) / (P_{L-L} X 1.732)
Secondary Amperes, for 3Ø Transformer = 360.9 = (150 X 1000) / (240 X 1.732) = (KVA X 1000) / (S_{L-L} X 1.732)

250% x 180 = 450 A MAX Primary Fuse
125% x 361 = 451A, or a 500 A MAX Secondary Fuse

http://www.risingedgeservices.com/lowVoltageTransformers.html



The exam will have multiple choice, very short essay questions, NEC look up questions, and some math.

Bring your NEC, a pen or pencil, and a calculator. The exam is open book and open notes! You will not be allowed to use the Internet to look up any answer.