Fire Alarms: Power Systems

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- Plans Review Considerations
- NFPA 70 NEC
- Wiring Considerations
- Power Considerations

Primary Power Supply

- Primary power is provided by a dedicated branch circuit (120 VAC)
- Connected to low voltage transformer located in fire alarm control cabinet
- Generators are permissable

Primary Power Supply

- Circuit must be protected mechanical from damage
- Circuit breaker marked as "FIRE ALARM CIRCUIT"
- Protected from unauthorized access
- Overcurrent protection not exceeding 20 amps

Secondary Power

- Rechargeable batteries most common
  - 24 hour/5 minute rule
- Generators acceptable if automatically activated (with 4 hour battery back up)
- Must respond within 10 seconds of power loss

Secondary Power

- 24/4 for residential
- 7/4 rule if no commercial power supply available
- Recharged in 48 hours
- Battery “Issue” will cause trouble signal

Back Up Power Calculations

- Determine Battery Size
- Add up total stand by load
- Total Alarm load times 5 minutes
- 20% Safety Margin

Stand by Current

- All detectors (10) X 1mA = 10mA
- Control Device (1) X 200mA=200mA
- Failsafe Relays (4) X 50mA=200mA
- Annunciator (1) X 100mA=100mA

410mA or .41 A

.41 X 24=9.84AH

Alarm Current

- All detectors (10) X 50mA = 500mA
- Control Device (1) X 200mA=200mA
- Relays in alarm (4) X 50mA=200mA
- Annunciator (1) X 200mA=200mA
- Horns/Strobes (10) X 50mA=500mA

1600mA

1.6 A

1.6X.083=.13AH

Battery Set Size

- Standby of 9.84AH + Alarm of .13AH=9.97AH

- 9.97AH X .20=1.99AH + 9.97AH=11.96

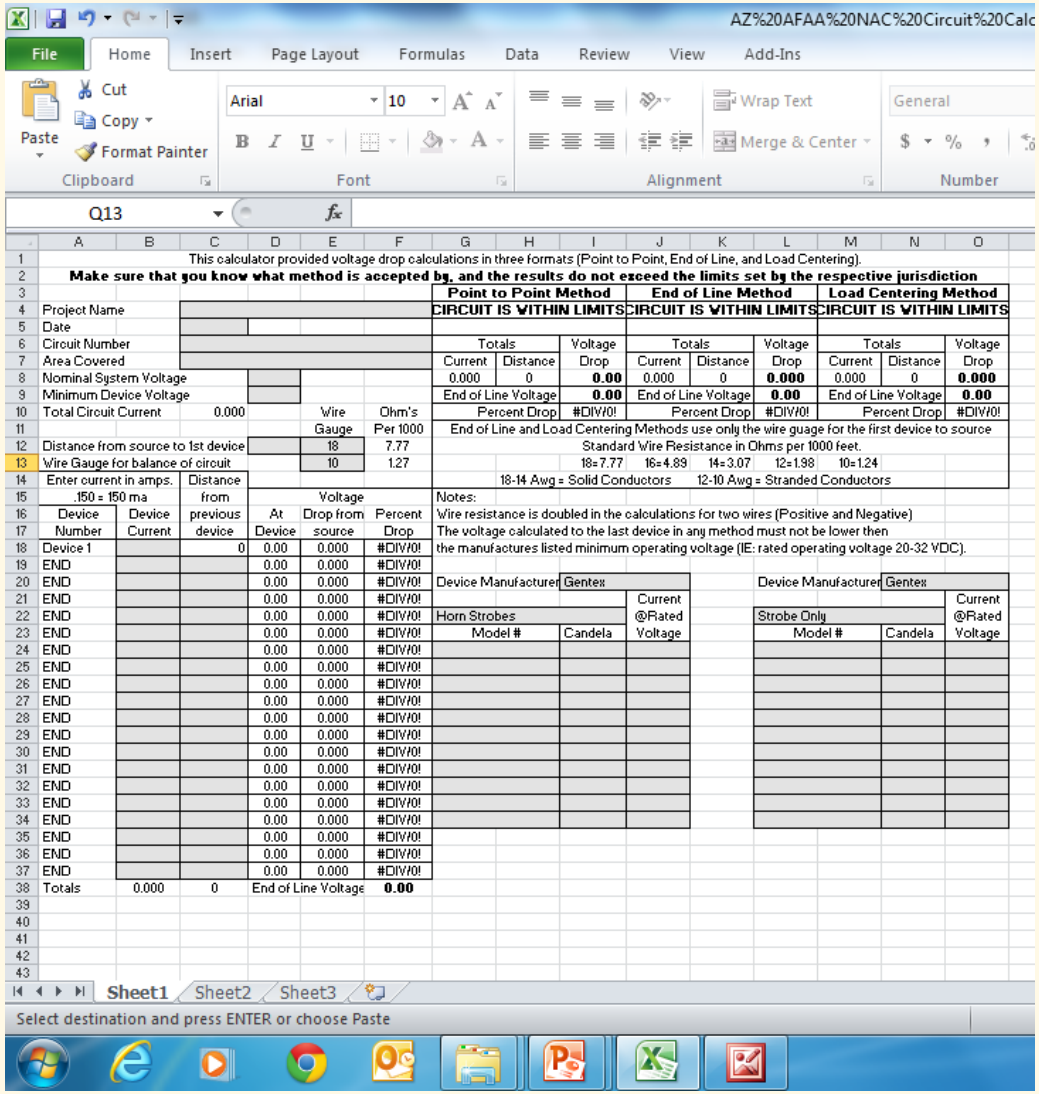
Calculating Voltage Drop

- Devices must be capable of performing between 85% and %110 of the primary and secondary voltage

- Function of Current and resistance
  - Resistance is function of conductor size and distance from source to load.

Voltage Drop Calculator

- www.afaa.org



Battery Types

- Vented lead acid
  - Used in high current/extended standby time at lower currents
- Sealed lead acid
  - All gases sealed in and recycled
  - Most common
- NiCad
  - Used with low, consistent volt draws

Remotely Located Power Needs

- Must have its own Primary and secondary power
- Must be supervised
- Used to power remotely located NAC Power boosters, distributed voice evacuation amplifier

Basics

- Name, Scope etc.
- Scale 1/8” = 1 ‘
- Your job is to confirm
  - Devices all function per MFG or NFPA 72
  - Installed Per NFPA 70

Basics

- **NFPA 170 Symbols**

- **Require FULL Fire Alarm System Diagrams including control unit, power supplies, battery chargers, and annunciators**

Terms

- **Fire Alarm Circuit**
  - **Either Power Limited or non power limitd**
- **Abandoned Fire Alarm Cable**
  - **Not terminated at equipment and not taged for future use**

Terms

- **Power Limited Fire Alarm Circuit (PLFA)**
  - **May use Class three transformer, Class three power supply or listed PLFA power supply**
- **Non Power limited Fire Alarm Circuit (NPLFA)-**
  - **Those meeting Article 760.41 and 760.43**
  - **Power source not more than 600 volts**
- **Fire Alarm Circuit Integrity (CI) Cable**
  - **Used to insure operation of Critical circuits**

Installation Considerations

- Must pass thru walls in an “Approved” manner (Fire Barrier)
- Must be supported in cable trays or attached in manner to structure which does not damage cable
- Must be installed in a neat manner

- Circuits must be identifiable
- Power NEVER supplied thur a GFCI or AFCI

- All raceway, conduits, and wire must meet the intent of the NEC
  - Must only be used in the manner designed (not over amped, etc)
  - Fused where necessary

Careful around Air Handling Systems

- **Specific Requirements on different types of air handling equipment**

- **Restrictions on wiring in ducts**
  - **Horizontal runs**

References

- Design of Special Hazards and Fire Alarm Systems - 2nd Edition-Gagnon
- Fire Protection Systems-2nd Edition-Jones
- Fire Protection Handbook-20th Edition-NFPA
- NFPA Standard

Questions?