

Fire Alarm Inspection and general Fire Alarm information class - Aug 11<sup>th</sup> 2009 - Murray Fire Station Training

This information is intended as an overview and a basic training class and is not meant to be used as a primary source material for code. Any language used in this document should be verified by directly looking up the code references. Often code is misquoted or misinterpreted even by instructors. As NICET certified individuals we still make errors and we welcome your input and correction. Being in the Fire Alarm industry we hope we can provide you with a different perspective on inspections and basic Fire Alarm principles. As an AHJ, Fire Marshal, Inspector or Industry Professional we all strive to meet code in a reasonable manner with Public Safety as our goal.

**Please take notes and feel free to ask questions.** – Handouts from NTC used with permission from author.

A. Basics of Fire Alarm Systems –

B. Basic wire requirements of NEC (NFPA 70) - FPL, FPLR, FPLP, CMP

C. Handouts on wire classes and explanation of styles –

D. Walk the AHJs through exactly by the numbers how an inspection should go

15 min Break

E. Go over NFPA 72 Completion form and inspection forms – Red Tag Procedures

F. Discussion Forum on the process of projects –

15 min Break

G. Wrap up with basic NFPA 72 code as well as questions and answers and changes in the NFPA 72 2007 code.

H. Discuss testing from the State Fire Marshal's Office – New Certification exams 1, 2 & 3

Be sure to review R710 since amendments were added when NFPA 72 (2007) was adopted. Example: Smoke detectors are required at the FACP Panel and NAC panels unless it is at a constantly attended location. See NFPA 72 and R710 (This applies to all buildings not just State facilities).

Notes:

## A. BEGINNING Basics of Fire Alarm Systems

1. ZONED CONVENTIONAL and ADDRESSABLE and ANALOG ADDRESSABLE are the basic types of Fire Alarm Systems. Zoned Conventional systems may have all the smokes for the entire first floor on one zone or all the pull stations for an entire floor or area on one zone. Addressable and Analog Addressable both tell you an exact location of each device. Sometimes companies will combine zoned and Addressable to save money by zoning out all the detectors as one zone in a gym etc... Analog Addressable systems are more expensive but they give you additional information such as sensitivity and rather than having the head make the decision to go into alarm the panel makes that decision.
2. Some references refer to CODED systems but since we do not use coded systems in Utah this does not apply. Example: If the alarm was on the 7<sup>th</sup> floor then the bells would be coded to indicate to the Firemen where the fire was in the building. This can also be done with Horn/Strobes. NY and other cities use this type of Notification.
3. Fire Alarm systems shall have 2 reliable power supplies primary and secondary. Most of the time this is accomplished with the AC power and battery backup. Some systems are on generators etc...
4. Battery charging circuits shall be supervised and initiate trouble signals upon failure. This being the case you must be able to pull the batteries out of a remote power supply or deactivate a remote power supply and receive a trouble signal at the main fire alarm panel. If you don't get a signal the remote power supplies are not supervised.
5. Central Station and Remote Station Systems standby should be 24 hours / 5 min (Standby means after the AC power goes off for 24 hours that the entire system can be activated and set off the Horn/Strobes and operate for at least 5 min) Some AHJs and Fire Marshals like to witness the Electrical Contractor or the Fire Alarm Contractor turn the AC off 24 hours before the test. This is not required since you as an AHJ can have the Fire Alarm Company be responsible for this test. If you would like to do this then you certainly have the option of doing it if you have the time and you can schedule these items in.
6. Voice Evac systems are 24 hours / 2 hours (or 15 min at max load)
7. Batteries shall be recharged within 48 hours
8. How to calculate battery backup needed for a system. A. Total your standby load in amps B. Multiply by 24 or 60 hours for a high-rise. C. Record your total standby amps. D. Total your alarm load in amps (add the draw from the devices and appliances) E. Multiply by .083 for 5 min or .25 for 15 min of standby. F. Record your total alarm amp hours. G. Sum the standby amp hours and the alarm amp hours H. Multiply by a safety factor of 1.2 to get the final amp hours in battery power needed for the project. The easier way is to use a spread sheet provided by your supplier. We provide a copy of this sheet with each submittal package that we do to show that the system will function before it is tested
9. Other areas of study should be Approval and Acceptance, Initiating Devices, Indicating Appliances such as bells, Horn/Strobes, Strobes, Elevator recall and shunt tied to Fire Alarm, Smoke Control and HVAC tied to Fire Alarm for larger buildings, Drawings, Completion Documents, Testing, Training, Testing, Installation, Records, Central Station information, proper phone line connection or Internet monitoring etc.....

Handout with basic system riser including Panel, Annunciators, Smokes, Heats, Pulls, Duct Detectors, Damper tie ins, Elevator recall (Separate Handout), Door holders, Anslut tie in, Flow and Tamper tie ins, beam smokes, flame detectors, Fire Phones, Voice Evac etc...

## B. Basic wire requirements of NEC - FPL, FPLR, FPLP, CMP – SEE NFPA 70 or National Electric Code NEC

Wire discussion – THHN can be acceptable for Non-power limited although FPL is generally used for Power Limited (Low voltage 12 & 24 volt) fire alarm circuits. FPL comes in red and you can get it in white as well. Some local AHJs require red wire although it is not a code requirement. FPL is Fire rated FIRE POWER LIMITED, FPLR is riser wire that will hold it's own weight in a shaft as well as not allowing fire to spread up the wire as easily and FPLP is plenum which should be used for plenum ceilings because it does not put off as much toxic fumes as other types. FPLP also exceeds the requirements of FPL and FPLR. THHN exceeds voltage requirements but may not meet data transfer specs etc...

## C. Handouts on wire classes and explanation of styles - Main handouts on class A and B

10. Class A and Class B wiring should be understood. Class A goes out from the panel and back to the panel leaving the panel in one conduit and returning in a different conduit. If a class A wire is cut you do not loose the system but you just get a trouble at the panel. Example: If a class A addressable loop has 24 smoke detectors and it gets cut in the middle you still have 24 smoke detectors active and a trouble on the panel. However if a class B addressable loop gets cut in the middle you loose all the detectors after the cut so you would only have 12 active detectors and a trouble on the panel. The good part is current addressable systems will many times pinpoint the basic area of the cut so trouble shooting is easier than it used to be.

11. The State of Utah requires class A on Schools, Hospitals, Universities, Rest-homes and other State buildings. NFPA 72 code does not require class A. In fact the trend in the industry is to move to class B. The old class B did not even let you know when a wire was cut but with newer systems it does and it is much less expensive for wire and labor to install class B. The thought process of having your detectors still operate is a valid point although with the new class B addressable systems the Central Station is notified immediately if there is a cut in the wire and it should be taken care of quickly.
12. How to calculate voltage line drop on a system. Most contractors use a spread sheet program for both voltage line drop and for battery backup. To figure voltage line drop: A. Add the load up and times the ohms resistance and that equals the voltage drop. Load times ohms resistance equals voltage drop. Many of the new devices will operate at a lower voltage than the older devices. Assuming that your NAC panel is only putting out say 20.4 in worse case even through it should be putting out 24 you can subtract the voltage drop from 20.4. Most Horn/Strobes will operate from 16-33 Volts.

D. Walk the AHJs through exactly by the numbers how an inspection should go----- List of Basic Inspection requirements from start to finish - When the AHJ shows up what should occur, what should he or she ask for? What should he or she specifically look for? The AHJ does not have to test everything although they have the authority if they want to. Asking for the filled out NFPA 72 form is a great starting point for the AHJ. He or she will know quite quickly if the Fire Alarm Contractor has his ducks in a row.

15 min Break

E. Go over NFPA 72 Completion form and inspection forms - Who can sign the form? Understanding the form. Handout the form in hard copy and disk (Word) See attached forms. We can email these forms to you if you would like.

F. Discussion Forum on the process of projects: Owner hires and Architect, Architect hires an Electrical Engineer and the Electrical Engineer designs the Fire Alarm, Electrical Contractors get sub bids from Fire Alarm Contractors, sometimes there is a plan review and sometimes there is not, Electrical Contractors install the system, wiring, appliances and devices, Alarm Contractors program, test and certify the system. Fire Marshal comes for inspection, many times change orders are generated because the Alarm Contractors had to bid what was on the plans even if they saw things that might not meet code. What are some solutions that could be used to improve the process? This is not the way it always is, sometimes the Alarm Contractor does the design, installation and the certification in which case you would have less problems. Addressing the AHJ requirements with the Engineers may help improve the process.

15 min Break

G. Wrap up with questions and answers and changes in the NFPA 72 2007 code.

13. Using NFPA 72, NEC (NFPA 70) IBC and IFC which have been adopted by Utah we can be informed of the following:
14. NFPA 72 covers the application, installation, location, performance, inspection, testing, and maintenance of fire alarm systems, fire warning equipment and emergency warning equipment, and their components. 72-14 1.1.1 (2007 edition) This Code establishes minimum required levels of performance. This is the code that most of the Inspection and Testing questions were taken from to establish the certification test given by the State Fire Marshals office.
15. NFPA 70 (2005 edition) is the National Electrical Code. Article 760 within this code discusses Nonpower-limited (High Voltage) and Power Limited (Low voltage) and includes cable, wire requirements such as FPL, FPLR, FPLP and CMP for Fire Alarm Systems. Conduit installation and conduit fill etc...
16. IBC and IFC International Building Code and International Fire Code go over what is required in difference types of buildings with different occupancies. Note that IFC refers to NFPA 72 so when an IFC quote is used stating that certain fully sprinkled buildings do not need pull stations we must not forget that the basic reference in NFPA 72 is still valid that requires at least one pull station. (See code)

Assembly - Groups (303)

A1 - Theaters with fixed seating

A2 - Restaurants / food

A3 - worship & recreation / libraries

A4 - viewing indoor sporting events

A5- viewing outdoor activities

Business Group B (304)

Educational Group E (305) - 6 or more persons for educational purposes through 12<sup>th</sup> grade  
also Daycare of more than 5 children of 2 ½ and older

Factory and Industrial (306) -

F1

F2 - low hazard like glass, brick and metal

High Hazard (307)

H1 - Detonation hazard

H2 - deflagration hazard or hazard from accelerated burning

H3 - materials that readily support combustion - flammable solids, consumer fireworks etc...

H4 - health hazards ---- toxic

H5 - semiconductor fabrication - see 307.7

Institutional (308) See requirements

I1

I2

I3

I4

Mercantile Group M (309)

Residential (310)

R1 less than 30 days - Hotels

R2 Apartment houses & Dorms

R3 See definitions

R4 More than 5 less than 16 Assisted Living

Storage (311)

S1 Furniture, Books, Lumber – Moderate Hazard

S2 Low Hazard – Food & Metal are examples

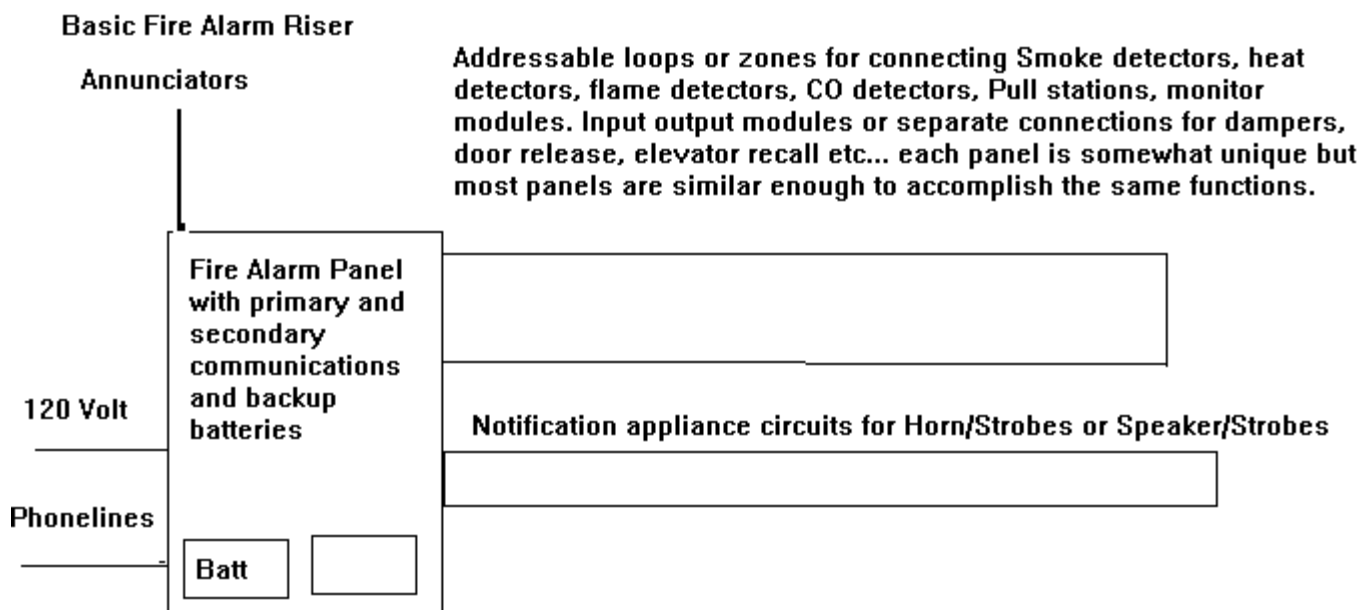
Utility and Miscellaneous Group U (312)

17. NFPA 72 questions such as having at least one smoke detector at the Fire Panel Location, at least one pull station on a sprinkled building, Horn/Strobe requirements and spacing, flow and tamper questions, requirement for annunciators, requirements for monitoring duct detectors with CFM of 2000 and greater for return and 15,000 CFM for supply. When remote test switches are and are not required, when and where smokes in the elevator are and are not required. Example NFPA states that smoke detectors shall not be installed in an un-sprinkled shaft. Using the NFPA 72 book is a good idea if the information used is common and useful. There is quite a bit of information in the NFPA 72 that is not used and someone putting a test together using the book without industry knowledge would not be recommended.
18. Trouble signals shall be visibly and audibly distinct from all other signals. The same with Alarm and Supervisory signals.
19. A silenced trouble signal shall automatically resound every 24 hours.
20. Equipment shall be able to operate at 85% of nameplate voltage

H. Discuss testing from the State Fire Marshal's Office – New Certification exams 1, 2 & 3

For any corrections or feedback on this course material please contact Larry Love at (801) 898 6003 or mail to 3913 South 300 East SLC, Utah 84107 Fax is (801) 293 0210 email is larrylove @ hotmail.com

As an AHJ you represent your Campus, City, Department or the State and your decisions can affect the safety of the public. With that great responsibility you have the obligation to do the best you can. While AHJs are not required to be experts in Fire Alarm we hope that this course has given you an appropriate overview of the industry, NFPA 72 basic requirements and the basics of Fire Alarm and we wish you success with your position as an industry professional, inspector, AHJ or Fire Marshal.

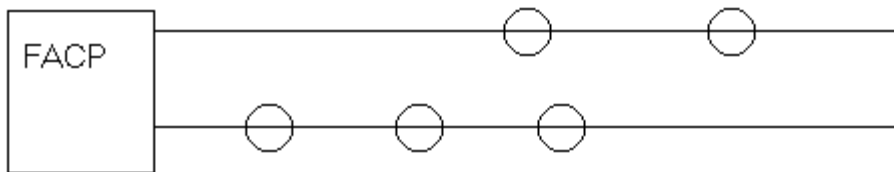


## Battery calculations

1. Total your standby load in amps
2. Multiply by 24 or 60 hours
3. Results = Total standby amp hours

Next

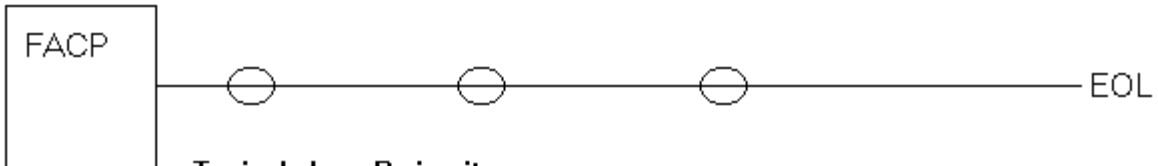
4. Total your alarm load in amps
  5. Multiply by .083 for 5 min or .25 for 15 minutes
  6. Results = Total alarm AH
7. Sum Standby AH & Alarm AH then multiply by a safety factor of 1.2 to get the final Amp hours in battery power needed for the project. (This gives you a 20% safety factor)



**Typical class A wiring loop with wires going out and coming back in different conduits/routes. Break in wire causes trouble.**

**Pros: If there is a break in the circuit all the detectors will still have the ability to transmit an alarm.**

**Cons: Conduit, labor and wire costs are more.**



**Typical class B circuit.**

**Pros: Less expensive for labor, wire and conduit and the new addressable system and even zoned systems will go into trouble to alert you of a break in the wire. This configuration will meet code requirements unless class A is required by the State on buildings such as Schools, State Buildings etc...**

**Cons: If the circuit is cut you will loose all the detectors after the break.**

Inspection by the numbers –

This is a guide only and the AHJ should understand that the Fire Alarm Contractor should have already tested the Fire Alarm System and signed the applicable NFPA 72 Form.

1. Arrive on site doing a quick **visual check** as you enter looking at basics such as pull station locations, horn/strobe locations, Annunciator locations etc...When you meet the Fire Alarm Contractor or Electrical Contractor the **first thing to ask for is the required NFPA 72 Completion or Inspection form.** If they don't have this form or they don't know what it is you have the prerogative to reschedule and let them obtain and complete the form. Once the word gets around that you require the proper paperwork your inspections will be much more organized and you will be able to make better use of your time. If the general contractor knows his or her occupancy is being held up because a subcontractor does not have the proper paperwork believe me they will get it done quickly.
2. Ask the Fire Alarm Contractor to briefly explain the system along with any concerns he or she may have before you start walking around.
3. Ask the Fire Alarm Contractor if they have tested the system as per NFPA 72 and if the system passed their test or not.
4. Ask if the System is monitored and if so has it been placed in test.
5. Ask to see the main fire alarm panel location. Have them open the panel. You do not have to be an expert to see if the wires are terminated in a orderly manner.
6. Ask them to explain to you how the panel communicates. Does it have a dual line dialer with two phone lines attached. Does it have cellular backup, radio communication or IP monitoring. Ask them if the panel is wired to seize the phone line in the event of an alarm.
7. Is there a point or zone list or map available or will the Annunciator allow you to scroll through the points one at a time? Code does not require a map.
8. How is the system wired? Class A or Class B or a combination? Wires can be ran for smoke detectors, pulls, heats and these type of devices that cause an alarm are initiation zones or loops. If the wire goes out around the building and comes back to the panel it is wired class A if not it is class B. There are different styles of wire and how the system reacts to different actions such as a break or short in the wire. As an AHJ you don't have to be an expert in this but the contractor should be. The fact that you are asking about it will keep the contractor on their toes. If they don't know, ask them to contact your office with the answers that you need. You can always hold your signature until they have met your requirements. These answers should be recorded on the NFPA 72 form. IDC circuits are zones, SLC circuits are addressable loops and NAC circuits are the Horn/Strobe, strobe or Speaker Strobe circuits.
9. Ask if the system has verification on the smoke detectors and ask how many seconds it is set for. This means the smoke detectors will see smoke and not go into alarm but they will wait an allotted time and check for smoke again in say 30 or 45 seconds and if there is still smoke present then they will go into alarm. If smokes are set for verification and you smoke a detector with canned smoke it will not go into alarm unless you smoke it again after the allotted time. This is a very important piece of information.
10. **Ask what type of wire was used.** TYPE OF WIRE – FPL is fire rated wire for Power limited (Low Voltage) systems. As is FPLR which is also power limited but is riser wire that holds it's own weight in a shaft to be used on multistory buildings. FPLP is also power limited cable and fire rated and meets all the requirements of FPL and FPLR but it is plenum wire which does not put off as much toxic fumes as other types and is used in plenum ceilings where the air is distributed freely not in duct work. Low voltage wire is not required to be in conduit except where it could be damaged by normal everyday use. Example, going up the side of a ladder you would want it in conduit. Wire should never be strapped to sprinkler pipes or high voltage conduit or wires. CMP cable/wire also meets all requirements for FPL, FPLR and FPLP and is also plenum wire. Most of the time FPL comes in red but you can also get it in white. Many contractors still use THHN wire,

some say it is less expensive. THHN is approved in the NEC for Non-power limited systems (High Voltage) In the US high voltage is not normally used for fire alarm. There are other parts of the world where it is. As an AHJ you have the authority to approve the use of THHN wire. Normally it will work just fine for functionality on most systems for zoned systems and Horn/Strobes but some addressable systems require so many twists per foot and the low voltage wire meets those requirements. The argument you will get from some contractors is: "But it is in conduit so it should not matter" . Once again you have the prerogative to decide if you will pass the system with other types of wire or not. Ask them to provide you with the quote from NEC which is NFPA 70 that shows they can use their type of wire. Remind them that Non-power limited is high voltage so you want to see the reference for Power limited. Article 760 will refer to fire alarm specifically.

11. **Ask if there is any type of release upon fire alarm.** Door release for maglock door holders or door closers, ansul release etc....
12. **Ask if an how the duct detectors are tied to the fire alarm.** Any duct detectors that are checking for smoke on airhandlers that are 2000 cfm and above should be monitored by the fire alarm panel. In certain types of systems the AHJ wants global shut down rather than local shut down. Global is when the fire alarm goes into alarm all the air handlers are shut down. If you are going to require something like this be sure to do it during the plan review stage so the proper modules and wiring can be done. If they have wired for individual shut down it may be very difficult and costly to have the change made late in the game.
13. **Ask if they have done battery calculation.** The purpose of battery calculations is to make sure there will be enough battery power to run all the system in alarm for 5 min on most systems and 15 on certain systems after the panel has lost AC power for 24 hours. The way to test this is to do a 24 hour battery test. Have the AC shut off to the fire panel for 24 hours. The breaker shut off should be marked in red for fire alarm. After the 24 hours of no AC power to the panel activate the system and allow the Horn/Strobes, horns and strobes to run for 5 min (or 15 if required such as Highrise or voice evac. ) If all of the appliances (Notification appliances such as Horn/Strobes) are operable for the entire time they pass the test. The AHJ does not have to be part of this test although many choose to be. Some AHJs want to witness the AC shut off and show up the next day for the test. If the contractor signs off that this test was previously done you can get a copy of this report for your file and you do not have to do that type of a test. However if you schedule the test to be done you can do the rest of your inspection at the same time. Similar advice applies to the rest of the system. As an AHJ you do not have to test the entire system by setting off each device. You can have the contractor provide you with the NFPA 72 report that states they have done this. If you do not feel confident that the company you are dealing with has done so feel free to inspect as many smoke detectors as you wish.
14. **Ask if they did battery calculations and how many appliances are on each circuit.** Most of the time you will have somewhere between 8 and 13 horn/strobes on a circuit. If the wire runs are long. Doing these calculations will assure that all the Horn/Strobes will function with enough power. New power supplies and new appliances with lower voltage and lower mA draw allow for more per circuit than before. Asking these type of questions will also help you determine if they know what they are doing or not.
15. **Ask if they did voltage line drop calculations.** See the worksheet on this for more information but understand that professional fire alarm contractors do these calculations to be assured that the last device or appliance on a circuit will still have enough voltage to have it function. If they have a 1000 foot run you cannot put as many appliances on a circuit as you can a 500 foot run. The truth will show during the Fire Alarm test. If the last few devices are not flashing or if the horn is making a different sound like the rest then they may not have done their homework and they may have to run a new circuit to those last few appliances. (Horn/Strobes)
16. **Ask how the access control or security system is tied to the Fire Alarm Panel.** See the Quick reference check off one page inspection list attached.

Quick reference check off list.

**A. First thing to ask for is the required NFPA 72 Completion or Inspection form.**

**B.** Ask the Fire Alarm Contractor to briefly explain the system along with any concerns he or she may have before you start walking around.

**C.** Ask the Fire Alarm Contractor if they have tested the system as per NFPA 72 and if the system passed their test or not. If it passed is there a green tag properly attached to the Fire Panel with #.

**D.** Ask if the System is monitored and if so has it been placed in test?

**E.** Ask to see the main fire alarm panel location. Have them open the panel. You do not have to be an expert to see if the wires are terminated in a orderly manner.

**F.** Ask them to explain to you how the panel communicates. Does it have a dual line dialer with two phone lines attached. Does it have cellular backup, radio communication or IP monitoring. Ask them if the panel is wired to seize the phone line in the event of an alarm.

**G.** Is there a point or zone list or map available or will the annunciator allow you to scroll through the points one at a time? Code does not require a map.

**H.** How is the system wired? Class A or Class B or a combination?

**I.** Ask if the system has verification on the smoke detectors

**J.** Ask what type of wire was used. FPL, FPLR, FPLP or CMP as per NEC

**K.** Ask if there is any type of release upon fire alarm. Door release for maglock door holders or door closers, ansul release etc....

**L.** Ask if an how the duct detectors are tied to the fire alarm.

**M.** Ask if they have done battery calculations.

**N.** Ask if they did battery calculations and how many appliances are on each circuit.

**O.** Ask if they did voltage line drop calculations.

**P.** You may want to use this checkoff sheet as you walk through the building and as you get to each portion of your test

Other items to check off during your inspection. You can do these in any order you wish and depending on the building you may want to change the order. All of these items are on the NFPA 72 Form.

1. Ansul system (Normally a separate contractor will be in attendance for this)
2. Sprinkler System – Flows, PIV, Low Air, Low Temperature – tampers gate valves etc.. The sprinkler contractor will normally be ready and they also have an ID card and are certified as well.
3. Backup generators – batteries – fuels storage
4. Fire Pumps
5. Duct Detectors and fan shut down
6. Emergency Pull Stations
7. Smoke Detectors
8. Elevator recall
9. Horn/Strobes – Strobes – Horns – Speakers & Speaker Strobes
10. Door holders or maglocks or fail secure strikes or other electronic lock hardware to release on fire alarm. (Note fail safe strikes allow free egress when they loose power)
11. Ask how the access control system is tied to the fire system.
12. Fire Alarm Communications – You can ask to speak with the central station dispatcher to verify they got all the signals that were sent during your test.

**FIRE ALARM SYSTEM RECORD OF COMPLETION**

To be completed by the system installation contractor at the time of system acceptance and approval.

**1. PROTECTED PROPERTY INFORMATION**

Name of property: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Description of property: \_\_\_\_\_  
 Occupancy type: \_\_\_\_\_  
 Name of property representative: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_  
 Authority having jurisdiction over this property: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

**2. FIRE ALARM SYSTEM INSTALLATION, SERVICE, AND TESTING INFORMATION**

Installation contractor for this equipment: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_  
 Service organization for this equipment \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_  
 Location of as-built drawings: \_\_\_\_\_ Location of historical test reports \_\_\_\_\_  
 Location of system operation and maintenance manuals \_\_\_\_\_  
 A contract for test and inspection in accordance with NFPA standards is in effect as of \_\_\_\_\_  
 Contracted testing company \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_  
 Contract expires: \_\_\_\_\_ Contract number \_\_\_\_\_ Frequency of routine inspections: \_\_\_\_\_

**3. TYPE OF FIRE ALARM SYSTEM OR SERVICE**

NFPA 72 Chapter Reference of System Type: \_\_\_\_\_  
 Name of organization receiving alarm signals with phone numbers (if applicable)  
 Alarm: \_\_\_\_\_ Phone : \_\_\_\_\_  
 Supervisory: \_\_\_\_\_ Phone : \_\_\_\_\_  
 Trouble: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Entity to which alarms are retransmitted: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Method of retransmission of alarms to that organization or location: \_\_\_\_\_

**3. TYPE OF FIRE ALARM SYSTEM OR SERVICE (continued)**

If Chapter 8, note the means of transmission from the protected premises to the central station:

- Digital alarm communicator
- McCulloh
- Multiplex
- 2-way radio
- 1-way radio
- N/A

If Chapter 9, note the type of connection:  Local energy  Shunt  N/A

**3.1 System Software**

Operating system (executive) software revision level: \_\_\_\_\_

Site-specific software revision date: \_\_\_\_\_ Revision completed by : \_\_\_\_\_

**4. SIGNALING LINE CIRCUITS**

Characteristics of signaling line circuits connected to this system (see NFPA 72, Table 6.6.1)

Quantity: \_\_\_\_\_ Style: \_\_\_\_\_ Class: \_\_\_\_\_

**5. 1 Manual Initiating Devices**

**5.1.1 Manual Pull Stations**

Number of manual pull stations \_\_\_\_\_

Type of devices:  Addressable  Conventional  Coded  Transmitter  N/A

**5.2 Automatic Initiating Devices**

**5.2.1 Area Smoke Detectors**

Number of smoke detectors: \_\_\_\_\_

Type of coverage:  Complete area  Partial area  Nonrequired partial area  N/A

Type of devices:  Addressable  Conventional  Coded  Transmitter  N/A

Type of smoke detector sensing technology:  Ionization  Photoelectric

**5.2.2 Duct Smoke Detectors**

Number of duct smoke detectors: \_\_\_\_\_

Type of coverage: \_\_\_\_\_

Type of devices:  Addressable  Conventional  Coded  Transmitter  N/A

Type of smoke detector sensing technology:  Ionization  Photoelectric

**5.2.3 Heat Detectors**

Number of heat detectors: \_\_\_\_\_

Type of coverage:  Complete area  Partial area  Nonrequired partial area  N/A

Type of devices:  Addressable  Conventional  Coded  Transmitter  N/A

**5.2.4 Sprinkler Waterflow Detectors**

Number of waterflow detectors: \_\_\_\_\_

Type of devices:  Addressable  Conventional  Coded  Transmitter  N/A

**5.2.5 Alarm Verification**

Number of devices subject to alarm verification: \_\_\_\_\_

Alarm verification on this system is:  Enabled  Disabled  Set for \_\_\_\_\_seconds

**6. SUPERVISORY SIGNAL-INITIATING DEVICES AND CIRCUITS**

**6.1 Sprinkler System**

Number of valve supervisory switches: \_\_\_\_\_

Type of devices:  Addressable  Conventional  Coded  Transmitter  N/A

**6.2 Fire Pump**

Type of fire pump:  Electric  Diesel

Type of fire pump supervisory devices:  Addressable  Conventional  Coded  Transmitter  N/A

Fire Pump Functions Supervised

Fire pump power  Fire pump running  Fire pump phase reversal  Selector switch not in auto  
 Engine or control panel trouble  Low fuel

Other: \_\_\_\_\_

**6.3 Engine-Driven Generator**

Type of generator supervisory devices:  Addressable  Conventional  Coded  Transmitter  N/A

Engine or control panel trouble  Generator running  Selector switch not in auto  Low fuel

Other: \_\_\_\_\_

**7. ANNUNCIATORS**

**7.1 Annunciator 1**

Local  Remote

Type:  Addressable  Directory  Graphic  N/A Location: \_\_\_\_\_

**7.2 Annunciator 2**

Local  Remote

Type:  Addressable  Directory  Graphic  N/A Location: \_\_\_\_\_

**7.3 Annunciator 3**

Local  Remote

Type:  Addressable  Directory  Graphic  N/A Location: \_\_\_\_\_

**8. ALARM NOTIFICATION DEVICES AND CIRCUITS**

**8.1 Emergency Voice Alarm Service**

Number of single voice alarm channels: \_\_\_\_\_ Number of multiple voice alarm channels: \_\_\_\_\_

Number of speakers: \_\_\_\_\_ Number of Speaker zones: \_\_\_\_\_

**8.2 Telephone Jacks**

Number of telephone jacks installed: \_\_\_\_\_ Number of telephone handsets stored on site: \_\_\_\_\_

Type of telephone system installed:  Electrically powered  Sound powered  N/A

**8.3 Nonvoice Audible System**

Characteristics of notification device circuits connected to this system (see NFPA 72, Table 6.5):

Quantity: \_\_\_\_\_ Style: \_\_\_\_\_ Class: \_\_\_\_\_

**8. ALARM NOTIFICATION DEVICES AND CIRCUITS (continued)**

**8.4 Types and Quantities of Nonvoice Notification Appliances Installed**

Bells: \_\_\_\_\_ With visual device: \_\_\_\_\_ Horns: \_\_\_\_\_ With visual device: \_\_\_\_\_  
Chimes: \_\_\_\_\_ With visual device: \_\_\_\_\_ Bells: \_\_\_\_\_ With visual device: \_\_\_\_\_  
Visual devices without audible devices: \_\_\_\_\_ Other: (describe) \_\_\_\_\_

**9. EMERGENCY CONTROL FUNCTIONS ACTIVATED**

- Hold-open door releasing devices
- Door unlocking
- Smoke management or smoke control
- Elevator recall
- other

**10. SYSTEM POWER SUPPLY**

**10.1 Primary Power**

Nominal voltage: \_\_\_\_\_ Amps: \_\_\_\_\_  
Overcurrent protection: Type: \_\_\_\_\_ Amps: \_\_\_\_\_  
Location ( of primary supply panelboard): \_\_\_\_\_  
Disconnecting means location: \_\_\_\_\_

**10.2 Secondary Power**

Location: \_\_\_\_\_ Type: \_\_\_\_\_ Nominal voltage: \_\_\_\_\_ Current rating: \_\_\_\_\_  
Number of standby batteries: \_\_\_\_\_ Amp hour rating: \_\_\_\_\_  
Location of emergency generator: \_\_\_\_\_  
Location of fuel storage: \_\_\_\_\_  
Calculated capacity of secondary power to drive the system  
In standby mode: \_\_\_\_\_ In alarm mode: \_\_\_\_\_

**11. RECORD OF SYSTEM INSTALLATION**

Fill out after all installation is complete and wiring has been checked for opens, shorts, ground faults and improper branching, but before conducting operational acceptance tests.

The system has been installed in accordance with the following NFPA standards: (Note any or all that apply.)

- NFPA 72
- NFPA 70, National Electrical Code, Article 760
- Manufacturer's published instructions
- Other (Please specify): \_\_\_\_\_

System deviations from referenced NFPA standards: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

**12. RECORD OF SYSTEM OPERATION**

All operational features and functions of this system were tested by or in the presence of the signer shown below, on The date shown below, and were found to be operating properly in accordance with the requirements of:

- NFPA 72
- NFPA 70, National Electrical Code, Article 760
- Manufacturer's published instructions
- Other (Please specify): \_\_\_\_\_

Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

**13. CERTIFICATIONS AND APPROVALS**

**13.1 System Installation Contractor**

This system as specified herein has been installed and tested according to all NFPA standards cited herein.

Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

**13.2 System Service Contractor**

This system as specified herein has been installed and tested according to all NFPA standard cited herein.

Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

**13.3 Central Station**

This system as specified herein will be monitored according to all NFPA standards cited herein.

Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

**13.4 Property Representative**

I accept this system as having been installed and tested to its specifications and all NFPA standards cited herein.

Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

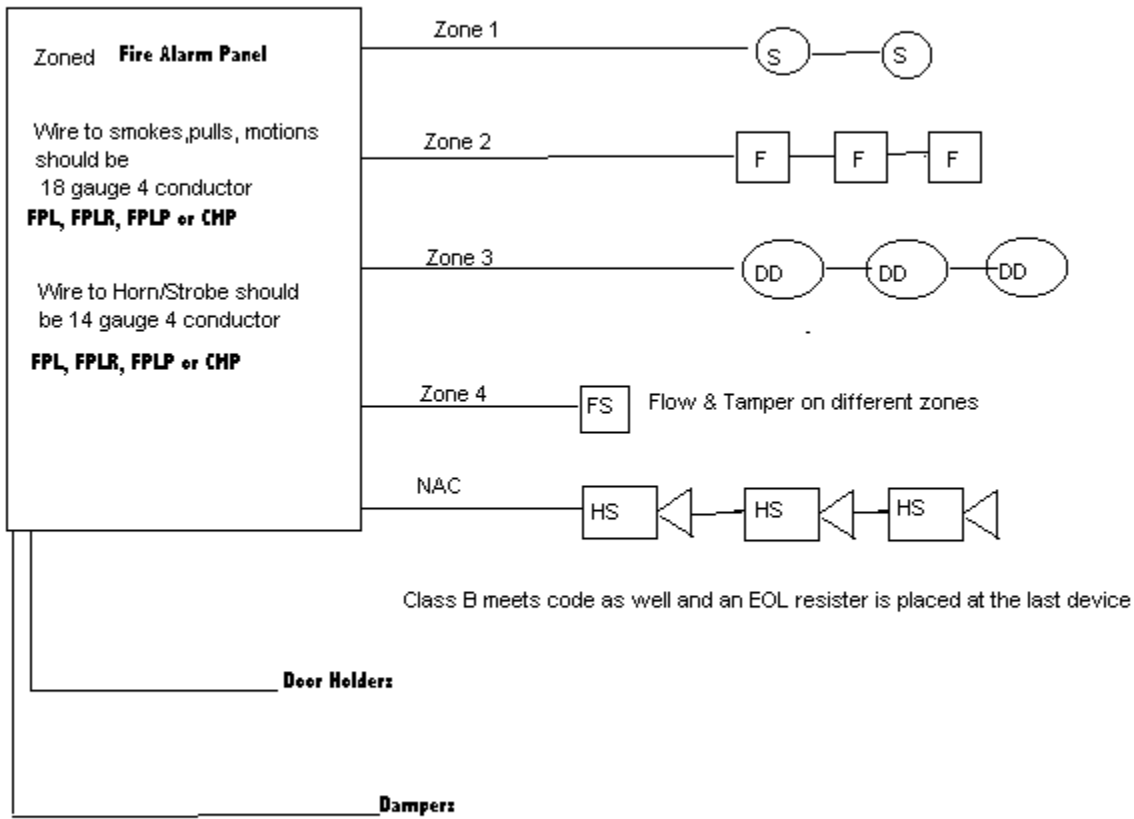
**13.4 Authority Having Jurisdiction**

I have witnessed a satisfactory acceptance test of this system and find it to be installed and operating properly in accordance with its approved plans and specifications, its approved sequence of operations, and with all NFPA standards cited herein.

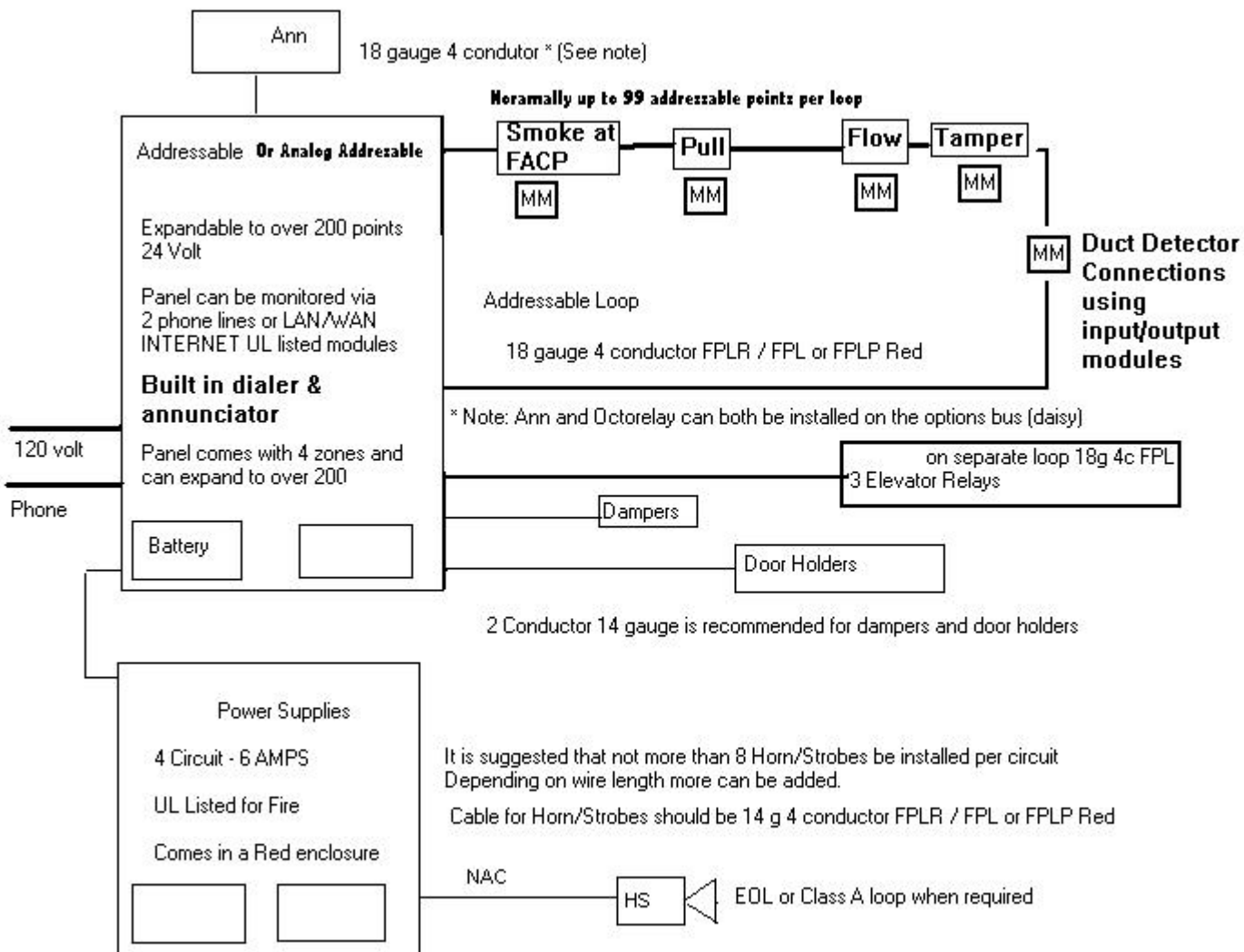
Signed: \_\_\_\_\_ Printed name: \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

### Zoned Fire Alarm Panel



Class A system would simply go out and then back to the panel. Some systems require class A modules and others don't.



## Voltage line drop

Load times Ohms Resistance equals voltage drop. Assuming you start with the worse case scenario that the power supply could be putting out 20.4 volts which is 85% of it's operating voltage if it were a 24 volt power supply. In reality a 24 volt power supply will be putting out more than 20.4 but the calculations will give you a safety factor.

18 gauge has a 8 ohm resistance over 1000 feet  
(Check each type for exact figures)

14 gauge has a 2.26 ohm resistance over 1000 feet

Load = draw in mA ----- example: 7 Horn/Strobes @183mA on 1000 feet of 14 gauge wire

$7 \times 183 = 1.281$  (this is the load)  
times 2.26 resistance = 2.89506 or 2.9 volt drop

- #1 - Start with 24 volts subtract 2.9 you get 21.1
- #2 - Start with 12 volts subtract 2.9 you get 9.1
- #3 - Start with 20.4 volts subtract 2.9 you get 17.5

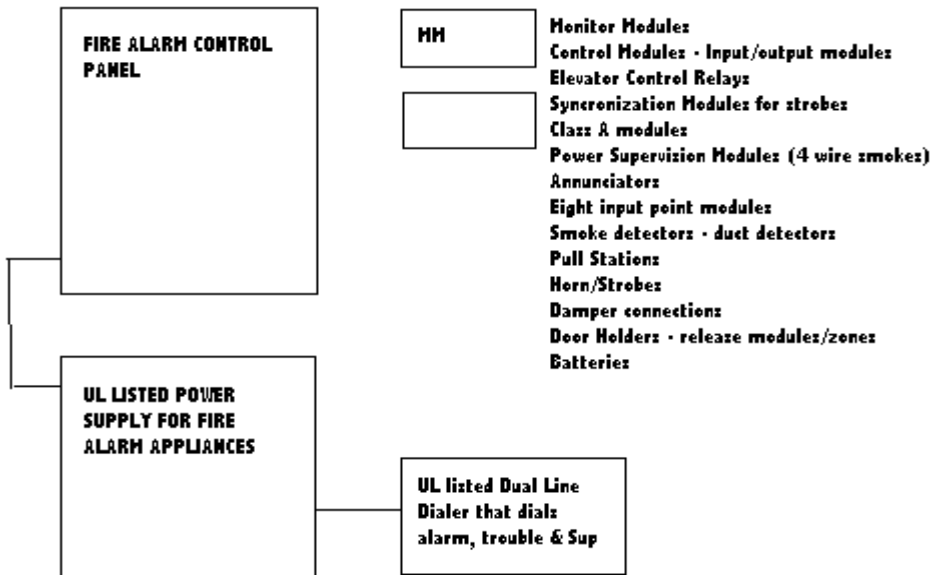
Need 20.4 volts at last appliance on a 24 volt system (or 17.34 volts which is 85% of 20.4)  
Need 10.2 volts at last appliance on a 12 volt system (Check appliance cut sheet since there are not many 12 volt systems out there)

Need 17.5 volts at last appliance on a 24 volt system with a worse case scenario.

Can install 8 Horn/Strobes on 24 volt sys w/1000'

Can install 4 possibly 5 Horn/Strobes on 12 volt

Many appliances will operate from 16 volts to 33 volts. When a Fire Alarm Contractor does voltage line drop calculations they can assist the installer with input as to how many Horn/Strobes or Strobes can be put on each circuit depending on wire length, gauge and appliance specs. If the distance is shorter than 1000 feet then you can put more than 8 Horn/Strobes per circuit. This allows for future expansion. Be sure to check your mA draw as it varies from brand to brand and check the operating voltage as well.



Circle the proper answer or answers if more than one applies

1. How do you test to see if the NAC power supplies that power the Horn/Strobes are supervised?
  - A. Disconnect the batteries or any of the NAC wires from the remote power supplies and you should get a trouble at the panel.
  - B. Use the appropriate NAC testing meter
  - C. Ask the Fire Alarm Contractor if they are supervised.
  
2. What forms should you ask the Fire Alarm Contractor for when you arrive on site ?
  - A. The IFC inspection form
  - B. The NFPA 72 form (If you city has their own form then ask for that one)
  - C. The General Contractors inspection form
  
3. How to you shut the Horn/Strobes off when you arrive on site responding to a fire alarm?
  - A. Use your axe and cut all the wires going to the fire panel
  - B. Silence the alarm at the FACP or annunciator and if that does not work turn the red AC breaker switch that powers the fire alarm and then disconnect the batteries by pulling the connectors off one at a time. The other option is if you can find the NAC supervision modules simply turn the NAC switches to disable or silence.
  - C. Shut all the power down to the entire building
  
4. You arrive on site for an inspection and you request the NFPA 72 inspection/certification report and the contractor does not have the form. What are your options as an AHJ ?
  - A. Tell the contractor that you will come back when he has the proper paperwork filled out and signed
  - B. Tell the contractor to have it faxed or emailed to your office
  - C. Tell the contractor not to worry about it but that they will need one on the next inspection.
  
5. You ask the fire alarm contractor if they have done battery calculations and voltage line drop calculations for their fire system and they seem to be confused at your question and they are not sure. What is the proper course of action?
  - A. Test the system to see if everything works.
  - B. Suggest that they do their homework before the next inspection and ask that they send the calculations to your office.
  - C. Wait while they do the calculations and present you with the worksheets.
  
6. List something that you learned in this class that you felt was useful  
\_\_\_\_\_  
\_\_\_\_\_
  
7. List other topics related to Fire Alarm that you would like additional training on.  
\_\_\_\_\_
  
8. List topics or items you felt were not pertinent to this class that were covered that should have been left out  
\_\_\_\_\_

Instructors \_\_\_\_\_

Rate overall presentation from 1 to 10 and ten being the best 1 2 3 4 5 6 7 8 9 10

Comments on the class / criticism or what you felt could be changed to make the class more useful to your situation.  
Continue on the back if needed.