Power Systems

- Determine acceptable means of emergency power
- Identify the requirements for power systems
- Explain the different wiring classification and survivability requirements

Primary Power

- Municipal connection
  - Reliable
  - Typically unlimited
- Generator
  - Must be maintained 24/7

Secondary Power

- 60 s
- Remote and independent
- Storage batteries
  - 2 sets
  - 125 %
  - Automatic transfer (10 s)
- Generators
  - Fuel on site
- Uninterrupted power supplies
  - Computer systems

Emergency and Standby Power

- NFPA 70
  - Two types of private power supply systems
    - Emergency and standby
- Loads to be served are classified as
  - Critical
    - Loads needed quickly for preservation of life and property
      - e.g. life-support systems, emergency lighting, fire pumps
  - Noncritical
    - All other loads permitted to be connected to system
      - e.g. elevators, chillers, HVAC systems

Emergency and Standby Power

- NFPA 110 *Standard for Emergency and Standby Power Systems*
  - Emergency power, standby power, alternate power, power supply, power system, power source, etc.
  - Categories of systems
    - Class
      - Defines the minimum allowable time that the alternate source has the capability of providing its rated load without being refueled
    - Type
      - Defines the maximum allowable time that the load is without acceptable power
    - Level
      - Defines the equipment performance stringency requirements
        - Level 1 – critical
        - Level 2 – non-critical

Class Examples

Table 4.1(a) Classification of EPSSs

Class	Minimum time
Class 0.083	0.083 hr (5 minutes)
Class 0.25	0.25 hr (15 minutes)
Class 2	2 hr
Class 6	6 hr
Class 48	48 hr
Class X	Other time, in hours, as required by the application, code, or user

Source: NFPA 110

Type Examples

Table 4.1(b) Types of EPSSs

Designation	Power restoration
Type U	Basically uninterruptible (UPS system)
Type 10	10 sec
Type 60	60 sec
Type 120	120 sec
Type M	Manual stationary or nonautomatic – no time limit

Source: NFPA 110

Support Time Requirements

- Normal operation 24 hrs
- Then all notification appliances for 5 min
- Emergency voice/alarm communications systems for additional 15 min

Specifications

Remote Location

- Primary and secondary power required
- Supervisory devices shall not impair the alarm system

Over-Current

- Circuit must be protected
- Device must be sized according to system requirements

Batteries

- Safe location
- Properly mounted
- Clean connections
- Under-voltage detection
- Automatically charging

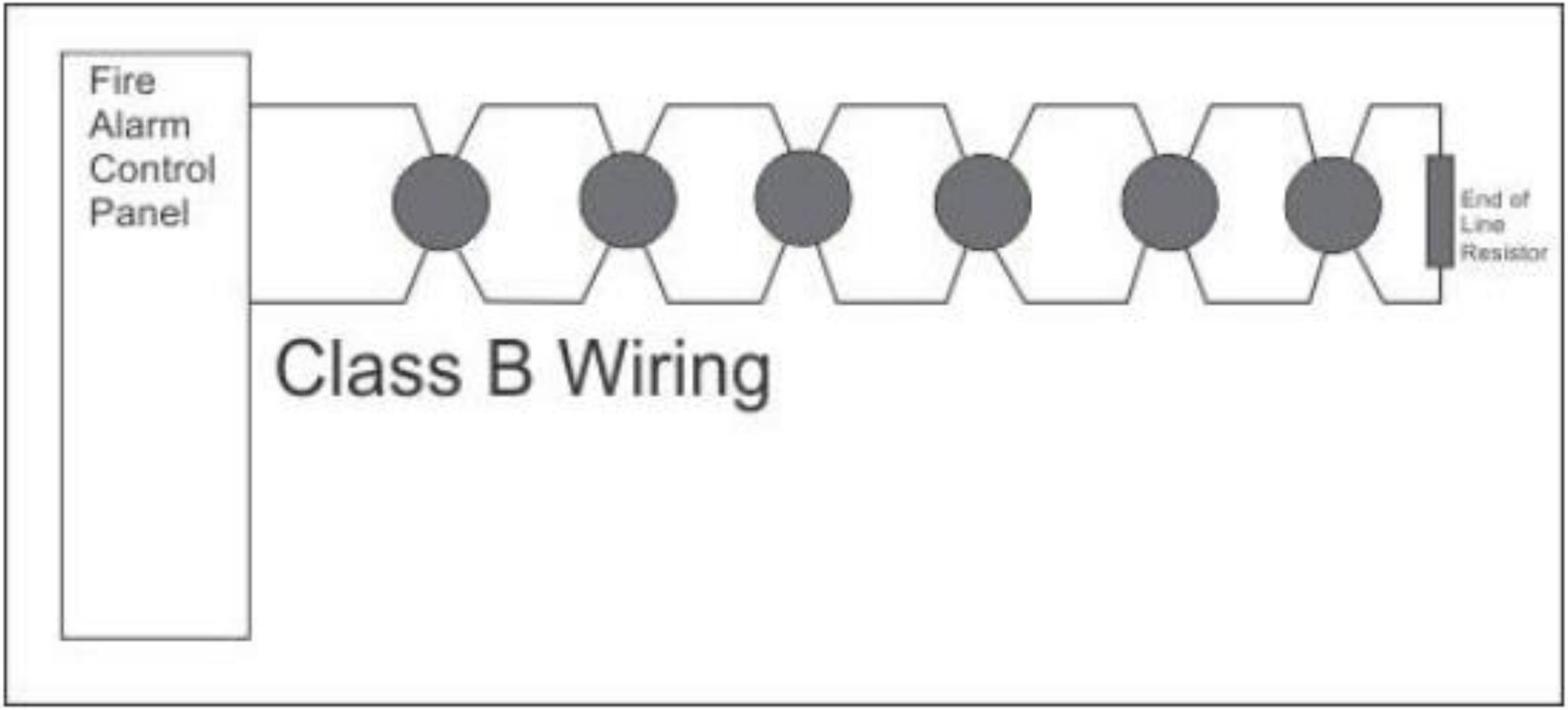
Generators

- Generally assumes a trained person available on site
- Must conform to NFPA 110
- Enough capacity to support load and any other demands
- Clean fuel
- Sufficient fuel
- No gravity feed allowed

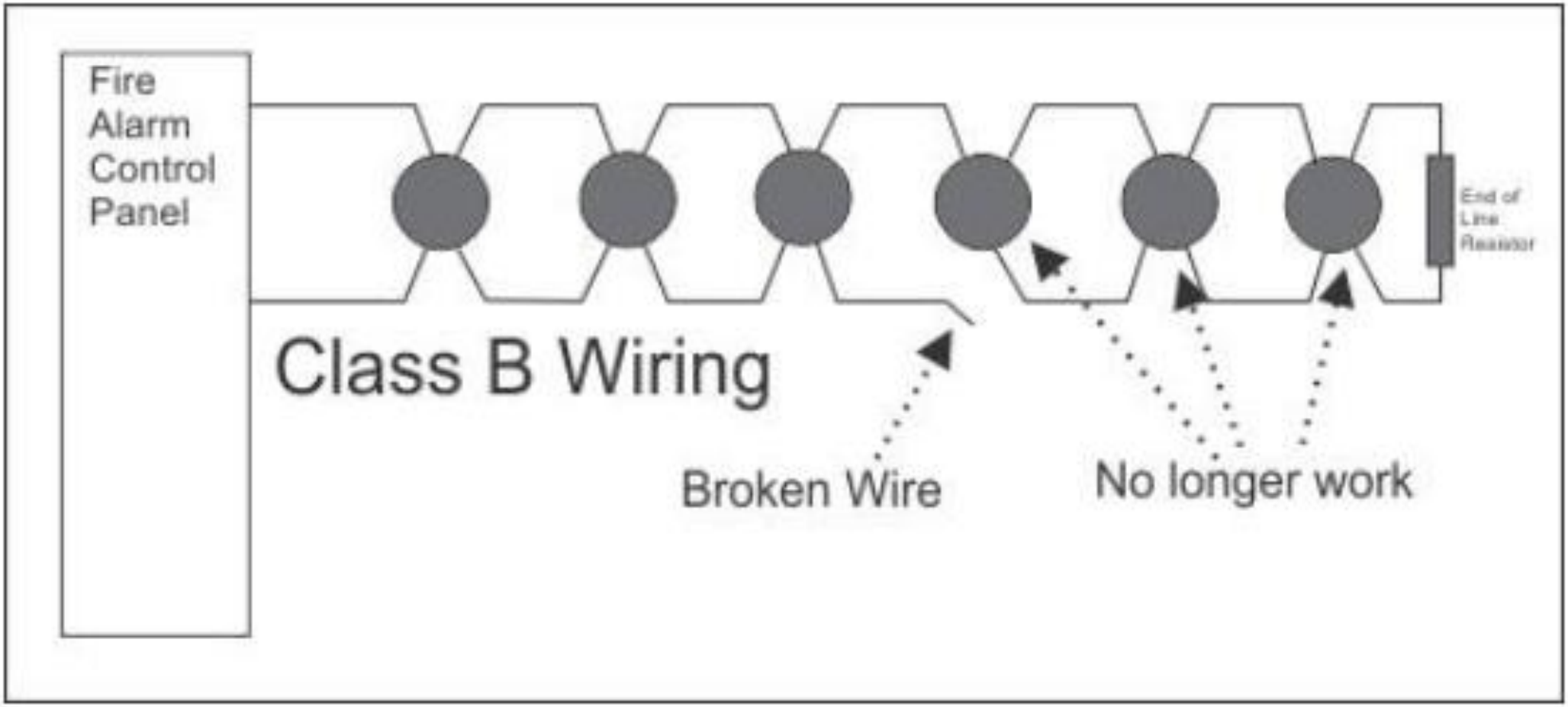
Circuit Wiring

- Class A
- Class B

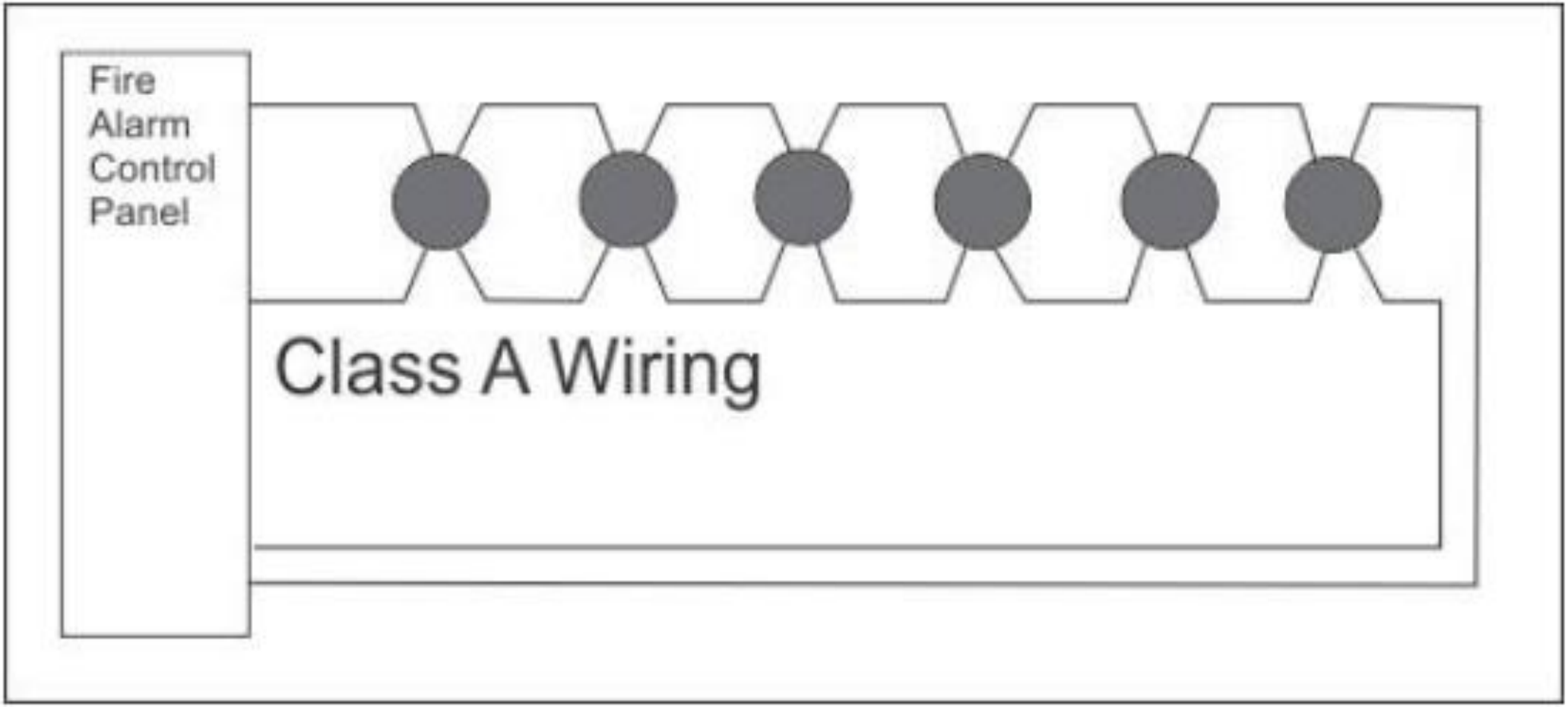
Class B Circuit Wiring



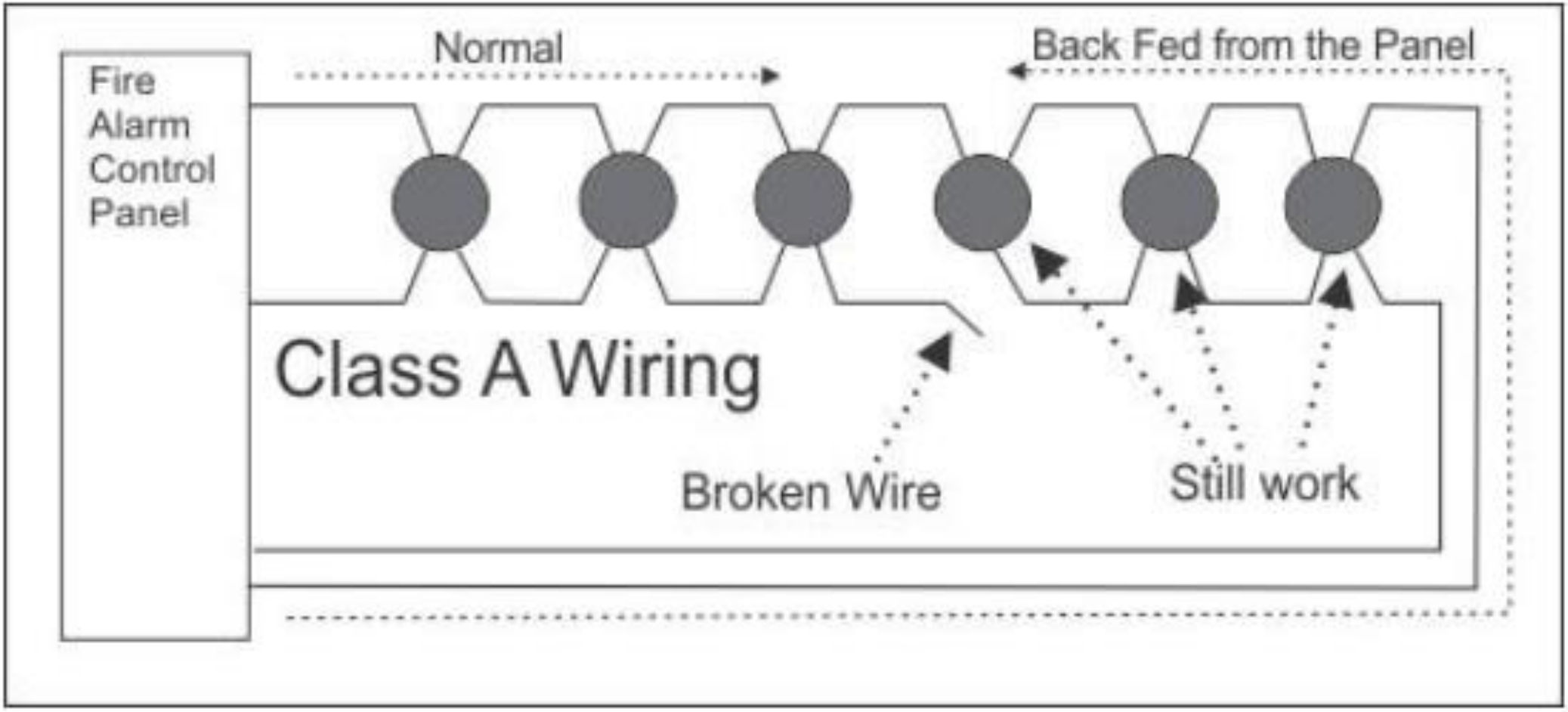
Class B Circuit Wiring



Class A Circuit Wiring



Class A Circuit Wiring



Other Classifications

- Class C
  - Handshaking to supervise
  - Signal to monitoring company
- Class D
  - Fails in fire mode
  - Door hold opens
- Class E
  - No supervision
- Class N
  - Two pathways
  - End-to-end communication
  - Local Ethernet
- Class X
  - Exceeds class A
  - Redundant
  - Isolation modules

Pathway Survivability

- Level 0
  - No requirements
- Level 1
  - Sprinklers
  - Metal raceways
- Level 2
  - 2 hr rated
- Level 3
  - Both level 1 and 2 requirements