Fire Alarm System Fundamentals and the UAE Code

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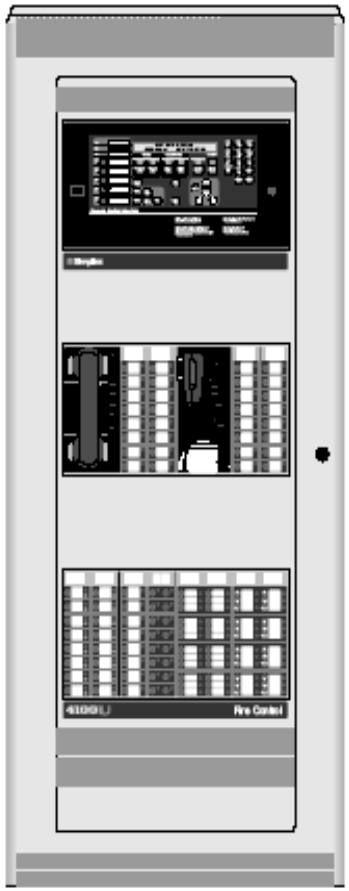
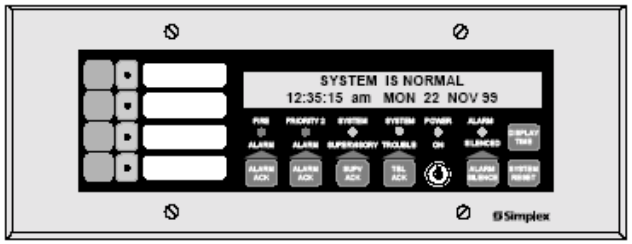
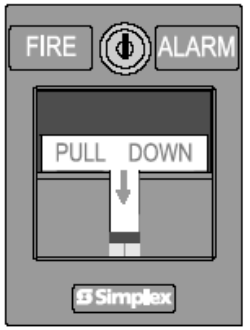
Overview

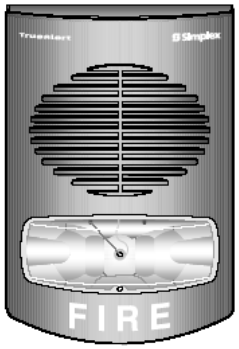
- Understanding the Codes
  - Fire Alarm Systems (Manual Vs. Automatic)
  - UAE Fire and Life Safety Code of Practice
  - NFPA 5000/ 72
- Selected Design Fundamentals
  - Fire Alarm and Detection
  - System Considerations
  - Survivability
  - Emergency Communication/ Notification
  - Emergency Command Center
  - Other Essentials

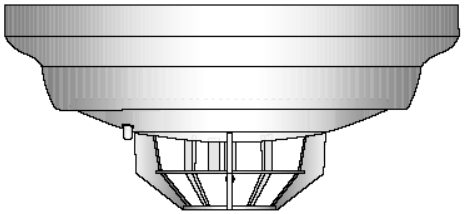
Understanding the Codes











Fire Alarm and Detection Systems

- Designed to initiate early responses to fires
- Includes:
  - Notifying building occupants
  - Summoning responding personnel
  - Activating safety control functions that mitigate a fire hazard
- NFPA/UAE Code: emphasis is on occupants' notification and evacuation
  - NFPA: Specific requirements are based upon occupancy type and expected facility conditions
  - UAE Code: Automatic and Manual fire alarm systems required for all types of occupancies (Chapter 8, Section 1.1)

Fire Alarm and Detection System Types

- Manual
  - Initiating devices or manual fire alarm boxes installed at exits and other locations in a building
  - Actuation by pulling a lever (single action) or pushing or lifting and pulling (double action)
- Automatic
  - Single- and multiple-station smoke alarms
  - System smoke detectors (spot or air sampling)
  - Video Image Smoke Detection
  - Heat detectors (spot or linear type)
  - Water flow switches
  - Flame Detectors
  - Spark / ember detectors
  - Gas Detection

NFPA - Manual or Automatic System?

- Determinants:
  - Number of occupants
  - Capabilities of the occupants
  - Characteristics of the building
    - Height, building access, hazard and use
- Automatic fire detection usually required when:
  - Detecting fire is essential to the evacuation plan or protection of occupants
- Automatic smoke detection usually required when:
  - Occupants are limited in movement and unable to act in self preservation
  - Occupants are provided with sleeping accommodations

Where is a fire alarm system required by Code?

- NFPA - Fire alarm requirements are determined by building use, occupancy type and specific building conditions, as described in NFPA 5000
- UAE Code - Automatic and Manual fire alarm systems required for all types of occupancies (Chapter 8, Section 1.1) with additional requirements for Substations and Special Structures as well as Buildings during Construction and Maintenance
  - Substations (Chapter 14)
  - Membrane Structures, Metro Rail and Tram Systems, Modular Houses and Offices, Road Tunnels, Automated Car Parks, Special Amusement Structures, and Tents (Chapter 18)
  - Buildings During Construction and Maintenance (Chapter 12)

Fire Alarm and Detection Systems

- UAE Code: One way emergency voice evacuation and communication system as well as an emergency command center required in the following facilities (Chapter 7, Section 3.1):
  - Large buildings with gross floor area > 2,800 m^2
  - Large buildings having an occupant load > 1000 persons
  - Large industrial and warehouse buildings with gross floor area > 5000 m^2
  - All high rise buildings
  - All assembly buildings
  - All hotel or health care occupancies (including less than 23 m)

Fire Alarm and Detection Systems

- NFPA/ IBC: Voice systems required in the following occupancies
  - Assembly Occupancies > 1000
  - High-rise Buildings >75ft
  - Malls and Special Amusement Bldg.

System Designs

Addressable vs. Non-Addressable

Is there really a choice anymore?

Addressable systems make up more than 90% of most manufacturer's fire alarm systems – with few exceptions

System Designs

Non-Addressable (conventional) Systems / circuits

- **Many newer systems have the capabilities to support conventional circuits as well as addressable technology**
- **All conventional type systems are limited to those with a maximum of 16 – 32 initiating device circuits (commonly referred to as zones)**
- **Typically , Conventional systems or devices are used when ambient conditions prohibit the use of addressable technology or for smaller (1-4 zone) applications**

System Design Considerations

Non-Addressable (conventional) Systems / circuits

- Maximum limit of 30 2-wire smoke detectors per circuit (zone)
- Smoke detectors must be UL listed with the control panel, by the control panel manufacturer
- Identification of the device in alarm is limited to the circuit (zone) – field verification is necessary
- Limited expandability
- Can be installed and serviced by mostly anyone

System Designs

Addressable systems and Circuits

- Small to large building applications
- Signaling Line Circuits can extend across several building zones
- 66 – 250 addressable devices per circuit (depending on manufacturer)
- May be networked with other panels of the SAME manufacturer to create a larger or distributed system
- New requirement to limit failure to 50 devices

Survivability - Circuits

UAE Code

- All circuits necessary for the operation of notification appliances shall be protected until they enter the evacuation signalling zone that they serve.
- The following methods are acceptable:
  - (1) A 2-hour fire rated circuit integrity (CI) cable
  - (2) A 2-hour fire rated cable system (electrical circuit protective system)
  - (3) A 2-hour fire rated enclosure
  - (4) Buildings fully protected by an automatic sprinkler system and with the interconnecting wiring or cables used for the operation of notification appliances installed in metal raceways

Survivability

- **NFPA 72, 24.4.1.8:**

  Applies only to Partial Evacuation or Occupant Relocation Systems (Selective Egress).

  - **Single notification appliance circuit shall not serve more than one notification zone.**
  - **Failure of equipment or a fault on one or more conductors, shall not result in functional loss.**

Survivability

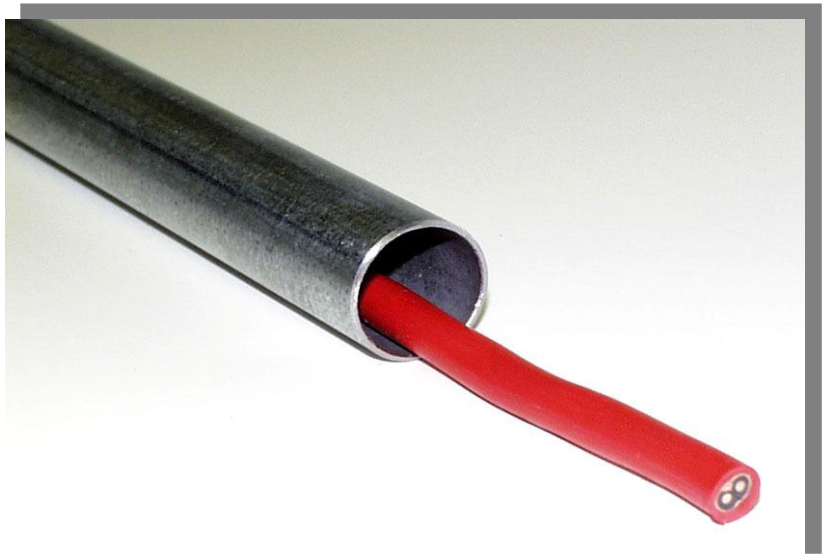
- **Pathway Survivability Level 2, 3 and 4 (NFPA 72 - 2007)**
  - (1) A 2-hour fire rated circuit integrity (CI) cable
  - (2) A 2-hour fire rated cable system (electrical circuit protective system)
  - (3) A 2-hour fire rated enclosure
  - (4)*Performance alternatives approved by the authority having jurisdiction
  - (5) Buildings fully protected by an automatic sprinkler system installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, and with the interconnecting wiring or cables used for the operation of notification appliances installed in metal raceways and in accordance with Article 760 of NFPA 70

Survivability

- **Pathway Survivability Level 2, 3 and 4 (NFPA 72 - 2010 and 2013)**
  - (1) 2-hour fire-rated circuit integrity (CI) cable
  - (2) 2-hour fire-rated cable system [electrical circuit protective system(s)]
  - (3) 2-hour fire-rated enclosure or protected area
  - (4) 2-hour performance alternatives approved by the authority having jurisdiction

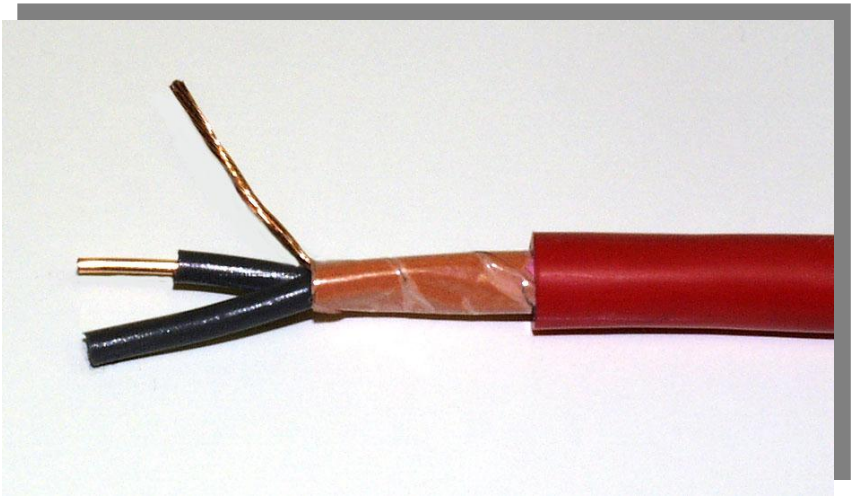
Types of CI Cable

- CIC - Requires Strict Compliance to the Installation Criteria for the CIC Electrical Circuit Protective Systems.

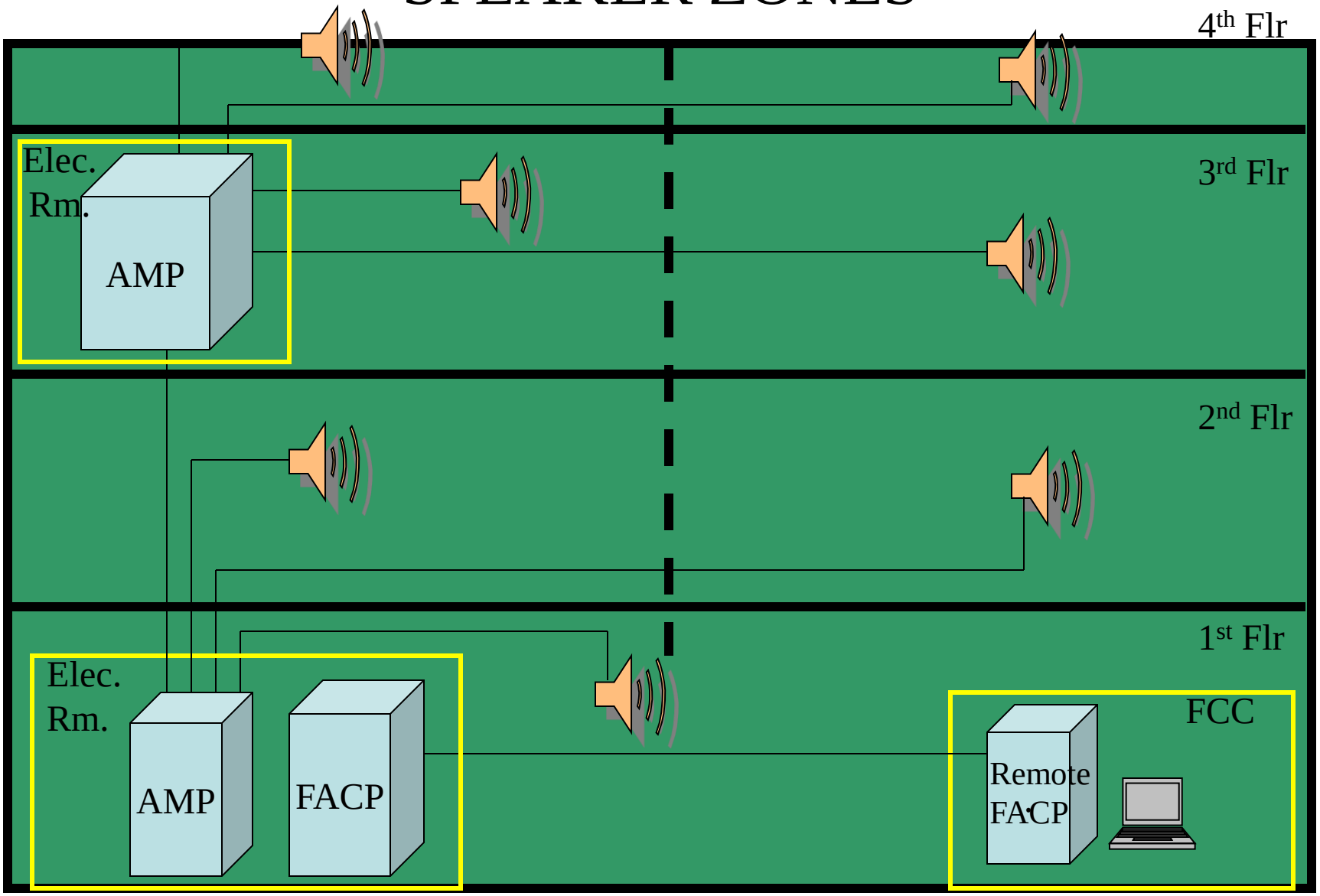


Types of CI Cable

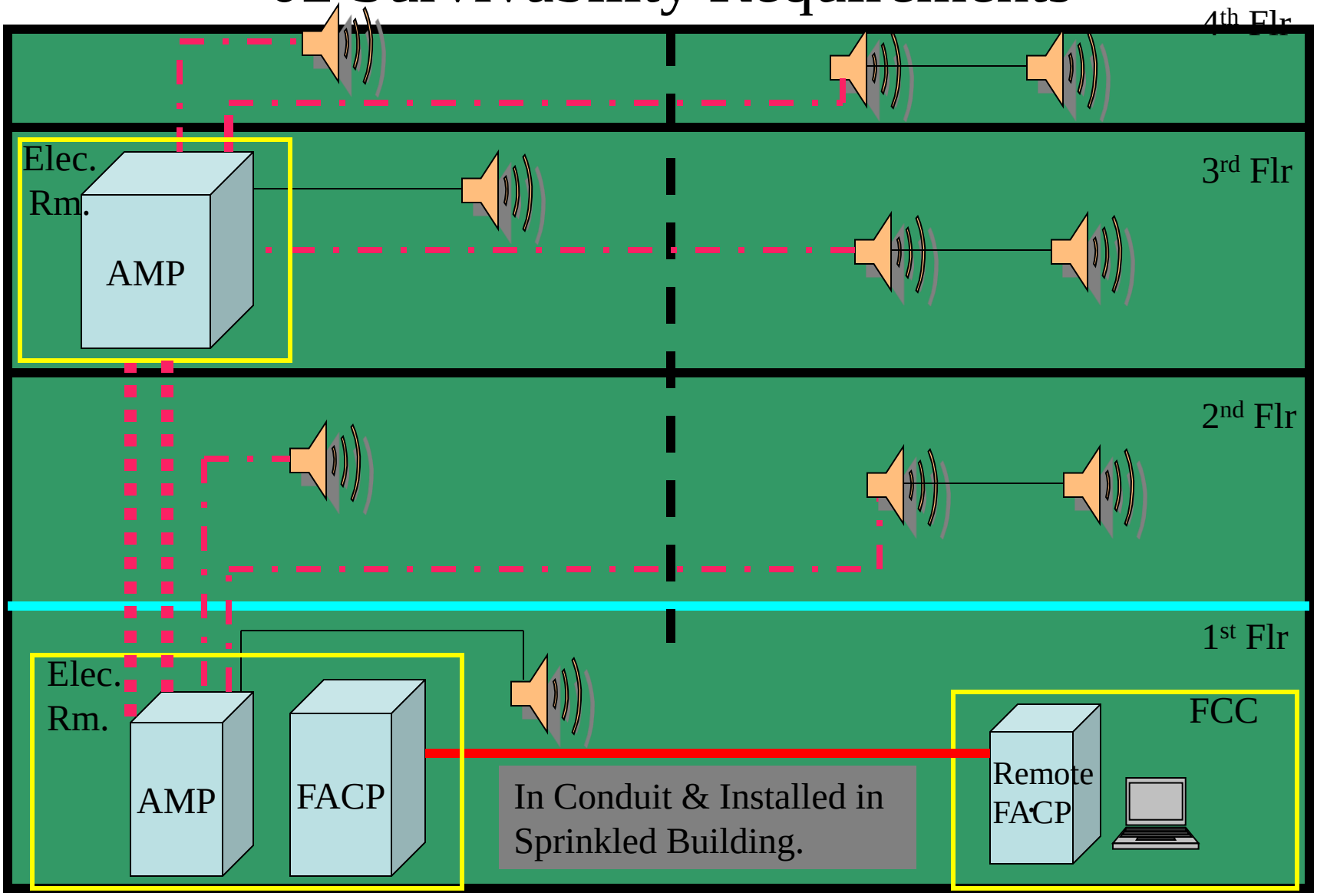
- CI – Follow NEC 760 applicable criteria for Power-Limited Fire Alarm Circuits.



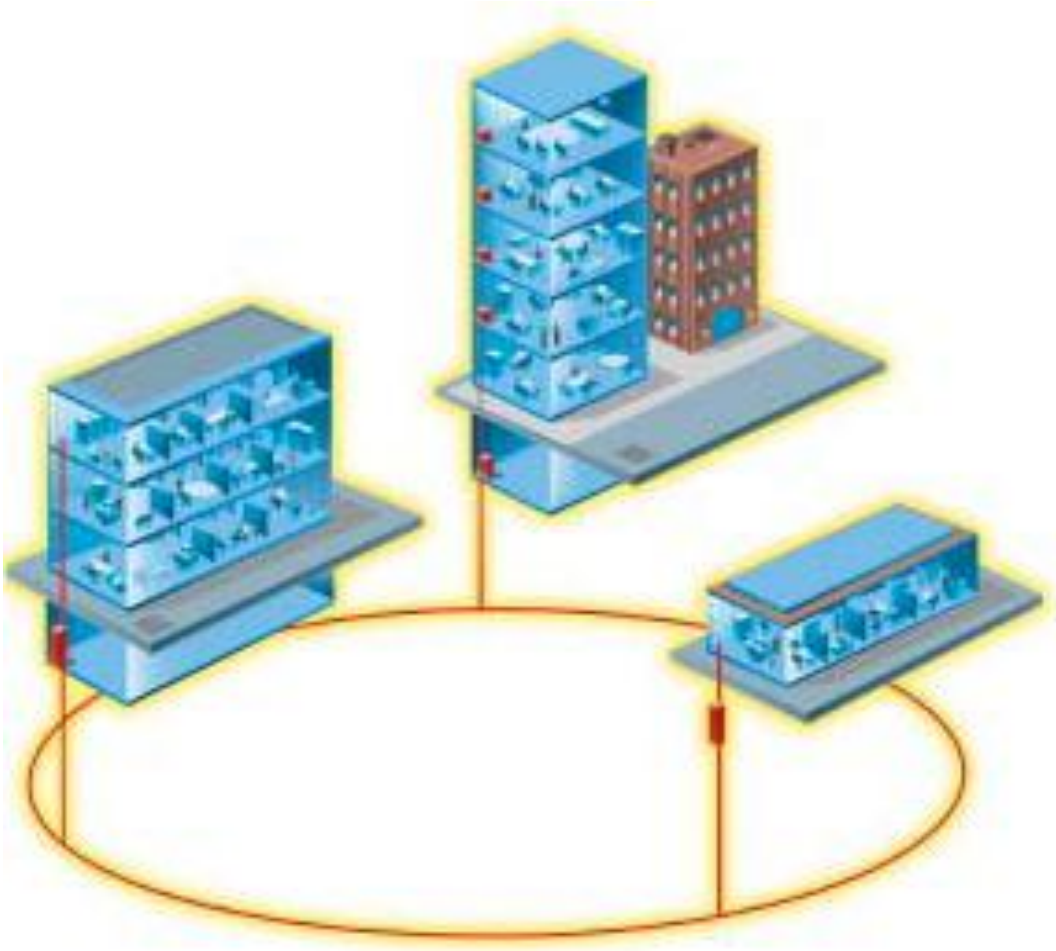
SPEAKER ZONES



02 Survivability Requirements



Panel Distribution and Configuration



Sub-Panel Distribution

- Sub-panels maybe referred to as remote booster power supplies or slave transponders
- Typically not an intelligent component of the system
- Rely on signals from other equipment or panels to operate

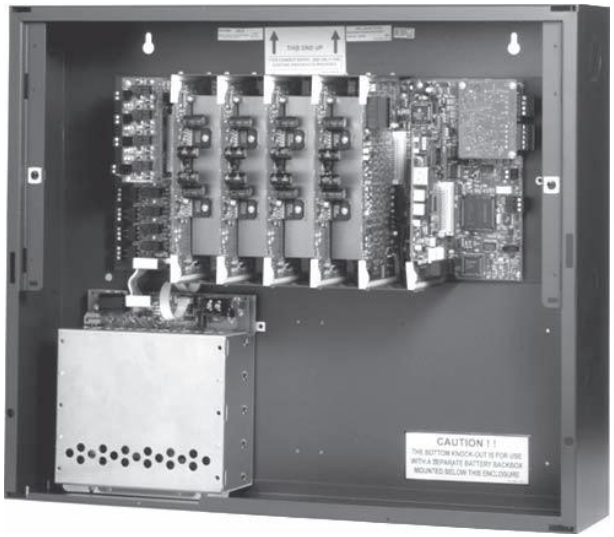
Sub-Panel Distribution

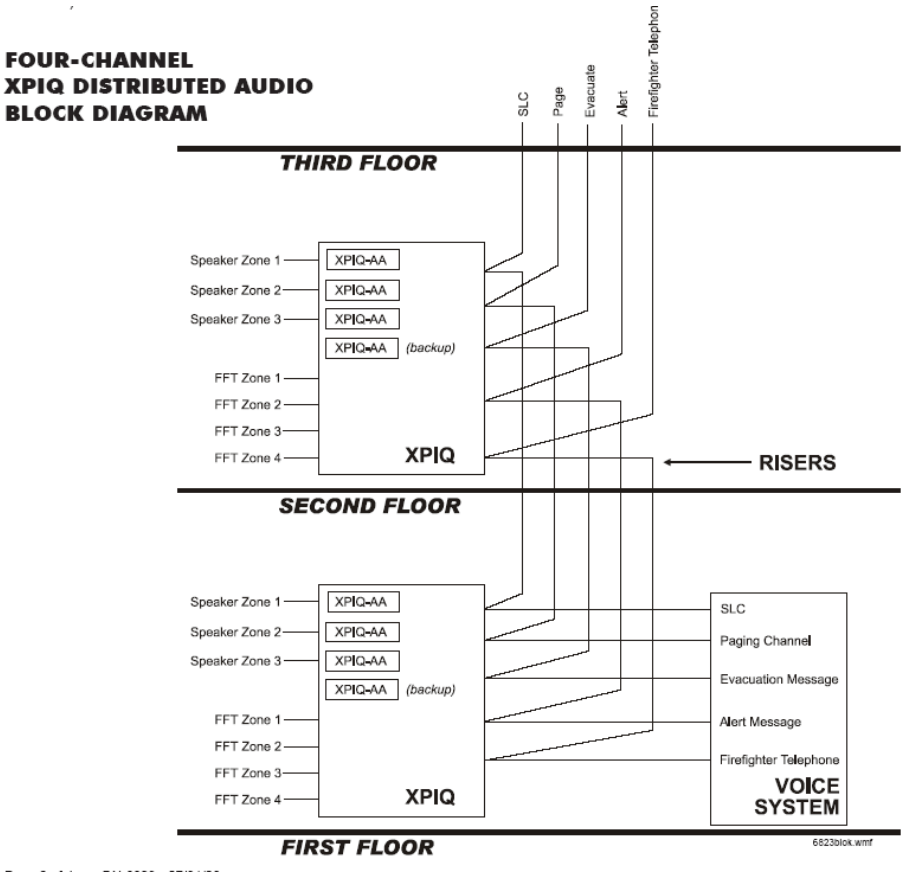
- Vertically – located on each floor and segregated circuits for the common areas from the tenant or residential areas of the floor

- Horizontally – Spaced at intervals near the extent of notification appliance circuits

- Sub panels may be configured with initiating device circuits, notification appliance circuits, auxiliary relays, signaling line circuits, power supplies, amplifiers, etc.

Sub-Panel Distribution





System Designs

Voice Systems vs Non-Voice

Emergency Communication Systems

Emergency Communication Systems

NFPA-72 – 2010 / 2013 editions

- **<u>23.9.1*</u> In-Building Fire Emergency Voice/Alarm Communications.** In-building fire emergency voice/alarm communications shall meet the requirements of Chapter 24.

- **24.4 One-Way Emergency Communications Systems.**
  - Messages shall be developed for each scenario developed in the emergency response plan.
  - A message template shall be developed for each message required
  - For an evacuation message, a tone in accordance with 18.4.2 shall be used with a minimum of two cycles receding and following the voice message.
  - Test messages shall clearly state the phrase “This is a test.”

Emergency Communication Systems

NFPA-72 – 2010 / 2013 editions

- **<u>24.4.2.1</u> Automatic Response.**

- The in-building fire emergency voice/alarm communications system shall be used to provide an automatic response to the receipt of a signal indicative of a fire alarm or other emergency.
- When the monitoring location is constantly attended by trained operators, and operator acknowledgment of receipt of a fire alarm or other emergency signal is received within 30 seconds, automatic response shall not be required.
- If acceptable to the authority having jurisdiction, the system shall permit the application of an automatic evacuation signal to one or more evacuation signaling zones and, at the same time, shall permit manual voice paging to the other evacuation signaling zones selectively or in any combination.

Emergency Communication System

Single or Multi-Channel Voice

- Single Channel – One message throughout building
- Multi-channel – Different messages simultaneously to different parts of the facility

Selective Evacuation or General Alarm

- Selective Evacuation – Minimum Standard / Floor of alarm / above and below
- General Alarm – Evacuation tone and message to entire facility

Intelligibility vs. Audibility

- The tone is measured for audibility / the message for intelligibility
- Intelligibility measure by STI or CIS Scale – refer to annex of NFPA-72
- Simple rule – Clearly hear without echo or overlap from adjacent zone

Emergency Communication System

NFPA-72 (2013 edition)

- **The following requirements shall be met for layout and design:**

  (1) The loudspeaker layout of the system shall be designed to ensure intelligibility and audibility.

  (2) Intelligibility shall first be determined by ensuring that all areas in the building have the required level of audibility.

- System design shall incorporate designation of acoustically distinguishable spaces (ADS) within the occupiable areas as required in Chapter 18.

- Audibility shall be required in all areas in accordance with Chapter 18.

Emergency Communication System

NFPA: Non-Voice Systems

UAE Code: Chapter 8, Sections 34-36

- Public Mode – 15dBA above ambient
- Private Mode – 10 dBA above ambient
- Sleeping areas – 75 dBA at the pillow
- Maximum dBA output of a device – 110dBA at the minimum hearing distance
- When the ambient noise is greater that 105dBA – Visual notification shall be used
- Ambient noise is measured over a period of time when people are present or 24-hours

Sound Levels

Average Ambient Sound Level According to Location
UAE Code Table 8.4

Location	dBA
Business Occupancies	55
Educational Occupancies	45
Industrial Occupancies	80
Institutional Occupancies	50
Mercantile Occupancies	40
Piers & Water Surrounded Structures	40
Places Of Assembly	55
Residential Occupancies	35

Location	dBA
Storage Occupancies	30
Thoroughfares, high density urban	70
Thoroughfares, medium density urban	55
Thoroughfares, rural & suburban	40
Tower Occupancies	35
Underground Structures/ Windowless	40
Vehicles & Vessels	50
Mechanical Rooms	85

Audio Appliance Locations

- If ceiling heights allow, wall-mounted appliances shall have their tops above the finished floors at heights of not less than 2290 mm and below the finished ceilings at distances of not less than 150 mm (UAE Code Section 37.1)

Emergency Communication System

Visible Notification (Flashers)

- UAE Code
  - Basement Carparks
  - Mechanical/ Machine rooms
  - Large machining areas of factories (>5000 m^2)
  - Locations where the ambient noise level >75dB

NFPA 72 & ADA REQUIREMENTS

- **Lamp**
  - Xenon strobe or equivalent.
  - Color to be clear or nominal white.
- **Intensity**
  - 75 Candela (Listed to UL 1638)
  - 15/75 Candela Strobes?
- **Spacing**
  - No place in any room or space required to have a visual signal shall be more than 50’ from the signal.
- **Flash Rate**
  - Minimum - 1hz, Maximum - 3hz.
- **Mounting**
  - 80” above floor or 6” below ceiling whichever is less. (Wall Mount)

UAE Code REQUIREMENTS
(Chapter 8, Section 39)

- **Lamp**
  - **Color to be clear or nominal white or other color as required by the emergency plan**
- **Intensity**
  - **Shall not exceed 1000 cd (effective intensity)**
- **Spacing**
  - **Shall be in accordance with Tables 8.5 or 8.6 or Figure 8.18**
- **Flash Rate**
  - **Minimum - 1hz, Maximum - 2hz**
- **Mounting**
  - **Minimum 2030 mm and maximum 2440 mm above finished floor**

Visible Appliance Locations

- Corridors ≤ 20’ – Maximum 15’ from the end of a corridor, minimum 15cd, no more than 100’ apart
- If ceiling heights exceed 30’, appliance must be lowered below 30’
- Wall mount – entire lens 80” – 96” above finished floor
- Sleeping areas – if ≥24” to the ceiling 177cd / if ≤ 24” to the ceiling 110cd
- Public Restrooms not Private (hotel guestroom restrooms are considered private
- Meeting rooms and common workspaces (two or more people)
- Areas accessible to the general public
- Large Assembly Spaces – Break down into small section and use room size tables
- Synchronization – when more than 2 are visible
- Line of sight / field of view – 135 degrees
- Performance based alternatives

UAE Code Table 8.5 - Wall Mounted Visible Appliances

Maximum Room Size		Minimum Required Light Output [Effective Intensity (cd)]	
ft	m	One Light per Room	Four Lights per Room (One Light per Wall)
20 × 20	6.10 × 6.10	15	NA
28 × 28	8.53 × 8.53	30	NA
30 × 30	9.14 × 9.14	34	NA
40 × 40	12.2 × 12.2	60	15
45 × 45	13.7 × 13.7	75	19
50 × 50	15.2 × 15.2	94	30
54 × 54	16.5 × 16.5	110	30
55 × 55	16.8 × 16.8	115	30
60 × 60	18.3 × 18.3	135	30
63 × 63	19.2 × 19.2	150	37
68 × 68	20.7 × 20.7	177	43
70 × 70	21.3 × 21.3	184	60
80 × 80	24.4 × 24.4	240	60
90 × 90	27.4 × 27.4	304	95
100 × 100	30.5 × 30.5	375	95
110 × 110	33.5 × 33.5	455	135
120 × 120	36.6 × 36.6	540	135
130 × 130	39.6 × 39.6	635	185

NA: Not allowable.

UAE Code Table 8.6 - Ceiling Mounted Visible Appliances

Maximum Room Size		Maximum Lens Height*		Minimum Required Light Output (Effective Intensity); One Light (cd)
ft	m	ft	m	
20 × 20	6.1 × 6.1	10	3.0	15
30 × 30	9.1 × 9.1	10	3.0	30
40 × 40	12.2 × 12.2	10	3.0	60
44 × 44	13.4 × 13.4	10	3.0	75
20 × 20	6.1 × 6.1	20	6.1	30
30 × 30	9.1 × 9.1	20	6.1	45
44 × 44	13.4 × 13.4	20	6.1	75
46 × 46	14.0 × 14.0	20	6.1	80
20 × 20	6.1 × 6.1	30	9.1	55
30 × 30	9.1 × 9.1	30	9.1	75
50 × 50	15.2 × 15.2	30	9.1	95
53 × 53	16.2 × 16.2	30	9.1	110
55 × 55	16.8 × 16.8	30	9.1	115
59 × 59	18.0 × 18.0	30	9.1	135
63 × 63	19.2 × 19.2	30	9.1	150
68 × 68	20.7 × 20.7	30	9.1	177
70 × 70	21.3 × 21.3	30	9.1	185

Emergency Command Center

As defined by UAE Code (Chapter 2, Section 15.7)

- **Required for all High Rise Buildings (greater than 23 m) other than One and Two Family Dwellings**
- **Shall be separated from other parts of the Building by 1-hour compartment walls and floors as well as fire suppression (Chapter 1, Section 17.1.1)**
- **Minimum size – 8.9 m^2 (Chapter 1, Section 17.1.1)**
- **Minimum dimension – 2.4 meters (Chapter 2, Section 15.7.2)**
- **Shall include….**

Emergency Command Center

As defined by UAE Code Chapter 2, Section 15.7.6

Shall include….

- **Schematic building floor plans, including fire protection systems, means of egress, fire department access and fire fighting equipment**
- **Emergency voice alarm communication system**
- **Fire detection and alarm system annunciator unit**
- **Elevator position annunciator**
- **Status indicators and control for air handling systems**
- **Control for unlocking stairway door simultaneously**
- **Sprinkler valve and waterflow detector displays**
- **Emergency and stand-by power status indicators**
- **Fire pump status indicators**
- **Generator supervision devices (manual start and transfer)**
- **Public address system**
- **Controls for smoke management systems including jet fans**

Emergency Command Center

Two way emergency communication system be provided between ECC and the following areas: (Chapter 2, Section 15.7.5)

- **Every fire fighting lobby, including ground floor**
- **All fire fighting related mechanical equipment rooms (sprinkler pump room, wet rising main pump room, hose reel pump room, switch rooms and generator rooms)**
- **All rooms housing smoke control equipment**
- **All lift machine rooms**
- **Fire lifts**
- **Fire fighting staircase**
- **Each area of refuge**
- **Air handling control rooms**

Fire Alarm Essentials

- **Manual fire alarm boxes**
  - **Location**
    - Manual fire alarm boxes shall be located not more than 1.5 m from the entrance to each exit.
    - Shall be mounted on both sides of grouped openings over 12.2 m wide (1.5 m from each side of opening)
    - Additional manual fire alarm boxes shall be located so that travel distance to the nearest box does not exceed 45 m (reduced to 25 m and 16 m in limited mobility areas and where processes of the area result in a likelihood of rapid fire development
  - **Height**
    - Shall be installed generally at a height of 1.1 to 1.4 m above floor level in plain, accessible, well lit and free-hindrance places
    - Height to be lowered to 91 cm to 1.2 m where required for accessibility

Fire Alarm Essentials – Zoning

- **UAE Code:**
  - Buildings shall be divided into a number of detection zones for easy recognition and short search time
    - Area of any single open detection zone shall not exceed 2,000 m^2
    - Area of a zone for single open plan area shall not exceed 10,000 m^2
  - Single open, short circuit or ground in one detection zone shall not affect the operation of other zones
  - In conventional systems, each detection zone shall be supplied by a separate circuit
  - In addressable systems, several zones may be supplied by a single loop

Fire Alarm Essentials – Zoning

- Search distance shall not exceed 60 m for conventional systems and 100 m for addressable systems if the building is sprinklered
- If the floor area of a given building is less than 300 m^2 and height less than 15 m, zone may cover more than a single story and entire building may be considered a single zone even if multiple storeys present
- For buildings with a total floor area greater than 300 m^2, each detection zone shall be limited to a single story
- Detectors within any enclosed stairwell, lift shaft, etc. should be considered as a separate detection zone

Fire Alarm Essentials – Zoning

- For voids above or below the floor area of a room, detectors in these areas may be included within same detection zone of the room, provided that the voids and the room constitute a single fire compartment and the floor area is less than 100 m^2

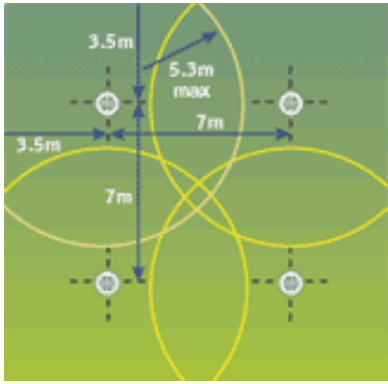
Fire Alarm Essentials - Zoning

- **NFPA 72 Zones (907.6.3)**
  - Each floor shall be zoned separately, not exceed 22,500 sq. ft.
  - The length of any zone shall not exceed 300 ft. in any direction
  - Automatic sprinkler system zones shall not exceed the area permitted by NFPA 13.
- **Zoning indicator panel (907.6.3.1 and 907.6.3.2) / Alarm Annunciation (NFPA-72, 4.4.6.1)**
  - Visible annunciation by indicator lamp, alphanumeric display, printout or other approved means
  - The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible alarm-silencing switch.
  - High-rise buildings, zone by floor / by device type where provided for; Smoke detector, Sprinkler water-flow device, Manual fire alarm boxes, other approved types of automatic fire detection devices or suppression systems

Fire Alarm Essentials

- **Fire safety functions (907.10) – cont.**
- **Detector Coverage *NFPA-72, 17.5.3.1***
  - Total (Complete) Coverage
    - Rooms, halls, storage areas, basements, attics, lofts, spaces above suspended ceilings, closets elevator shafts enclosed stairways, dumb waiters, shafts and chutes
    - If inaccessible areas contain combustibles, must be made accessible
    - May not be required in combustible blind spaces (17.5.3.1.2)
    - May not be required below open grid ceilings (17.5.3.1.3)
    - May not be required in concealed, accessible spaces above suspended ceilings used as a return air plenum (17.5.3.1.4)
    - May not be required beneath open loading docks or platforms (17.5.3.1.5)

Fire Alarm Essentials



- **Detector Coverage *NFPA-72, 17.5.3.2***
  - Partial Coverage
    - Where codes, standards, laws or AHJ require protection of selected areas only.
  - Nonrequired Coverage
    - When not required by codes, standards, laws or AHJ
    - Shall meet all the requirements of NFPA-72
    - Except the prescriptive spacing criteria.
    - When achieving specific fire safety objectives, additional detectors not necessary to achieve the object are not required.

Fire Alarm Essentials

- **Duct smoke detectors** **UAE Code Chapter 8 Section 23**
  - Where total coverage smoke detection is installed in all areas of the smoke compartment served by the return air system, duct detectors in the return system shall not be required (provided function is accomplished by the area detection system design)

- **Fire-extinguishing systems** **UAE Code Chapter 8 Section 19**
  - Shall be connected to the building fire alarm system
  - Alarm or Supervisory Signal
  - Off normal conditions to report as a supervisory signal

Device Placement Rules

- Smoke Detectors
- Heat Detectors
- Manual Fire Alarm Box
- Audible / Visible Notification

Spacing & Installation General Rules

The location and spacing of smoke detectors result from engineering evaluation based on the guidelines detailed in NFPA 72 and engineering judgment. Some of the conditions included in the evaluation are the following:

1. Ceiling shape and surface
2. Ceiling height
3. Configuration of contents in the area to be protected
4. Burning characteristics of the combustible materials present
5. Ventilation
6. Ambient environment
7. Early Warning

Smoke Detector Spacing

NFPA 72 – 17.7.3.2.3.1 Spot Type Smoke Detectors

17.7.3.2.3.1* In the absence of specific performance-based design criteria, smoke detectors shall be permitted to be located using 9.1 m (30 ft) spacing.

Smoke Detector Spacing

- **Spacing and Location**
  - 30 foot Guide
  - Modifications to Guide
    - Ceiling Configuration and Height
      - H < 12’, D < 1’ = ½ R Perpendicular
      - H > 12’, D >1’ = Each Beam Pocket
      - Sloped Ceilings
    - Air Movement
      - Air Changes
      - Effect of Grills (Supply and Return)

Spacing & Installation General Rules

(1) For ceilings with beam depths of less than 10 percent of the ceiling height (0.1 H), smooth ceiling spacing shall be permitted. Spot-type smoke detectors shall be permitted to be located on ceilings or on the bottom of beams.

Spacing & Installation General Rules

(2) For ceilings with beam depths equal to or greater than 10 percent of the ceiling height (0.1 H), the following shall apply:

(a) Where beam spacing is equal to or greater than 40 percent of the ceiling height (0.4 H), spot-type detectors shall be located on the ceiling in each beam pocket.

(b) Where beam spacing is less than 40 percent of the ceiling height (0.4 H), the following shall be permitted for spot detectors:

i. Smooth ceiling spacing in the direction parallel to the beams and at one-half smooth ceiling spacing in the direction perpendicular to the beams
ii. Location of detectors either on the ceiling or on the bottom of the beams

Spacing & Installation General Rules

(3)*For beam pockets formed by intersecting beams, including waffle or pan-type ceilings, the following shall apply:

(a) For beam depths less than 10 percent of the ceiling height (0.1 H), spacing shall be in accordance with 17.7.3.2.4.2(1).

(b) For beam depths greater than or equal to 10 percent of the ceiling height (0.1 H), spacing shall be in accordance with 17.7.3.2.4.2(2).

Spacing & Installation General Rules

(4)*For corridors 15ft (4.6 m) in width or less having ceiling beams or solid joists perpendicular to the corridor length, the following shall apply:

(a) Smooth ceiling spacing shall be permitted.

(b) Location of spot-type smoke detectors on ceilings, sidewalls, or the bottom of beams or solid joists

Spacing & Installation General Rules

(5) For rooms of 900 ft2 (84 m2) or less, the following shall be permitted:

(a) Use of smooth ceiling spacing

(b) Location of spot-type smoke detectors on ceilings or on the bottom of beams

Smoke Detector Spacing

- **Special Spacing Problems**
  - Uneven ceilings or ceilings crossed by joists or beams.
  - Sloped or Peaked ceilings.
  - High ceilings.
  - High storage racks.
  - Partitions.
  - Stratification.
  - Uninsulated roofs.

Other Smoke Detector Spacing

- Smoke detectors installed within 21’ of the centerline of elevator doors for elevator recall
- Area smoke detectors can be used for control of dampers and doors
- When area smoke detection is used in corridors, smoke detectors are not required within 5’ of smoke door assemblies provided that any corridor smoke detector causes the smoke doors to release
- Smoke detectors required for the protection of panels when panels are located in unattended areas – this includes remote booster power supplies
- Smoke detectors installed within 10 ft of an entrance to a smoke proof enclosure for mechanically ventilated and pressurized enclosures (NFPA-101, section 7.2.3.10 2000 and 2006 editions)

Other Smoke Detector Spacing NFPA-72 (2010) A17.7.5.4.2.2

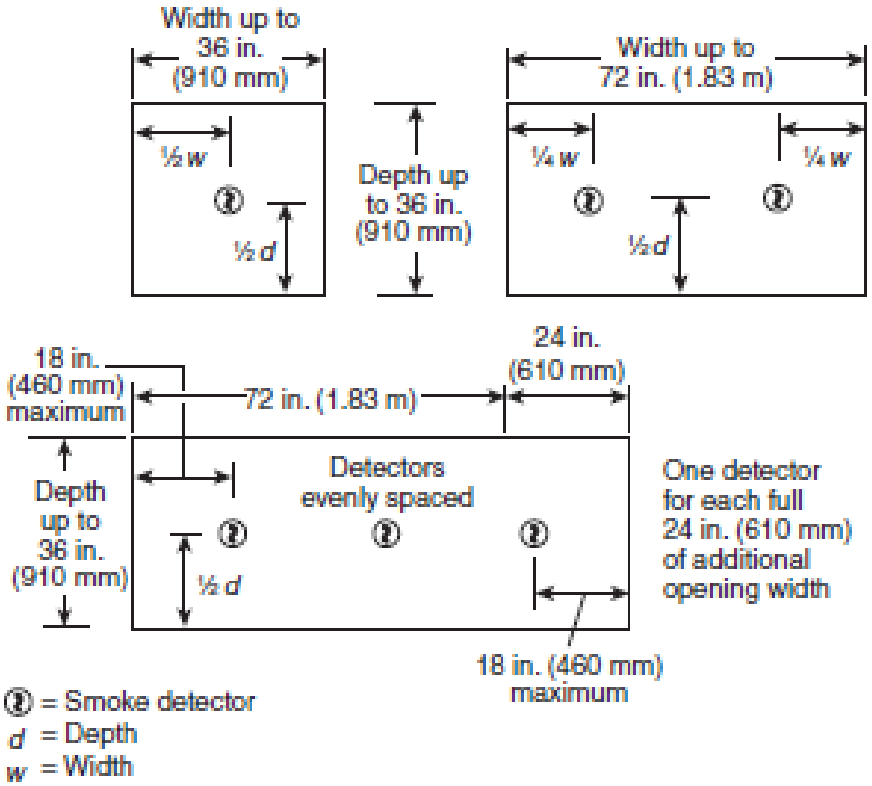


FIGURE A.17.7.5.4.2.2(a) Location of a Smoke Detector(s) in Return Air System Openings for Selective Operation of Equipment.

Other Smoke Detector Spacing IBC 717.3.3.2

- Smoke Detectors for Damper Actuation
  - Within 5’ damper
  - On either side of a smoke barrier door opening
  - 5’ horizontally of a damper
  - Within a corridor
  - Area detection in all areas serviced by the mechanical (HVAC) system

Spacing & Installation General Rules

Spot Type Smoke & Heat Detectors Located on Ceiling Surface*

- Not > 12 in. down from ceiling surface
- Not < 4 in. from side walls
- Not on sidewalls between 4 in. and 12 in. down from the ceiling surface
- Not Recessed
- All points on the ceiling shall have a detector within a distance equal to 0.7 times the listed (or selected) spacing

**Exceptions for solid joist construction, beam construction and high ceilings. Reference NFPA 72 for specific location and spacing details.*

Spacing & Installation General Rules

Smoke Detectors for Door Release

NFPA-72 (2010) 17.7.5.6.5.3.

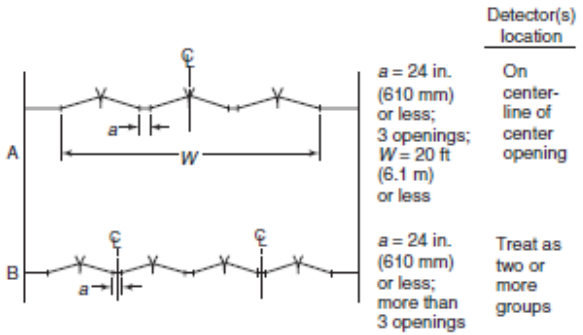


FIGURE 17.7.5.6.5.3(B) Detector Location Requirements for Group Doorways.

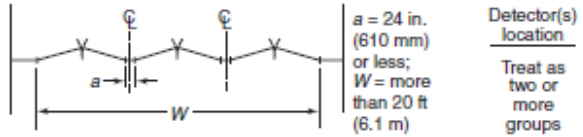


FIGURE 17.7.5.6.5.3(C) Detector Location Requirements for Group Doorways over 20 ft (6.1 m) in Width.

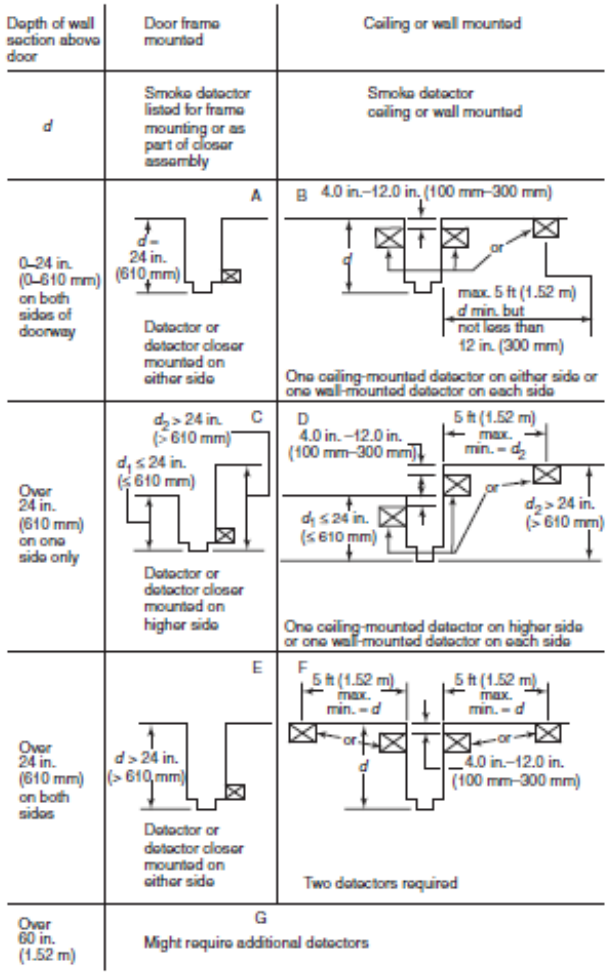


FIGURE 17.7.5.6.5.1(A) Detector Location Requirements for Wall Sections.

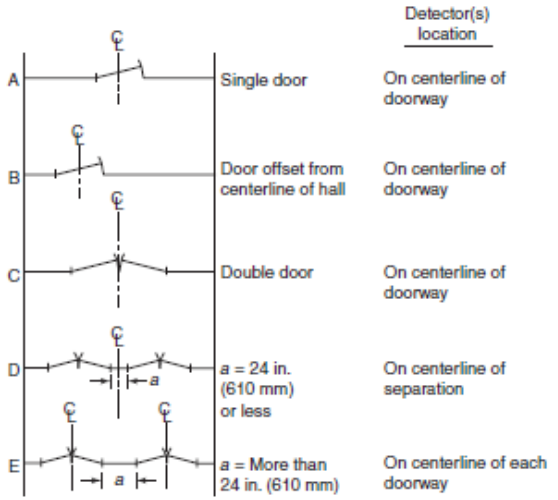


FIGURE 17.7.5.6.5.3(A) Detector Location Requirements for Single and Double Doors.

Heat Detectors

- Modification to Selected Spacing
  - Ceiling Height
    - Reduced Spacing for Ceilings above 10 feet
    - Ambient Conditions
    - Plume and Ceiling Jet Consideration (see Annex A)
  - Ceiling Configuration
    - Beams and Joists
    - Sloped Ceilings
  - Atriums
  - Annex B

Manual Fire Alarm Boxes/ Manual Call Points

NFPA 72

17.4.4 The operable part of each manual fire alarm box shall be not less than 42 in. (1.07 m) and not more than 48 in (1.22 m) above floor level.

17.14.5 Manual fire alarm boxes shall be installed so that they are conspicuous, unobstructed, and accessible.

UAE Code (Chapter 8)

3.5.10 The manual call points shall be installed generally at the height of (1.1-1.4) m above floor level and in plain, accessible, well lit and free-hindrance places.

3.5.11 Where disabled people are expected to operate, height to be lowered to (91cm – 1.2m).

3.5.6 The Manual call points shall be installed so that they are conspicuous, unobstructed and accessible.

Manual Call Points

NFPA 72

17.14.6 Manual fire alarm boxes shall be located within 60 in. (1.52 m) of the exit doorway opening at each exit on each floor.

17.14.7 Manual fire alarm boxes shall be mounted on both sides of grouped openings over 40ft (12.2 m) in width, and within 60 in. (1.52 m) of each side of the opening.

17.14.8* Additional manual fire alarm boxes shall be provided so that the travel distance to the nearest fire alarm box will not be in excess of 200ft (61.0 m), measured horizontally on the same floor.

UAE Code (Chapter 8)

3.5.5 The Manual call points shall be installed on all escape routes and in particular all stairwell entrances and all exits to open air.

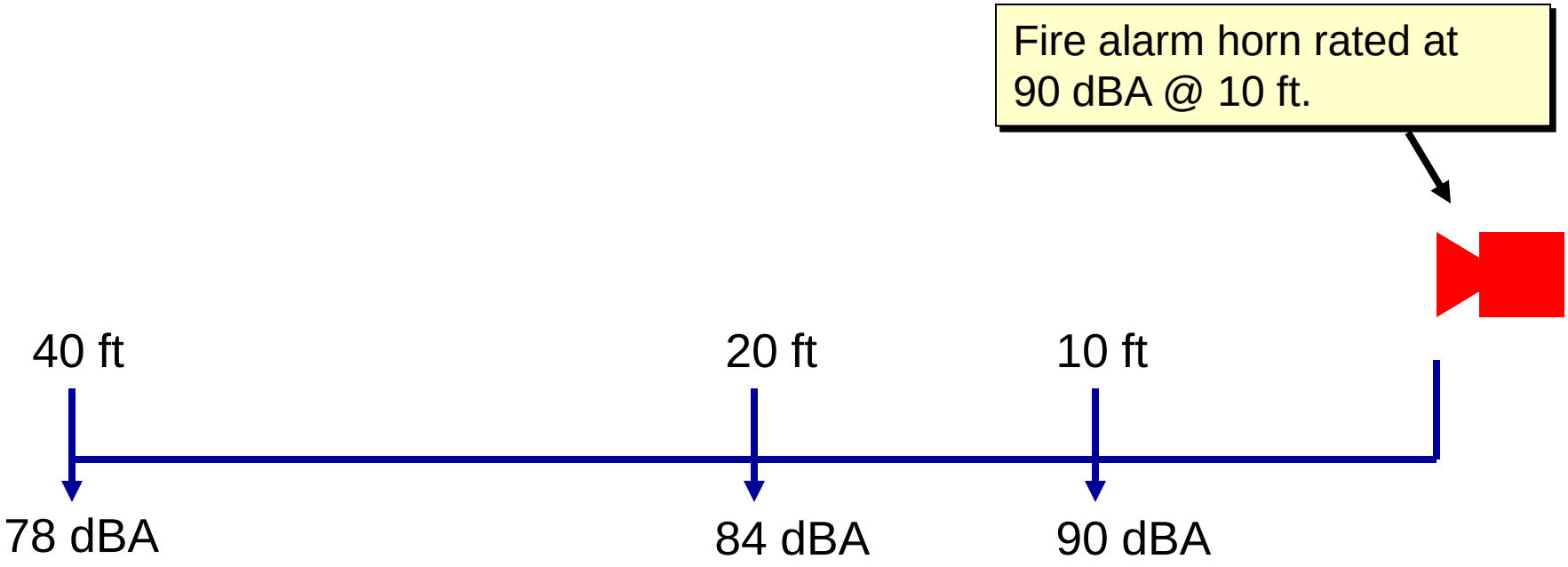
3.5.9 Manual Call Points shall be installed within 1.5m from exit door way opening and shall be mounted on both sides of grouped openings over 12.2m width and 1.5m each side of opening.

3.5.7 Distribution of the manual call points should be such that travel distance should not be more than 45m to reach the nearest manual call point.

3.5.8 These figures to be reduced to 25m and 16m in limited mobility areas (areas where rapid fire development expected)

Sound Loss "Rule Of Thumb"

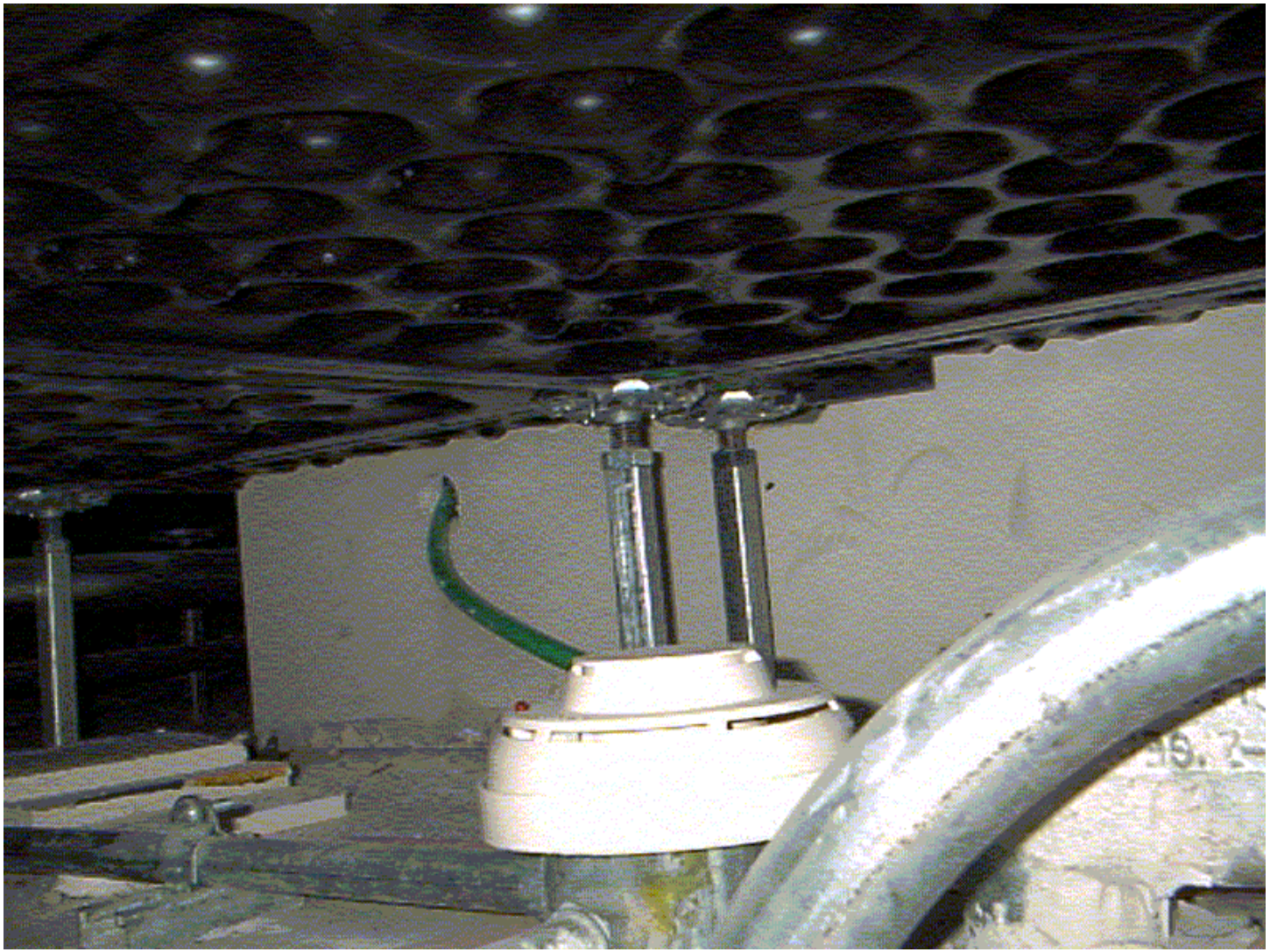
- Each time the distance doubles to the sound source you incur a 6 dBA loss.



Sound Loss Barriers

- **Typical sound loss at 1000 hertz.**
  - Non-insulated Stud Wall 41 dBA
  - Open Doorway 4 dBA
  - Typical Interior Door 11 dBA
  - Typical Fire Rated Door 20 dBA
  - Typical Door With Gasket 24 dBA

EXAMPLES OF FA PITFALLS




FIRE
ALARM
PULL
ALL WAY
DOWN
BREAKING
GLASS
AND LET GO
9

Thank you!

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