Fire Alarm Design Review Process

Workshop with Consultants

December 2024



By:

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- Design Review Process Flow Diagram
- List of Documents in submittal.
  - **Concept Design Report**
  - **Design Drawings**
    - Layout Drawings
    - Riser/Schematic Drawings
    - General Installation Details
    - Calculations

Content

- **Equipment Details.**
  - Technical Specifications
  - Product Data Sheets of all proposed equipment including FACP, Detectors, MCP, sounders, flashers.
  - Product listing certificates
  - Installation Manuals

Review Process

FADS Design Review Process

FADS Design Review Process

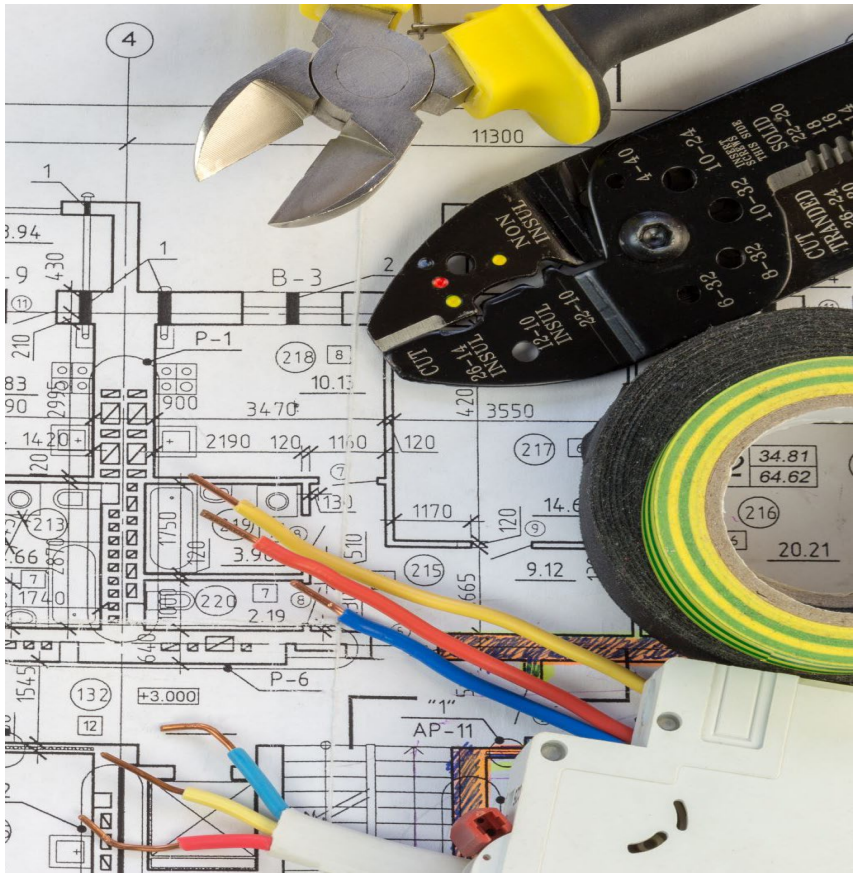
Design Drawings

"In this presentation, we have used fire equipment from various manufacturers to provide examples. However, this is not intended as an endorsement of any specific manufacturer or product."

What to check inside the design

It includes:

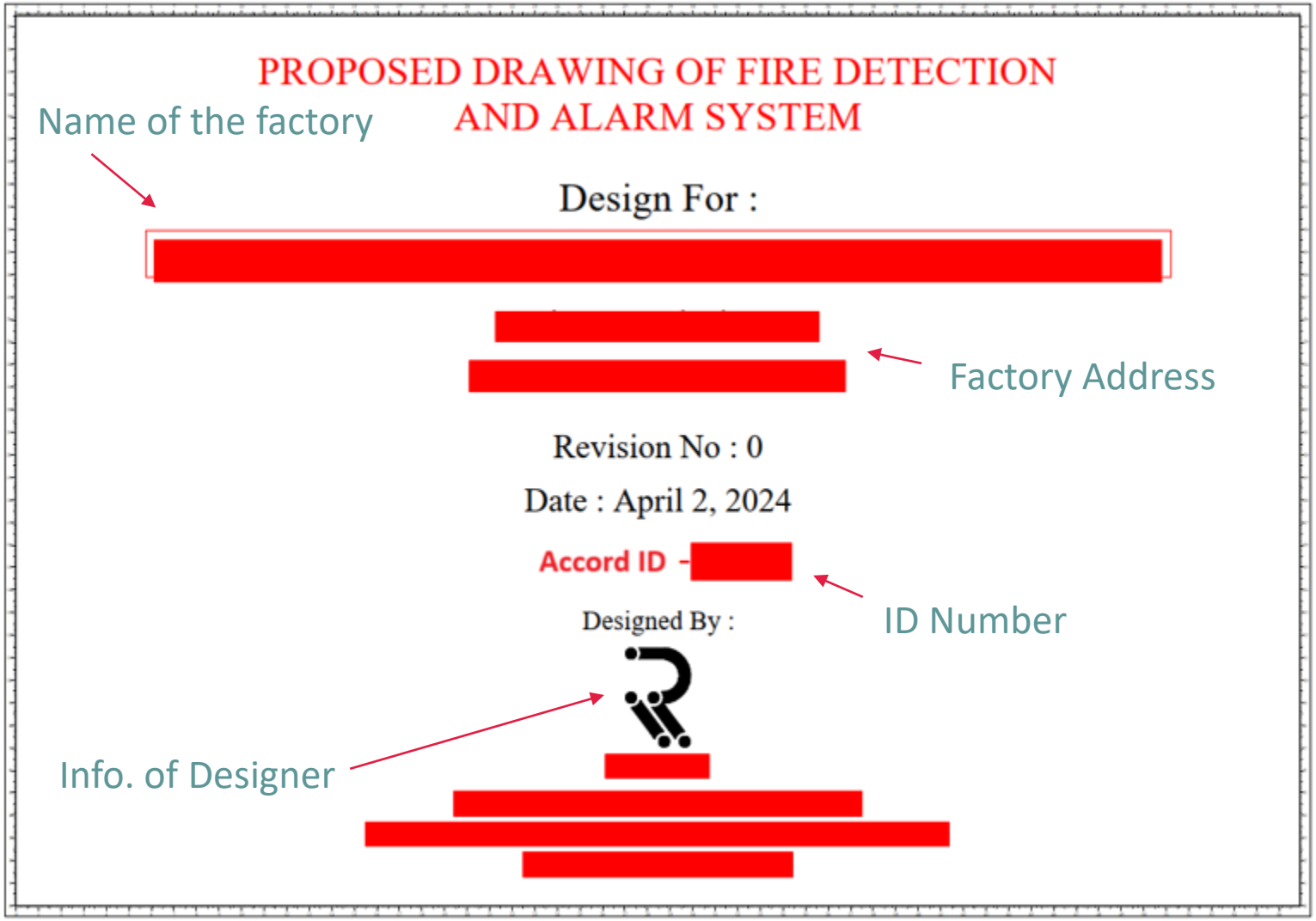
- Cover Page
- List of Drawings and Design Notes
- Master Plan
- Site Plan
- Legend and Notes
- Layout Drawings
- Riser/Schematic Drawings
- Building Elevation
- Coordinated Drawings with structure details and any obstructions on plan
- Device Count Table
- Input/ Output Matrix



List of Drawings

FA : List Of Drawings (Fire Alarm System)	
1	Cover Page
2	Legends and Design Notes
3	Typical Installation Details
4	Master Plan / Site Plan
5	Schematic/Riser Drawings
6	Fire Alarm System Layout Drawings Basement
7	Fire Alarm System Layout Drawings Ground Floor
8	Fire Alarm System Layout Drawings First Floor
9	Fire Alarm System Layout Drawings Second Floor
10	Fire Alarm System Layout Drawings Third Floor
11	Fire Alarm System Layout Drawings Fourth Floor
11	Fire Alarm System Layout Drawings Building 2 Ground Floor
12	Fire Alarm System Layout Drawings Building 2 First Floor
13	Fire Alarm System Layout Drawings Building 2 Second Floor

Cover Page


PROPOSED DRAWING OF FIRE DETECTION
AND ALARM SYSTEM
Name of the factory
Design For :
[redacted]
Factory Address
Revision No : 0
Date : April 2, 2024
Accord ID – [redacted]
ID Number
Designed By :
Info. of Designer
[redacted]

Legend & Design Notes

LEGEND

ITEM	NAME	QTY
P	Addressable Smoke Sensor Detector	37
R	Addressable Fixed Temperature Heat Detector	06
P	Addressable Manual Call	07
	Sounder with flasher / Horn With Strobe	03
	Sounder Without flasher / Horn without Strobe	04
AOM	Output Module	04
AIM	Input Module	16
FACP	Addressable Fire Alarm Control Panel	01
	Loop Cable, 2 X 1.5 RM FR	1200 ft
	Sounder Circuit Cable for Horn,2 X 2.5 RM FR	480 ft
DB	Distribution Board	--
CM-EF	Control Module For Exhaust Fan	--
	Cable Riser	2
	Fire Rated Door	08
	5" Wall -2 Hours Fire Rated	--
	10" Wall -4 Hours Fire Rated	--
	Exhaust Fan	00
EOL R	End Of Line Resistor	00

Design Notes:

01. The drawing shows approximate positions only. Exact position will be determined in conjunction with the actual site condition.
02. Fire Alarm system designed as per NFPA72.
03. For Panel circuit 2c, 1.5 rm FR . cable should be used.
04. For sounder circuit 2c, 2.5rm FR. cable should be used.
05. All the cable should run through uPVC conduit.
06. All the Manual Call Point (MCP) should be installed at 42"-48" above from the finished floor level(F.F.L.).
07. All the Fire Alarm Sounder should be installed at 2200mm above from the finished floor level (F.F.L.).
08. All the detector should be installed at the highest ceiling not at the drop beam.
09. Lifts, fire rated doors, sprinkler ZCV, exhaust fan, HVAC should be interfaced with fire alarm control panel
    As Shown on the drawing.
10. Contractor shall be responsible for all Fire Alarm System installation works.
11. Installation, testing and maintenance of installed Fire Alarm System should be maintained as per NFPA72.
12. Internal power backup, smf battery capacity : 12V, 18 AH battery
13. FACP Location: GUARD Room

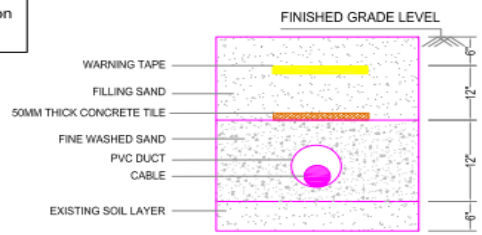
ALL CABLE WILL PASS THROUGH INSULATED WATER GRADE PVC PIPE.
N.B: Detector Placed as Per Considering 10% of Floor Height & Beam Calculation Rule-5.7.3.2.4.2, NFPA-72,2009 Edition

Design Notes:

5.6.5.5 High Ceilings. (NFPA 72)
5.6.5.5.1 On ceilings 3 m to 9.1 m (10 ft to 30 ft) high, heat detector linear spacing shall be reduced in accordance with Table 5.6.5.5.1 prior to any additional reductions for beams, joists, or slope, where applicable.

Table 5.6.5.5.1 Heat Detector Spacing Reduction Based on Ceiling Height

Ceiling Height above	Up to and Including	Multiply Listed Spacing by	Covered Area
ft	ft		Combined Detector
0	10	1.00	27 ft
10	12	0.91	25 ft
12	14	0.84	23 ft
14	16	0.77	21 ft
16	18	0.71	19 ft
18	20	0.64	17 ft
20	22	0.58	15 ft
22	24	0.52	13 ft
24	26	0.46	12 ft
26	28	0.40	10 ft
28	30	0.34	9 ft



Installation Details of Underground (Buried) Cable
Underground (Buried) Cable

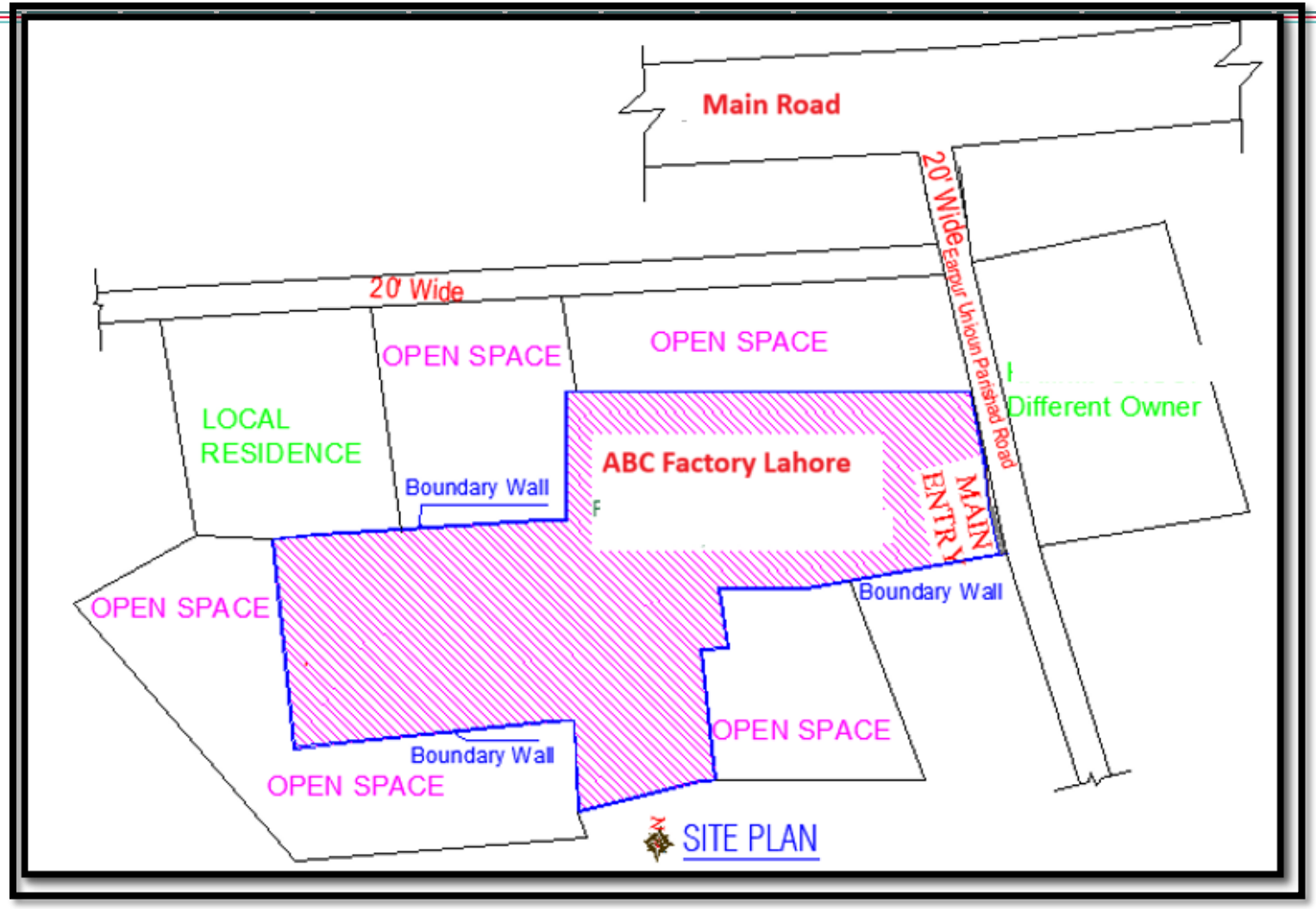
N.B: Detector Placed as per Beam Rule-5.7.3.2.4.2, NFPA-72.

Short notes from NFPA 72.

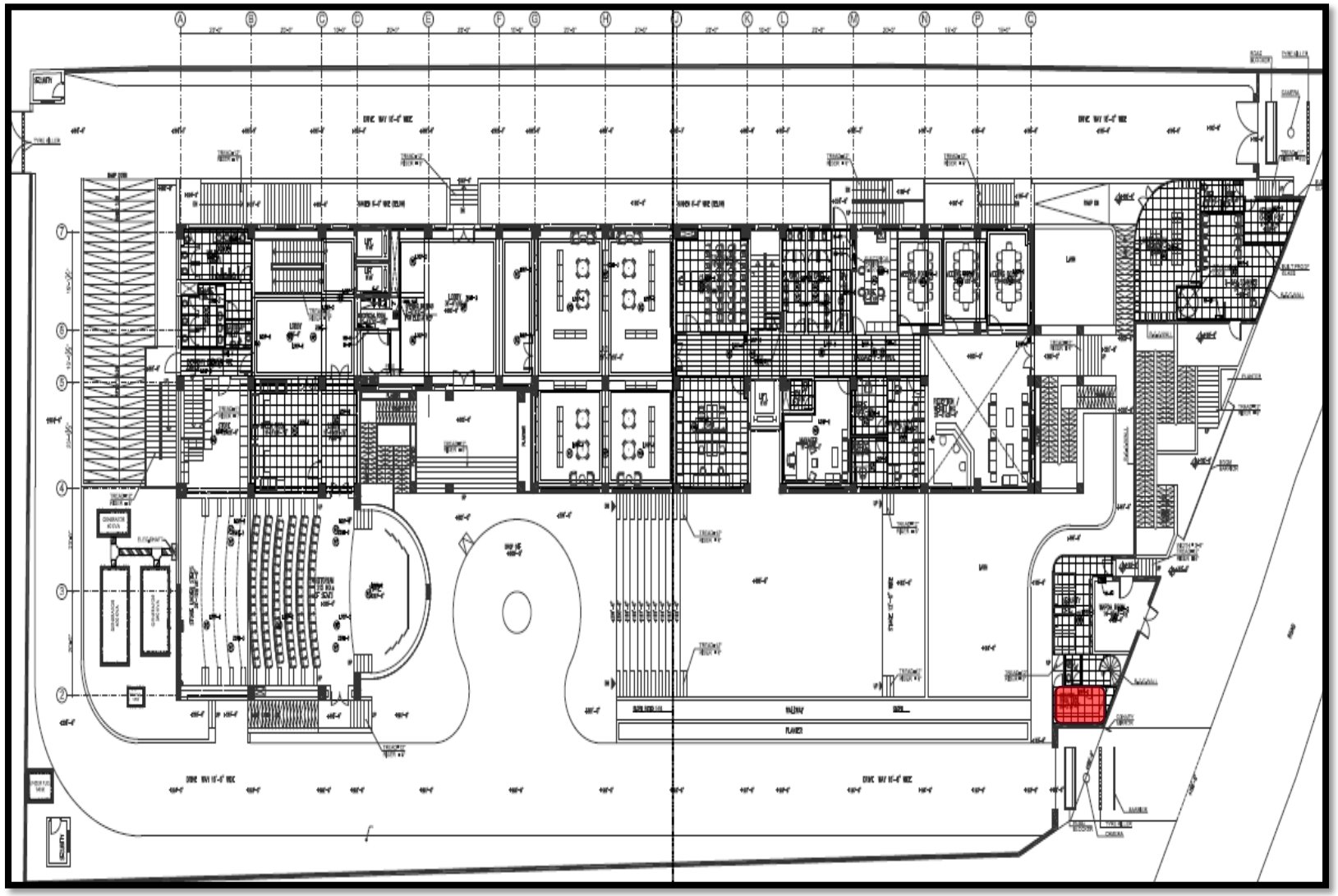
A. For rooms of 84m2 (900 ft2) area or less, only one smoke detector shall be required. (Article no.: 5.7.3.2.4.2 NFPA 72)
B. Where the beams project more than 460 mm (18 in.) below the ceiling and are more than 2.4m (8 ft.) on center, each bay formed by the beams shall be treated as a separate area. (Article no.: 5.6.5.3.3 NFPA 72)
C. Beam Construction. (For Fire Detection System)
5.6.5.3.1 A ceiling shall be treated as a smooth ceiling if the beams project no more than 100 mm (4 in.) below the ceiling (Article no.: 5.6.5.3 NFPA 72)
D. For level ceilings the following shall apply:
(4)*For corridors 4.5 m (15 ft.) in width or less having ceiling beams or solid joists perpendicular to the corridor length, the following shall be permitted:
(a) Smooth ceiling spacing including those provisions permitted for irregular areas in 5.6.5.1.2, substituting "selected spacing" for "listed spacing"
(b) Location of spot-type smoke detectors on ceilings, sidewalls, or the bottom of beams or solid joists (Article no.: 5.7.3.2.4.2 NFPA 72)

e) B.4 Smoke Detector Spacing for Flaming Fires.
B.4.1.1 The listing investigation for smoke detectors does not yield a "listed spacing" as it does for heat detectors. Instead, the manufacturers recommend spacing. Because the largest spacing that can be evaluated in the full-scale fire test room is 7.6 m (25 ft.), it has become common practice to recommend 9.1 m (30 ft.) spacing for smoke detectors when they are installed on flat, smooth recommend 9.1 m (30 ft.) spacing for smoke detectors when they are installed on flat, smooth ceilings. Reductions in smoke detector spacing are made empirically to address factors that can affect response, including ceiling height, beamed or joisted ceilings, and areas that have high rates of air movement (Article no.:B.4.1.1NFPA 72)

Master Plan

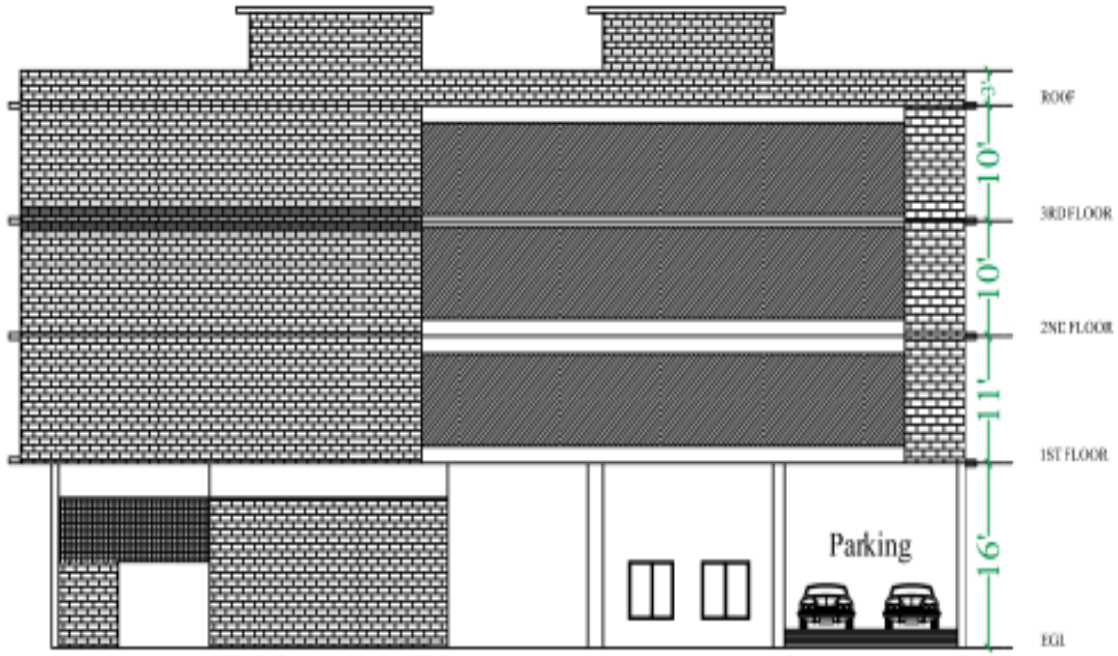

Main Road
20' Wide
20' Wide Eanpur Unioun Parishad Road
OPEN SPACE
OPEN SPACE
LOCAL RESIDENCE
Different Owner
ABC Factory Lahore
Boundary Wall
MAIN ENTRY
Boundary Wall
OPEN SPACE
OPEN SPACE
Boundary Wall
OPEN SPACE
SITE PLAN

Site Plan

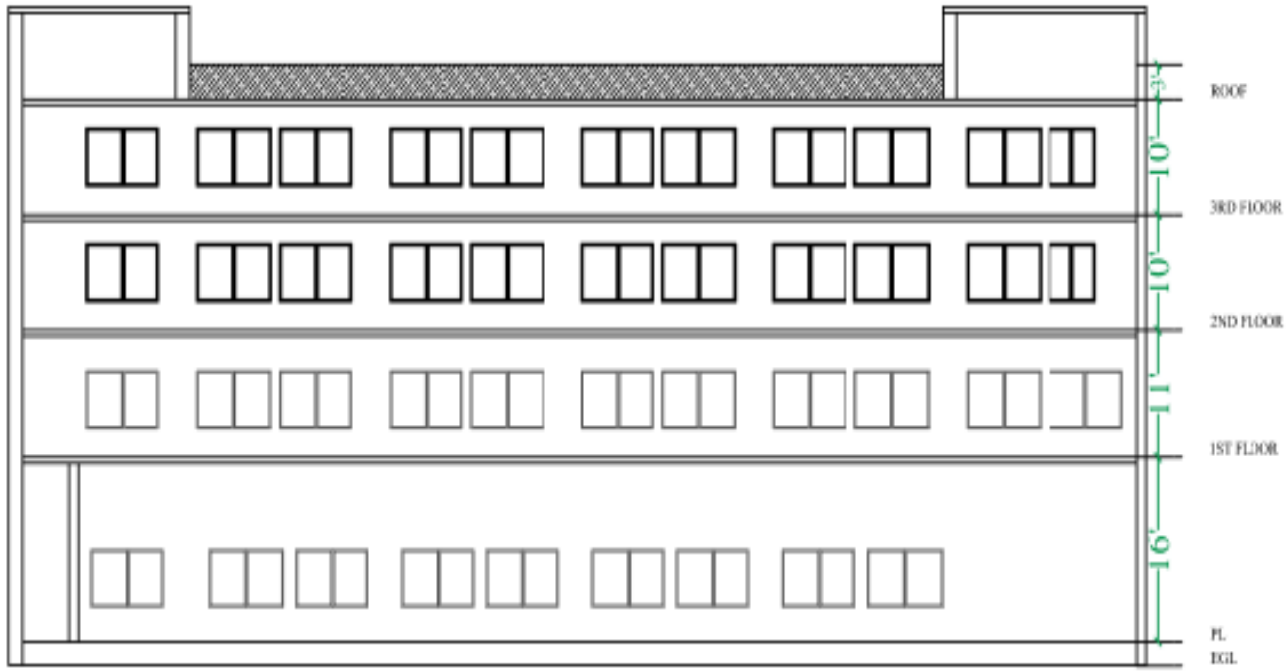


1. FACP Panel with cable routing.
2. Location of the stairs
3. Factory Entrance
4. All Structures with Accord ID
5. Cable Risers
6. Cable Routing
7. Compass and Scale

Elevation Drawings



FRONT ELEVATION

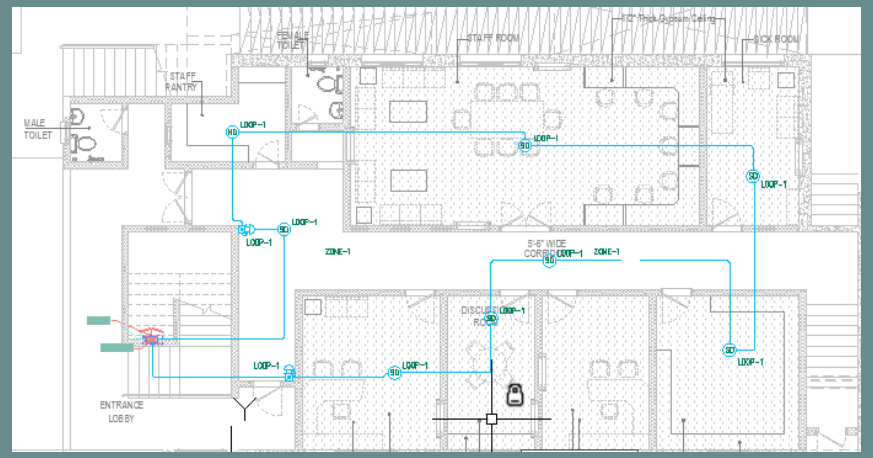


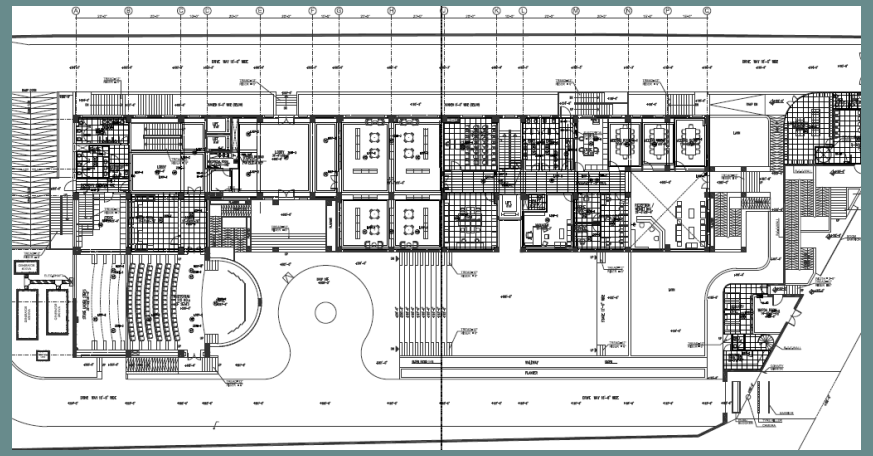
NORTH ELEVATION

Layout Drawings

Layout drawings shall cover

- Floor Identification
- Compass with indication of north
- Legend(indicate all device types, models, etc.)
- Graphic Scale
- Room description
- Riser Locations (SLC/NAC)
- Structural detail affecting fire alarm devices specifically the beam drops.
- Dimension for the distance between the devices.
- Coordinated ceiling plan drawings including all services.
- Monitor or control interfaces to other systems
- Walls and doors

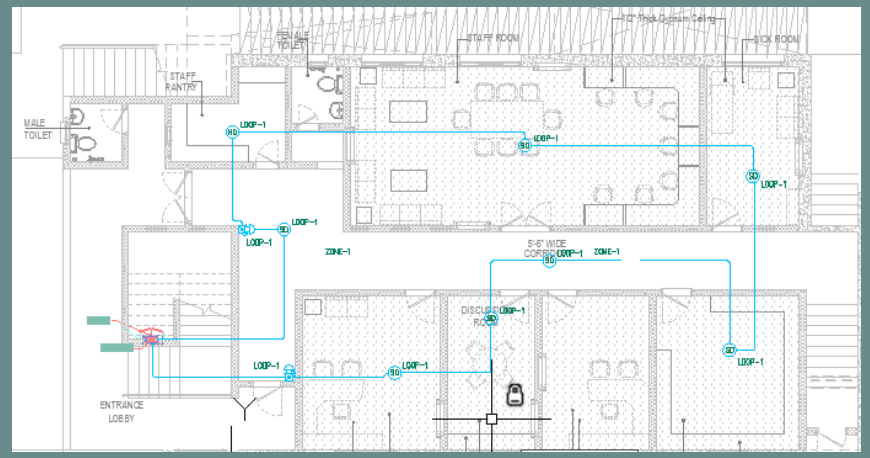


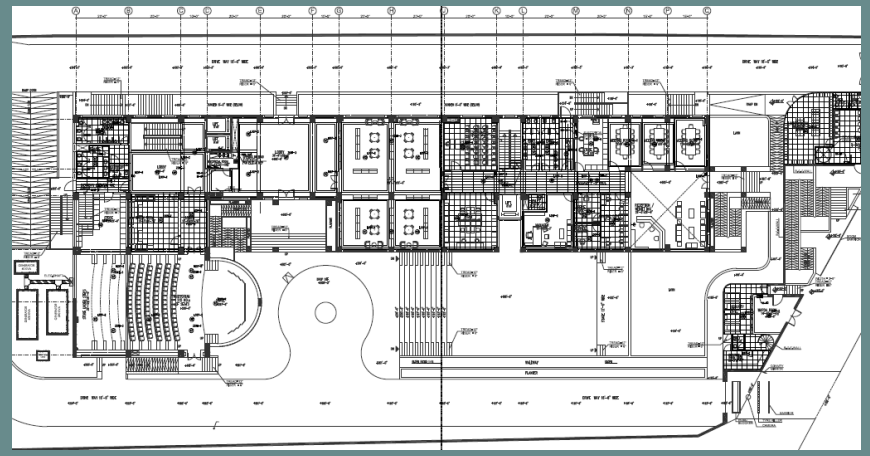


Layout Drawings

Layout drawings shall cover

- Ceiling geometries where fire detection is provided
- Class A wiring for Signaling Line Circuits (SLC)
- Class B wiring for Notification Appliance Devices (NAC)





Riser /Schematic Drawings

Riser/ Schematic drawings shall cover:

- Coordinated with floor plans
- Number of risers
- Type and number of circuits in each riser
- Type & number of system components / devices on each circuit, on each floor / level (device count table)
- Number of conductors for each circuit

Device Count FACP-01

SN	Device Type	Model	Loop				NAC				Total
			1	2	3	4	1	2	3	4	
1	Smoke Detector	ULCAP320	40	70	72	105					287
2	Heat Detector	ULCAP330	49	54	21	0					124
3	Multi Detector	ULCAP340	6	0	0	1					7
4	Pull Station	UMPS-100	10	8	7	7					32
5	Input Module	ULMCIM	7	9	4	4					24
6	Output Module	ULMCOM	1	0	1	2					4
7	Sounder Strobe	HSR					0	0	0	0	0
Total			113	141	105	119	0	0	0	0	478

Device Count FACP-02

SN	Device Type	Model	Loop		NAC				Total
			1	2	1	2	3	4	
1	Smoke Detector	ULCAP320	116	5					121
2	Heat Detector	ULCAP330	4	6					10
3	Multi Detector	ULCAP340	0	0					0
4	Pull Station	UMPS-100	16	6					22
5	Input Module	ULMCIM	4	25					29
6	Output Module	ULMCOM	2	4					6
7	Sounder Strobe	HSR			0	0	0	0	0
Total			142	46	0	0	0	0	188

Device Count NAC Extender 2

SN	Device Type	Model	NAC				Total
			1	2	3	4	
1	Sounder Strobe	HSR	10	10	9	5	34

Device Count NAC Extender 1

SN	Device Type	Model	NAC				Total
			1	2	3	4	
1	Sounder Strobe	HSR	9	8	8	8	33

Input /Output Matrix

Pakistan ACCORD for Health and Safety in the Garment and Textile Industry

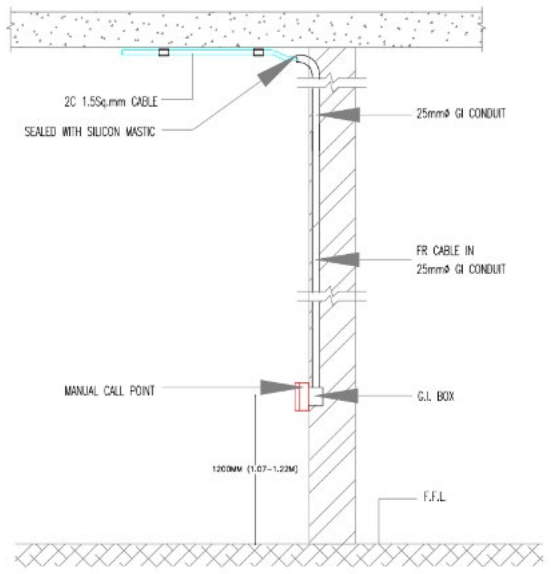
Input Output Martrix

SL. No	System Inputs	Actuate Common alarm Signal Indicator	Actuate Audible alarm Signal	Actuate Common Supervisory Signal Indicator	Actuate Audible Supervisory Signal	Actuate common Trouble Signal Indicator	Actuate Audible common Trouble Signal	Actuate Alarm Indicator Ground Floor To Roof Top	Display / Print Change of Status	Transmit Fire Alarm Signal to Supervising Station	Transmit Supervisory Signal to Supervising Station	Transmit Trouble Signal to Supervising Station	Storbe / Horn	PA System Shutdown	Close Smoke / Fire Dampers in Rated Wall	Shutdown Exhaust Fan Control Switch	Release Magnetically Held Fire Door
		Control Unit Announciation											Notification			Required Fire Safety Control	
01	Smoke Detector Ground Floor To Roof Top	●	●					●	●	●			●	●	Not Applicable	●	●
02	Heat Detector Ground Floor To Roof Top	●	●					●	●	●			●	●		●	●
03	Multi Detector Ground Floor To Roof Top	●	●					●	●	●			●	●		●	●
04	Manual Call Point Ground Floor To Roof Top	●	●					●	●	●			●	●		●	●
05	Water Flow Switch	●	●						●	●			●	●		●	●
06	Temper Switch & Butterfly Valve			●	●				●		●		●	●		●	●
07	Ep Motor Run			●	●				●		●						
08	Ep Motor Trouble			●	●				●		●						
09	Ep Phase Reversal			●	●				●		●						
10	Ep Fail Safe			●	●				●		●						
11	Dp Engine Run			●	●				●		●						
12	Dp Fail Safe			●	●				●		●						
13	Dp Engine Trouble			●	●				●		●						
14	Dp HOA			●	●				●		●						
15	Fire Alarm AC Power Faiure					●	●		●			●					
16	Fire Alarm System low Battery					●	●		●			●					
17	Open Circuit					●	●		●			●					
18	Ground Fault					●	●		●			●					
19	Notification Appliance Circuit Short					●	●		●			●					

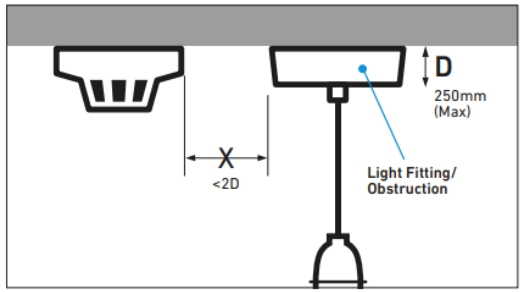
General Installation Drawings

Few example related to General installation drawings:

- Placement position of devices.
- Spacing between detectors

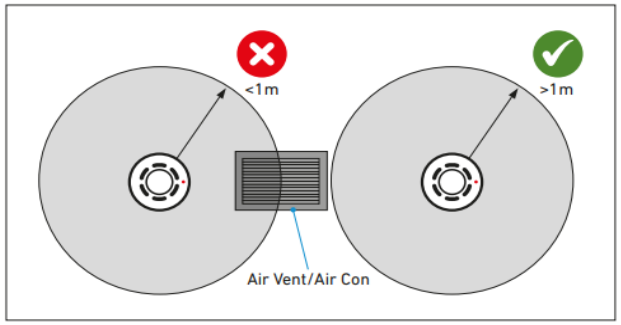


CLAUSE 22.3 Cont.

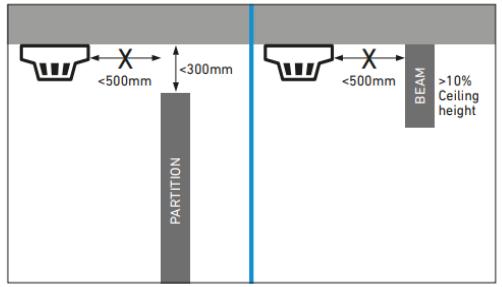


Never mount devices closer than twice the depth of light fittings or other obstructions on the ceiling.

CLAUSE 22.3 Cont.



Do not site detectors less than 1m from air supply points or air circulating units.

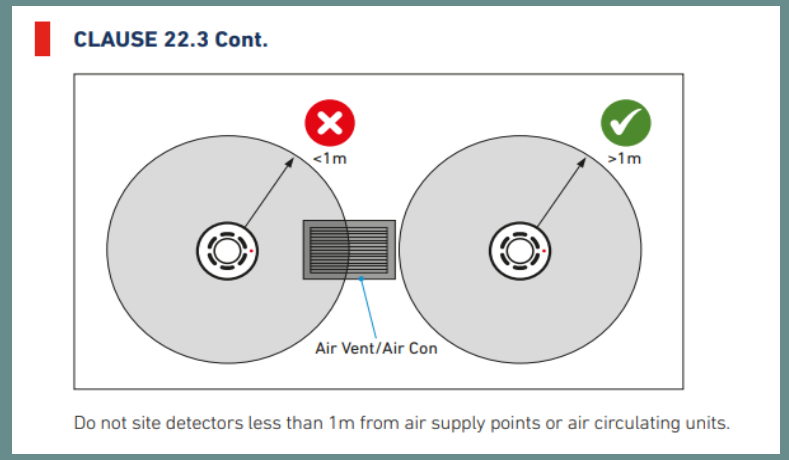


A device should not be mounted within 500mm of any obstruction.

If the top of a solid partition is less than 300mm from ceiling then treat it as a wall. Similarly, ceiling obstructions such as beams should be treated as walls if deeper than 10% of the ceiling height.

Calculations

- Voltage Drop Calculations
- Battery Sizing Calculations.
- Travel Distance
- Sound pressure Level calculations.



Equipment Details

Equipment Checklist

Project:Unique Designer's Limited
Address:Kalemshar, K.B. Bazar
Gazipur, Bangladesh

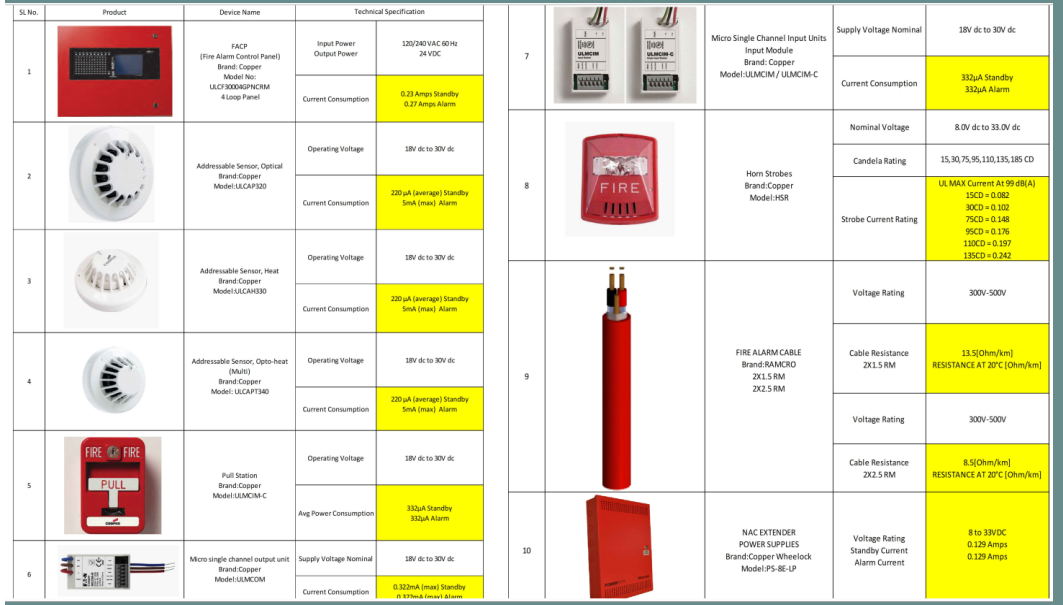
Product Checklist

11/20/2023 12:06 PM

SN	Equipment's Name	Manufacturer Name	Model No.	3rd Party Certifications	Certification Number	Stand Current Alarm Current	Remark
1	Fire Alarm Control Panel	Cooper	ULCF30004GPNCRM	UL/FM	S24837	0.23 Amps Standby 0.27 Amps Alarm	
2	Smoke Detector Addressable	Cooper	ULCAP320	UL/FM	S24205	220 µA (average) Standby 5mA (max) Alarm	
3	Heat Detector Addressable	Cooper	ULCAH330	UL/FM	S35887	220 µA (average) Standby 5mA (max) Alarm	
4	Multi Sensor Detector	Cooper	ULCAPT340	UL/FM	S24205	220 µA (average) Standby 5mA (max) Alarm	
5	Addressable Detector Base	Cooper	UCAB300	UL/FM	S24205		
6	Otuput Module	Cooper	ULMCOM	UL/FM	S24988	0.322mA (max) Standby 0.322mA (max) Alarm	
7	Input Module	Cooper	ULMCIM	UL/FM	S24988	332µA Standby 332µA Alarm	
8	Horn/ Horn With Strobe	Cooper	HSR	UL/FM	E5946	UL MAX Current At 99 dB(A) 15CD = 0.082 30CD = 0.102 75CD = 0.148 95CD = 0.176 110CD = 0.197 135CD = 0.242 185CD = 0.282	
9	Manual Call Point/Manual Pull Station	Cooper	UMPS-100	UL/FM	S25161	332µA Standby 332µA Alarm	
10	Cable 2X1.5 RM	Ramcro	FPLR	UL	E475091	13.5[Ohm/km] RESISTANCE AT 20°C [Ohm/km]	
11	Cable 2X2.5 RM	Ramcro	FPLR	UL	E475091	8.5[Ohm/km] RESISTANCE AT 20°C [Ohm/km]	
12	NAC Extender	Cooper	PS-8E-LP	UL	S5361	8 to 33VDC 0.129 Amps 0.129 Amps	

Technical Specifications

- These specifications will be prepared by the consultants as per site conditions in compliance with NFPA-72

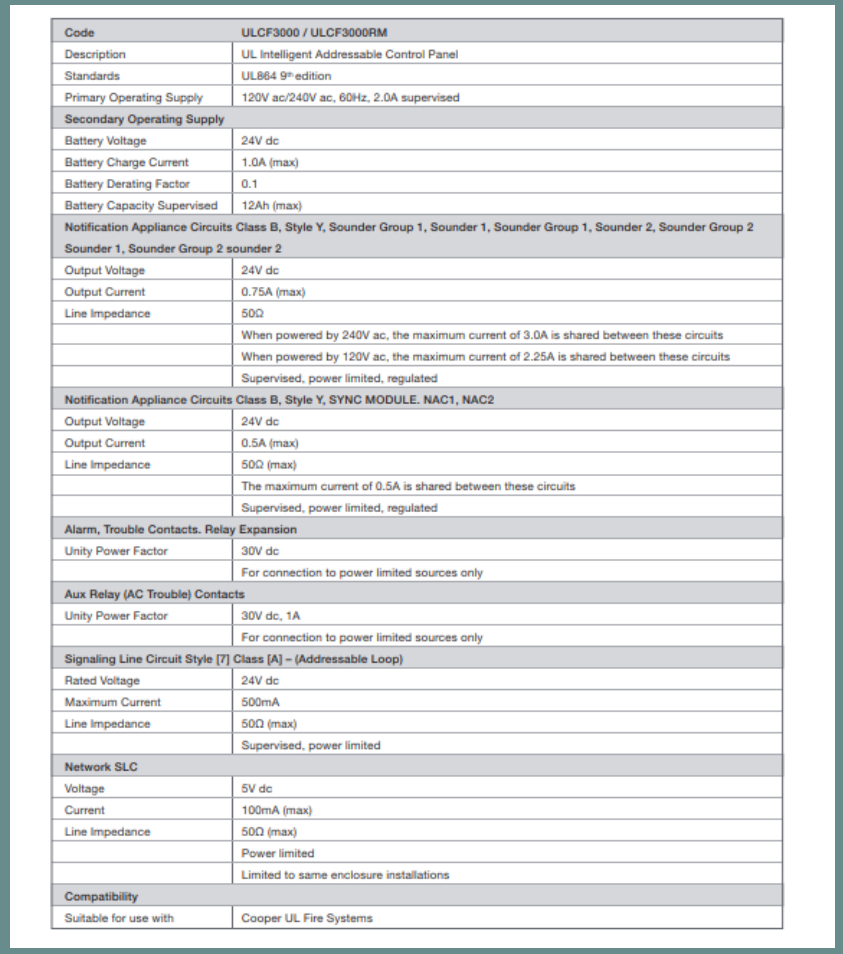


Sl. No.	Product	Device Name	Technical Specification	
1		FACP (Fire Alarm Control Panel) Brand: Copper Model No: ULCF30004GPNCRM 4 Loop Panel	Input Power Output Power	120/240 VAC 60 Hz 24 VDC
			Current Consumption	0.23 Amps Standby 0.27 Amps Alarm
2		Addressable Sensor, Optical Brand:Copper Model:ULCAP320	Operating Voltage	18V dc to 30V dc
			Current Consumption	220 µA (average) Standby 5mA (max) Alarm
3		Addressable Sensor, Heat Brand:Copper Model:ULCAH330	Operating Voltage	18V dc to 30V dc
			Current Consumption	220 µA (average) Standby 5mA (max) Alarm
4		Addressable Sensor, Opto-heat (Multi) Brand:Copper Model: ULCAPT340	Operating Voltage	18V dc to 30V dc
			Current Consumption	220 µA (average) Standby 5mA (max) Alarm
5	FIRE FIRE PULL	Pull Station Brand:Copper Model:ULMCIM-C	Operating Voltage	18V dc to 30V dc
			Avg Power Consumption	332µA Standby 332µA Alarm
6		Micro single channel output unit Brand:Copper Model:ULMCOM	Supply Voltage Nominal	18V dc to 30V dc
			Current Consumption	0.322mA (max) Standby

7		Micro Single Channel Input Units Input Module Brand: Copper Model:ULMCIM / ULMCIM-C	Supply Voltage Nominal	18V dc to 30V dc
			Current Consumption	332µA Standby 332µA Alarm
8	FIRE	Horn Strobes Brand:Copper Model:HSR	Nominal Voltage	8.0V dc to 33.0V dc
			Candela Rating	15,30,75,95,110,135,185 CD
			Strobe Current Rating	UL MAX Current At 99 dB(A) 15CD = 0.082 30CD = 0.102 75CD = 0.148 95CD = 0.176 110CD = 0.197 135CD = 0.242
9		FIRE ALARM CABLE Brand:RAMCRO 2X1.5 RM 2X2.5 RM	Voltage Rating	300V-500V
			Cable Resistance 2X1.5 RM	13.5[Ohm/km] RESISTANCE AT 20°C [Ohm/km]
			Voltage Rating	300V-500V
			Cable Resistance 2X2.5 RM	8.5[Ohm/km] RESISTANCE AT 20°C [Ohm/km]
10		NAC EXTENDER POWER SUPPLIES Brand:Copper Wheelock Model:PS-8E-LP	Voltage Rating Standby Current Alarm Current	8 to 33VDC 0.129 Amps 0.129 Amps

Product Data Sheets

- Product Data Sheets of all proposed equipment including FACP, Detectors, MCP, sounders, flashers.



Code	ULCF3000 / ULCF3000RM
Description	UL Intelligent Addressable Control Panel
Standards	UL864 9th edition
Primary Operating Supply	120V ac/240V ac, 60Hz, 2.0A supervised
Secondary Operating Supply	
Battery Voltage	24V dc
Battery Charge Current	1.0A (max)
Battery Derating Factor	0.1
Battery Capacity Supervised	12Ah (max)
Notification Appliance Circuits Class B, Style Y, Sounder Group 1, Sounder 1, Sounder Group 1, Sounder 2, Sounder Group 2 Sounder 1, Sounder Group 2 sounder 2	
Output Voltage	24V dc
Output Current	0.75A (max)
Line Impedance	50Ω
	When powered by 240V ac, the maximum current of 3.0A is shared between these circuits
	When powered by 120V ac, the maximum current of 2.25A is shared between these circuits
	Supervised, power limited, regulated
Notification Appliance Circuits Class B, Style Y, SYNC MODULE. NAC1, NAC2	
Output Voltage	24V dc
Output Current	0.5A (max)
Line Impedance	50Ω (max)
	The maximum current of 0.5A is shared between these circuits
	Supervised, power limited, regulated
Alarm, Trouble Contacts. Relay Expansion	
Unity Power Factor	30V dc
	For connection to power limited sources only
Aux Relay (AC Trouble) Contacts	
Unity Power Factor	30V dc, 1A
	For connection to power limited sources only
Signaling Line Circuit Style [7] Class [A] – (Addressable Loop)	
Rated Voltage	24V dc
Maximum Current	500mA
Line Impedance	50Ω (max)
	Supervised, power limited
Network SLC	
Voltage	5V dc
Current	100mA (max)
Line Impedance	50Ω (max)
	Power limited
	Limited to same enclosure installations
Compatibility	
Suitable for use with	Cooper UL Fire Systems

Product Listing Certificates

- Certificates will be provided for all type of components used in fire alarm system including
  - Control Panel
  - Detectors
  - Flashers
  - Sounders
  - MCPs

Installation Manuals

- Installation manual covers all type of installation, testing commissioning details from the manufacturer.

Code	ULCF3000 / ULCF3000RM
Description	UL Intelligent Addressable Control Panel
Standards	UL864 9th edition
Primary Operating Supply	120V ac/240V ac, 60Hz, 2.0A supervised
Secondary Operating Supply	
Battery Voltage	24V dc
Battery Charge Current	1.0A (max)
Battery Derating Factor	0.1
Battery Capacity Supervised	12Ah (max)
Notification Appliance Circuits Class B, Style Y, Sounder Group 1, Sounder 1, Sounder Group 1, Sounder 2, Sounder Group 2 Sounder 1, Sounder Group 2 sounder 2	
Output Voltage	24V dc
Output Current	0.75A (max)
Line Impedance	50Ω
	When powered by 240V ac, the maximum current of 3.0A is shared between these circuits
	When powered by 120V ac, the maximum current of 2.25A is shared between these circuits
	Supervised, power limited, regulated
Notification Appliance Circuits Class B, Style Y, SYNC MODULE. NAC1, NAC2	
Output Voltage	24V dc
Output Current	0.5A (max)
Line Impedance	50Ω (max)
	The maximum current of 0.5A is shared between these circuits
	Supervised, power limited, regulated
Alarm, Trouble Contacts. Relay Expansion	
Unity Power Factor	30V dc
	For connection to power limited sources only
Aux Relay (AC Trouble) Contacts	
Unity Power Factor	30V dc, 1A
	For connection to power limited sources only
Signaling Line Circuit Style [7] Class [A] – (Addressable Loop)	
Rated Voltage	24V dc
Maximum Current	500mA
Line Impedance	50Ω (max)
	Supervised, power limited
Network SLC	
Voltage	5V dc
Current	100mA (max)
Line Impedance	50Ω (max)
	Power limited
	Limited to same enclosure installations
Compatibility	
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Any Questions

Pakistan ACCORD
for Health and Safety in the Garment and Textile Industry

Thanks