Design and Implementation of a Smart Fire Detection System for Electrical and Electronic Engineering (EEE) Building of Daffodil Smart City

A Project report is submitted in partial fulfillment of the requirements for the award of Degree of Bachelor of Science in Electrical and Electronic Engineering.

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DAFFODIL SMART CITY

SEPTEMBER, 2024

DECLARATION

We hereby declare that this project "Design and Implementation of a Smart Fire Detection System for Electrical and Electronic Engineering (EEE) Building of Daffodil Smart City " represents our own work which has been done in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil Smart City in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering, and has not been previously included in a thesis or dissertation submitted to this or any other institution for a degree, diploma or other qualifications. We have attempted to identify all the risks related to this research that may arise in conducting this research, obtained the relevant ethical and/or safety approval (where applicable), and acknowledged our obligations and the rights of the participants.

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The project entitled "Design and Implementation of a Smart Fire Detection System for Electrical and Electronic Engineering (EEE) Building of Daffodil Smart City" submitted by- SM Rakib Sattar (ID:201-33-1116), Ahsan Ahammed Afridi (ID:201-33-1122), Fahim Masud (ID:201-33-1108), Prasenjit Saha Pranta (ID: 201-33-1065), Md. Nawaz Sharif Zim (ID: 201-33-1045), Ahteshamul Haque (ID: 201-33-1091), MD.Kefait Ullah Kazim (ID:201-33-1216), Shakil Ahmed (ID:201-33-1298), Md. Asad Ullah (ID:201-33-1236), Ridowan Ahmed Risan (ID:201-33-1096) has been done under our supervision and accepted as satisfactory in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering in September, 2024.

Signed

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Dedicated

To

Our

“PARENTS”

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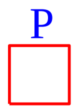
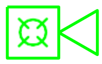
LIST OF ABBREVIATIONS

BAETE	Board of Accreditation for Engineering and Technical Education
DIU	Daffodil International University
DSC	Daffodil Smart City
EEE	Electrical and Electronic Engineering
NFPA	National Fire Alarm & Signaling Code
BNBC	Bangladesh National Building Code
SD	Smoke Detector
HD	Heat Detector
MD	Multi Sensor Detector
MPS	Manual Pull Station
CMD	Carbon Monoxide Detector
B	Fire Alarm Sounder with Strobe
I MOD	Input Module
O MOD	Output Module
I/O MOD	Input/output Module
ISO	Fault Isolator Module
FACP	Fire Alarm Control Panel
FRC	Fire Cable
AOM	Relay Output Module
AIOM	Relay Input/output Module
FPLR CABLE	Fire Power Limited Riser
EF	Exhaust Fan
EOL	End of Line Resistor
RP	Riser Point
CFAS	Conventional Fire Alarm System
AFAS	Addressable Fire Alarm System

LIST OF SYMBOLS

SL No.	Device Name	Legend
1.	Fire Alarm Control Panel (FACP)	FACP
2.	Multi Sensor Detector (MD)	
3.	Smoke Detector (SD)	
4.	Manual Pull Station (MPS)	
5.	Fire Alarm Sounder with Strobe (B)	
6.	Fault Isolator Module	ISO
7.	BRB Cable (2c, 1.5mm2)	
8.	BRB Cable (2c, 2.5mm2)	
9.	End of Line Resistor (EOL)	EOL

ACKNOWLEDGEMENT

First of all, we want to give thanks to Almighty Allah. With his blessing we are able to complete our work with best effort.

We want to pay our utmost respect to our Supervisor Md. Dara Abdus Satter, Associate Professor & Associate Head of the Department of Electrical and Electronic Engineering, Daffodil Smart City for who has given us the chance to work on an impactful idea and taken care of every issue of development of this concept. Then we would like to take this opportunity to express gratitude to our supervisor for being dedicated in supporting, motivating and guiding us throughout this project. This project can't be done without his useful advice and help. Also thank him very much for giving us the opportunity to work with this project.

We also want to convey our thankfulness to Muhammad Maruf Islam, Head of Engineering of the Morgen Integrated Systems Limited for his support and encouragement. Apart from that, we would like to thank our entire class fellows for sharing knowledge; information and helping us in making this project a success. To beloved family, we want to give them our deepest love and gratitude for being very supportive and also for their inspiration and encouragement during our studies in this Institution.

ABSTRACT

Smoke detection systems serve an important part in fire safety by detecting the presence of smoke, which is an early warning of fire. This abstract focuses on the two basic types of smoke detectors: Multi detector and smoke detector. This is a project to design and build a smart fire alarm and detection system. This project will design and build a sophisticated fire detection and alarm system for Daffodil Smart City 's EEE Building. The major goal of this project is to create a system that can reliably detect the presence of smoke or fire, inform all individuals around, and permit quick emergency action or evacuation in the case of a fire. There is also an IOT system for delivering SMS messages about the incident to our nearby fire station and the university's primary safety team.

Keywords: Smoke Detector, Multi Detector, Smart Fire Alarm Control Panel, SMS &Call System, Safety, Fire, etc.

CHAPTER 1
INTRODUCTION

The EEE Building at Daffodil Smart City requires improved fire safety measures, hence a smart fire alarm and detection system is required. Traditional fire alarms are frequently insufficient to identify fires or manage situations successfully. This new system will use cutting-edge technology to enhance safety and safeguard both people and property. The project will center on developing and installing the system, ensuring that it works well with the building's current configuration, and assisting in creating a safer environment for everyone in the building.

1.1 Problem Statement and Proposed Solution

It was originally an industrial building and taken over by the university to accommodate their EEE department. This establishment, however failed to have a fire sensing system and put life in grave danger. Without this necessary piece of equipment, the potential was increased for fires to start and remain unnoticed which placed both staff and machines at risk. One difficulty was in getting its fire detection system installed because of the slow budget approval procedure at the university. These delays created an ambiguity that delayed the project and necessitated additional time to quickly fix any safety-related concerns.

A budget proposal was then forwarded to the university to fill this deficiency of a fire detection system. The first proposal encountered numerous challenges in the approval process and was delayed. Based upon the experience with this, the budget was amended and reduced to what would fit within the financial parameters of the university while still meeting the essential safety needs. In the process, the narrowing of the scope of the project went with cost-effective fire detection solutions of good quality. Following the proposal of the revised budget, it was approved by the university. This finally made provisions for the installation of the fire detection system so that the building would be safe for its new use in the department of EEE.

1.2 Objectives

- **Study of Existing Fire Detection Standards:** Conduct a thorough analysis of NFPA 72 and BNBC standards to gain a comprehensive understanding of fire detection system requirements, ensuring the effective design and implementation of the system in the EEE building.

- **Development of a Reliable Smoke and Fire Detection System:** Install a customized fire detection system in the EEE Building with a loop configuration, incorporating advanced components such as heat detectors, multi-detectors, manual call points, and a central control panel.

- **Implementation of an Effective Alarm System:** Design an alarm system that ensures effective alarm to all building occupants in the event of a fire emergency.

1.3 Implementation Schedule

To effectively implement the smart fire alarm and detection system, a comprehensive work breakdown structure (WBS) will be created, detailing the tasks and activities Involved. The relationships between these activities will be identified to ensure smooth progress. Below is a tentative time frame for each activity organized using a Table:

Table 1.1: Task & Activity

Task/Activity	Start Date	End Date
Research on Smart Fire Alarm Technologies	1 September 2023	21 September 2023
Procurement of Necessary Equipment	1 October 2023	28 November 2023
Site Preparation and Infrastructure Setup	1 January 2024	21 January 2024
Project Proposal	20 February 2024	26 February 2024
Installation of Fire Alarm Devices	15 March 2024	20 April 2024
Testing and Quality Assurance	20 April 2024	26 April 2024
Training for Building Occupants	27 April 2024	3 May 2024
Integration with Existing Systems	4 May 2024	10 May 2024
Final System Review and Approval	11 May 2024	16 May 2024

1.4 Organization & Structure of the Report

The following is the report on how to design and implement smart fire alarm system applicable to the EEE Building.

- It starts with an Introduction on the subject with a focus on the general topic of enhancing fire safety and an objective of the subject of the project.
- A literature review will be aimed at identifying the current state in fire detection technologies, smart system capabilities and shortcomings, building codes and standards relating to smart fire systems, and the potential barriers to the implementation of smart fire systems.
- As a part of the system design, we describe selected sensors, the communication protocol, functions of the central hub and other features.
- The implementation phase defines the chosen hardware and software layout, installation procedures, check points and changes made during the process.
- System evaluation and maintenance refer to the tests of the efficiency of a system, the schedules for system maintenance, the analysis of the financial impact of a system, and an arrangement of the physical oversee of sensors.
- The conclusion, finally, enlists the accomplishments, embraces the limitations, and suggests conducting user training, updating, and further development. There is information in Appendices which have detailed information about the equipment type and specifications, diagrams showing how the equipment should be configured, and other testing information that was gathered.

-- This project aims to design and develop a smart fire alarm and detection system for the EEE Building at Daffodil Smart City. The system will incorporate both multi-detectors and smoke detectors to ensure accurate detection of smoke or fire, alerting everyone in the vicinity for rapid evacuation or response. Future plan It also include an IoT-based functionality that sends SMS alerts to the nearest fire station and the university's main safety team for immediate action.

CHAPTER 2
LITERATURE REVIEW

This literature review aims to investigate and analyze the design aspects of fire alarm detection systems. The review was conducted to understand the current state of fire alarm detection system design, identify existing technologies, methods, and processes, and highlight potential research gaps. By examining relevant literature, this review aims to provide insights into the strengths and weaknesses of existing fire alarm detection systems and propose recommendations for future improvements.

2.1 Research

The history of fire alarm detection systems may be traced back to the nineteenth century, when manual methods such as watchmen and telegraph-based systems were adopted in Boston in 1852. Automatic fire detection began in the late 1800s, with Francis Upton and George Andrew Darby developing early heat and smoke detectors. The twentieth century saw the commercialization of smoke and heat detectors, with more affordable and dependable models arriving in the 1960s and 1970s. Today's highly integrated and sophisticated fire alarm systems are the result of technological breakthroughs in the late twentieth and twenty-first centuries, such as microprocessors, addressable systems, and smart detectors. Modern systems now include real-time monitoring, wireless communication, and AI-powered analytics, which dramatically improve fire safety and prevention.

Fire alarm detection systems are critical components of building safety infrastructure, designed to detect the presence of fire, smoke, or heat and alert occupants to potential fire incidents. According to the National Fire Protection Association (NFPA) 72, a fire alarm system consists of components such as smoke detectors, heat detectors, alarm notification appliances, control panels, and monitoring devices. These components work together to provide early warning of fire emergencies and facilitate timely evacuation procedures. Several studies have been conducted to evaluate the performance of fire alarm detection systems in various building environments. For example, research by Smith et al. (2018) investigated the effectiveness of different types of smoke detectors in residential buildings. The study found that photoelectric smoke detectors were more effective at detecting smoldering fires, while ionization smoke detectors were better at detecting fast-burning fires.

Similarly, research by Johnson et al. (2019) compared the reliability of conventional fire alarm systems with addressable fire alarm systems in commercial buildings. The study found that addressable fire alarm systems provided faster detection and more accurate location information compared to conventional systems, leading to quicker response times and reduced property damage. Previous coursework in fire protection engineering has also contributed to the understanding of fire alarm detection system design principles. Concepts such as system reliability, false alarm management, integration with building systems, and compliance with regulatory standards have been explored in depth.

The BNBC serves as a comprehensive guideline for the construction, occupancy, and safety standards of buildings within Bangladesh. Specifically, concerning fire safety, the BNBC outlines requirements and recommendations for various aspects relevant to fire alarm and detection systems.

2.2 Related Research Paper Study:

The paper by Nyyssönen, Rajakko, and Keski-Rahkonen (2005) examines the reliability of fire detection and alarm systems by analyzing data from nuclear and non-nuclear installations. It reviews failure frequencies and organizes inspection records into a database to classify and present system failures over a 20-year period[1]. Liu et al. (2010) review the design and operation of automatic fire alarm systems, focusing on their components, working principles, and control software. The paper highlights the use of a two-wire method to improve system reliability and simplify installation[2]. Jee et al. (2014) developed a traceable fire alarm system to overcome limitations of conventional systems, offering precise fire location tracking and compatibility with existing detectors. The new system improves reliability and simplifies upgrades without rewiring (Jee et al., 2014)[3]. Chen (2011) evaluates the reliability of a fire alarm system in a student apartment, using metrics like PFD and spurious trip rates. The study helps assess the system's effectiveness and provides recommendations for risk reduction, concluding that the system is suitable for use with minimal changes (Chen, 2011)[4]. Deve, Hancke, and Silva (2016) designed a smart fire detection system using a Wireless Sensor Network and GSM communication to improve accuracy and reduce false positives. The system includes smoke and temperature sensors and allows SMS notifications for better interaction and detection (Deve, Hancke, & Silva, 2016)[5]. Mobin et al. (2016) describe the Safe from Fire (SFF) system, an intelligent fire detection and extinguishing system that uses sensors and fuzzy logic to detect and address fires accurately, with automated notifications and fire suppression (Mobin et al., 2016)[6]. Jadon et al. (2019) present FireNet, a lightweight neural network for real-time fire and smoke detection, optimized for deployment on IoT devices like Raspberry Pi. The model offers high performance with minimal size, addressing issues of false alarms and delays (Jadon et al., 2019)[7]. Sung-Ho (2016) evaluates the response characteristics of different fire detectors in a warehouse setting, finding that fixed temperature detectors are less effective for early fire detection compared to rate-of-rise and photoelectric detectors due to slower response times (Sung-Ho, 2016)[8]. Sowah et al. (2020) developed a smart fire detection system using multiple sensors and real-time web integration to enhance early fire detection and security. The system processes data with fuzzy logic and CNNs, displaying results on a web portal for improved monitoring and intruder detection (Sowah et al., 2020)[9].

Key areas covered in the literature review of BNBC for this system include: Fire Alarm System Design Standards: The BNBC specifies the standards and criteria for designing fire alarm systems, including the types of detectors, alarm notification devices, and control panels required for different building occupancy. It provides guidelines for the layout, zoning, and coverage of fire detection devices to ensure comprehensive coverage and early detection of fire incidents.

CHAPTER 3
METHODS AND MATERIALS

Designing and implementing the Smart Fire Alarm and Detection System for the EEE Building entails installing modern smoke detectors, multi-sensor detectors, hooters, and manual call points to ensure full fire protection. Smoke detectors and multi-sensor detectors, which detect both smoke and heat, are deliberately located to ensure accurate detection. The technology lowers false alarms and sends out speedy signals, enabling for efficient evacuation and firefighting response. Manual call points are set at doors and in strategic locations to facilitate access. To ensure long-term reliability, the installation must be meticulously designed, including detector location, wiring, and integration with the building's electrical system, and maintained on a regular basis. This initiative emphasizes the relevance of sophisticated fire safety protocols and cutting-edge technologies in improving infrastructure protection.

3.1 Methodology

We opted for an Addressable Fire Alarm System (AFAS) model for the design of the fire alarm system in EEE building. The rationale for this decision is outlined below.

Conventional Fire Alarm Control Panel (CFACP):

It is commonly used in small and medium-sized organizations and provides a structured way to find a specific device, which sends a signal through an alarm system. This system affects devices and provides opportunities for threat or fire detection. When a threat or fire is detected, the system sends an audible signal so that everyone can be alerted and again transferred to minimize damage, injuries, and fatalities.

Figure 3.1: Conventional Fire Alarm System.

Addressable Fire Alarm Control Panel (AFACP):

An addressable fire alarm system is a system in which each device is given a unique address, which facilitates individual control and security arrangements for almost all devices. For example: each smoke detector, heat detector, sprinkler, and other devices. This system maintains a sensor for each device that ensures maximum alertness and impacts adversaries when fire or threat is detected. When fire or threat is detected in the system, it sends a signal that identifies the location of the fire or threat and provides the necessary minimum rights for response and evacuation.

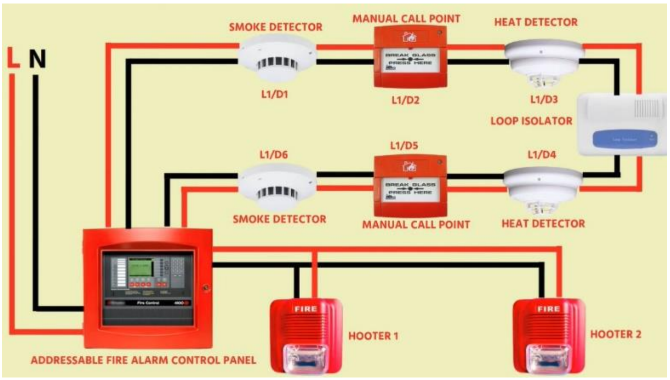


Figure 3.2: Addressable Fire Alarm System.

3.2 System Design and Components

The Smart Fire Alarm and Detection System is designed to be installed at the Electrical and Electronic Engineering (EEE) Building and compromises the advanced smoke detectors, Multi Sensor Detectors, hooters, a central control Panel and Manual Call Points to effectively work in eliminating the danger of a fire. This device is fixed around the building and to enable it to sense the presence of smoke particles it is equipped with smoke detectors. Smoke, heat, and carbon monoxide detectors are integrated into Multi Sensor Detectors during installation to increase their accuracy, while decreasing their chances of producing false alarms.

Manual call points are used to manually trigger fire alarms and help in identifying the location, responding quickly and are also useful in meeting safety standards. All these detectors are connected to one master control panel and it can be referred to literally as the heart and mind of the system, as it receives input from all the connected detectors and manual call point. When there is smoke or some other sign of a fire, the control panel sounds a set of horns known as hooters, which produce loud and audible sounds to warn those in the building of the impending calamity. The control panel is also equipped with the map showing the location of the activated detectors so that the authorities can easily find the place.

Every aspect of the system is made to be dependable and fastidiously planned to construct the many parts as orderly as possible to locate each corner and figure out the best way to be the most effective. It is important to keep maintaining and testing the system for its reliability over the years to really give the EEE Building a sound and effective form of fire safety system.

The fire alarm detection system for the building incorporates an addressable fire alarm system to help in identifying the location and extent of a fire. The following components are integral to the system design. The following components are integral to the system design:

- **Addressable Fire Alarm Control Panel (FACP):** The FACP is the brain of the fire alarm system and it is located on the ground floor in case one needs to access it or maintain it. It collects data from detectors, analyze the data and sends command to the alarm notification devices in case there is fire.

Figure 3.3: FACP

- **Smoke Detectors:** Smoke detectors are installed in classrooms to monitor for the presence of smoke which could mean fire eruption.

Figure 3.4: Smoke Detector

➢ **Multi Sensor Detectors:** Known as Multi Sensor Detectors, these systems are fitted in corridors to ensure a more advanced form of fire detection that involves both smoke and heat.

Figure 3.5: Multi Sensor Detector

➢ **Manual Call Points:** There are manual call points on every exit door of each floor to ensure that in case of an emergency one can easily access them. It enables occupants to turn on the fire alarm system to start the evacuation process physically.

Figure 3.6: Manual Call Pont

➢ **Notification Devices (Hooters):** These include the hooters which are audible notification devices installed at all exits and in the center of every floor to inform people in case of fire. These devices produce loud and clear noises to make sure people leave the building as fast as possible.

Figure 3.7: Hooter

➢ **End of Line (EOL) Resistors:** End of line resisters are used with the detectors to help monitor the wiring circuit of the system. They maintain that the circuit is not tampered with or damaged and if there is a cut in the wiring, the control panel is informed.

Figure 3.8: EOL Resistor

3.3 Procedure of Working

The EEE Building at Daffodil Smart City needs an upgraded fire alarm and detection system to ensure occupant safety. An Addressable Fire Alarm Control Panel (FACP) system provides advanced features that significantly enhance fire detection accuracy, timely emergency responses, and overall safety compared to a Conventional FACP system.

An addressable FACP system allows precise identification of alarm locations, as each device has a unique address. This system uses Multi Sensor Detectors that can simultaneously detect smoke, heat, and carbon monoxide, ensuring a more accurate and faster response to potential fire hazards. In contrast, a conventional FACP system groups devices into zones, making it difficult to pinpoint the exact location of an alarm within a zone. It typically relies on single-sensor detectors, which may delay the detection process.

Integration capabilities also differ between the two systems. An addressable FACP integrates seamlessly with the Building Management System (BMS), allowing centralized monitoring and control. It supports remote access and control, making it easier to manage and respond to alarms. On the other hand, a conventional FACP has limited integration capabilities with other building systems and generally lacks remote access features, making it less efficient in terms of monitoring and control. When it comes to alert and notification, an addressable FACP provides detailed information about the exact location and nature of the fire. Automated notifications can be sent to local fire departments with specific details, facilitating a quicker and more informed emergency response. In contrast, a conventional FACP offers basic alerting, usually through bells or horns, without providing detailed information. Manual intervention is often required to notify emergency services, which can delay response times.

Maintenance and testing are simplified with an addressable FACP. This system allows for easy monitoring and testing of individual devices, making it straightforward to identify and repair faulty devices. In contrast, maintenance for a conventional FACP can be more challenging, as faults are identified by zone rather than by individual device, requiring manual checking of each device within a zone. The addressable FACP system is also more flexible and scalable, allowing for easy expansion and integration of additional devices. It can accommodate changes and upgrades without significant reconfiguration. In contrast, a conventional FACP is less flexible, making expansion and upgrades more complex and time-consuming, often requiring extensive rewiring and reconfiguration. While the initial cost of an addressable FACP system is higher due to advanced technology and features, the long-term operational and maintenance costs are lower due to increased efficiency. In comparison, a conventional FACP has a lower initial cost but potentially higher long-term costs due to less efficient maintenance and system limitations.

The addressable FACP system offers significant advantages over the conventional FACP system in terms of detection accuracy, integration capabilities, detailed alerting, simplified maintenance, and scalability. Although the initial investment may be higher, the long-term benefits in safety, efficiency, and operational cost savings make it a superior choice for the EEE Building at Daffodil Smart City.

3.4 Proposed Design

The Smart Fire Alarm and Detection System of EEE Building includes smart and systematically coordinated detection, notification, and control arrangements to achieve speedy action during fire incidents. It utilizes Auto Cad for architectural design and integration and is scalable enough to accommodate the current capacity of the company.

First of all, the layout of EEE Building is categorized into discrete zones as per their activities and occupants. Specific primary zones are laboratories, classroom, corridors, stairs, and other common areas. Each laboratory and classroom is equipped with a smoke detector because these are potential fire-prone zones given the presence of electrical installations and laboratory experiments. These smoke detectors are very effective and reach a point of detecting even the smallest proportion of smoke, various to signify possible fire risks.

Ground Floor:

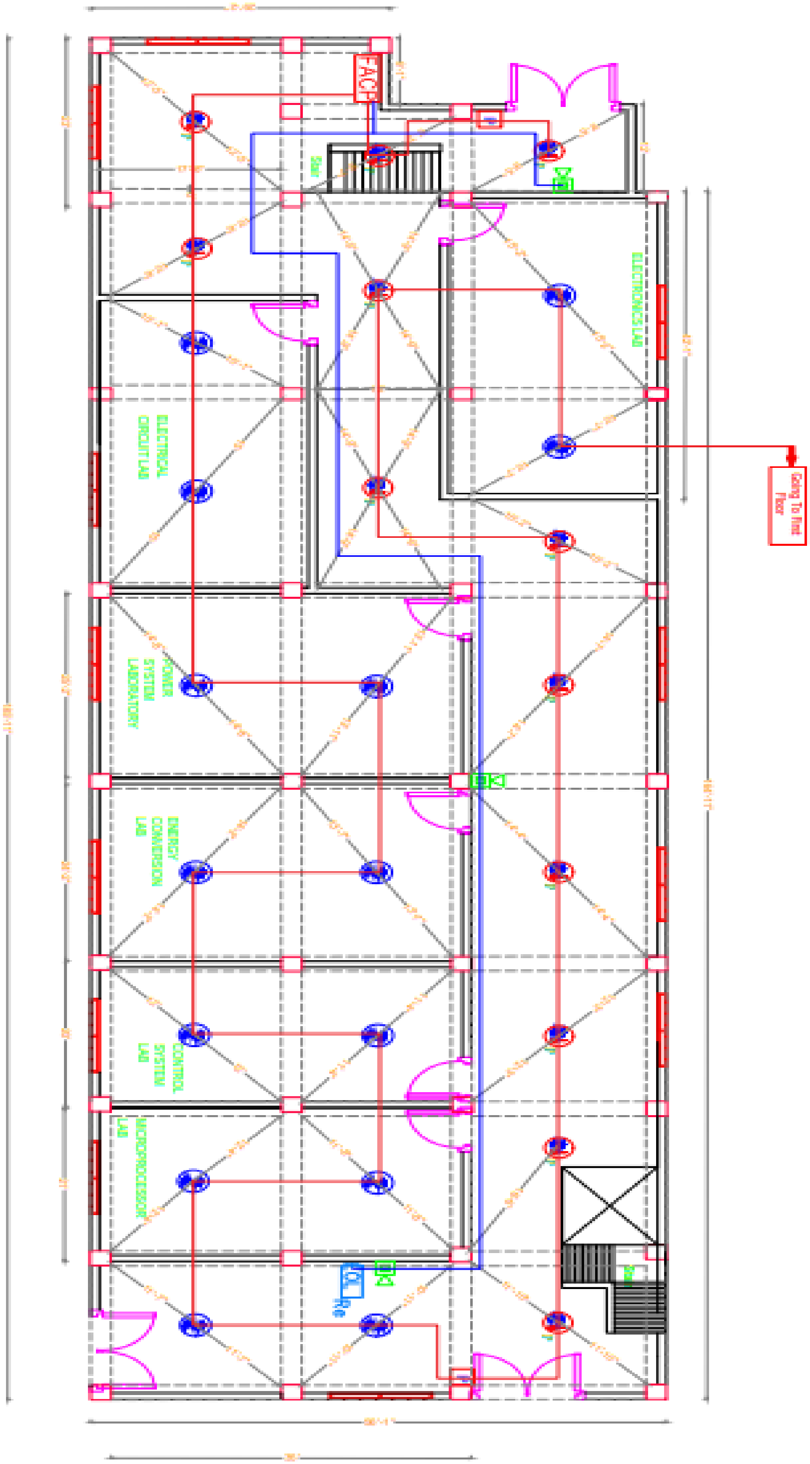


Figure 3.9: Proposed Design of Ground Floor.

First Floor:

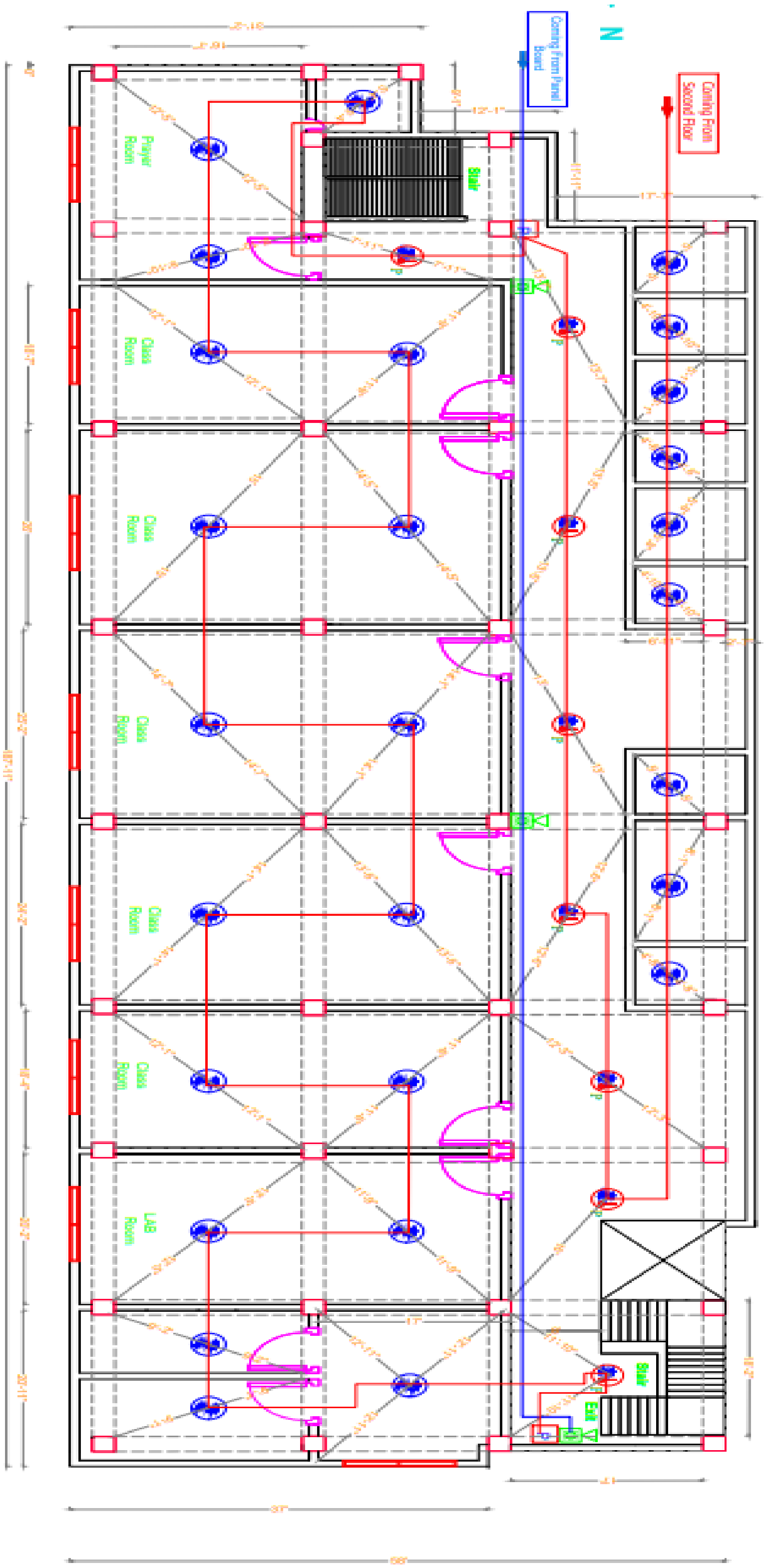


Figure 3.10: Proposed Design of First Floor

Second Floor:

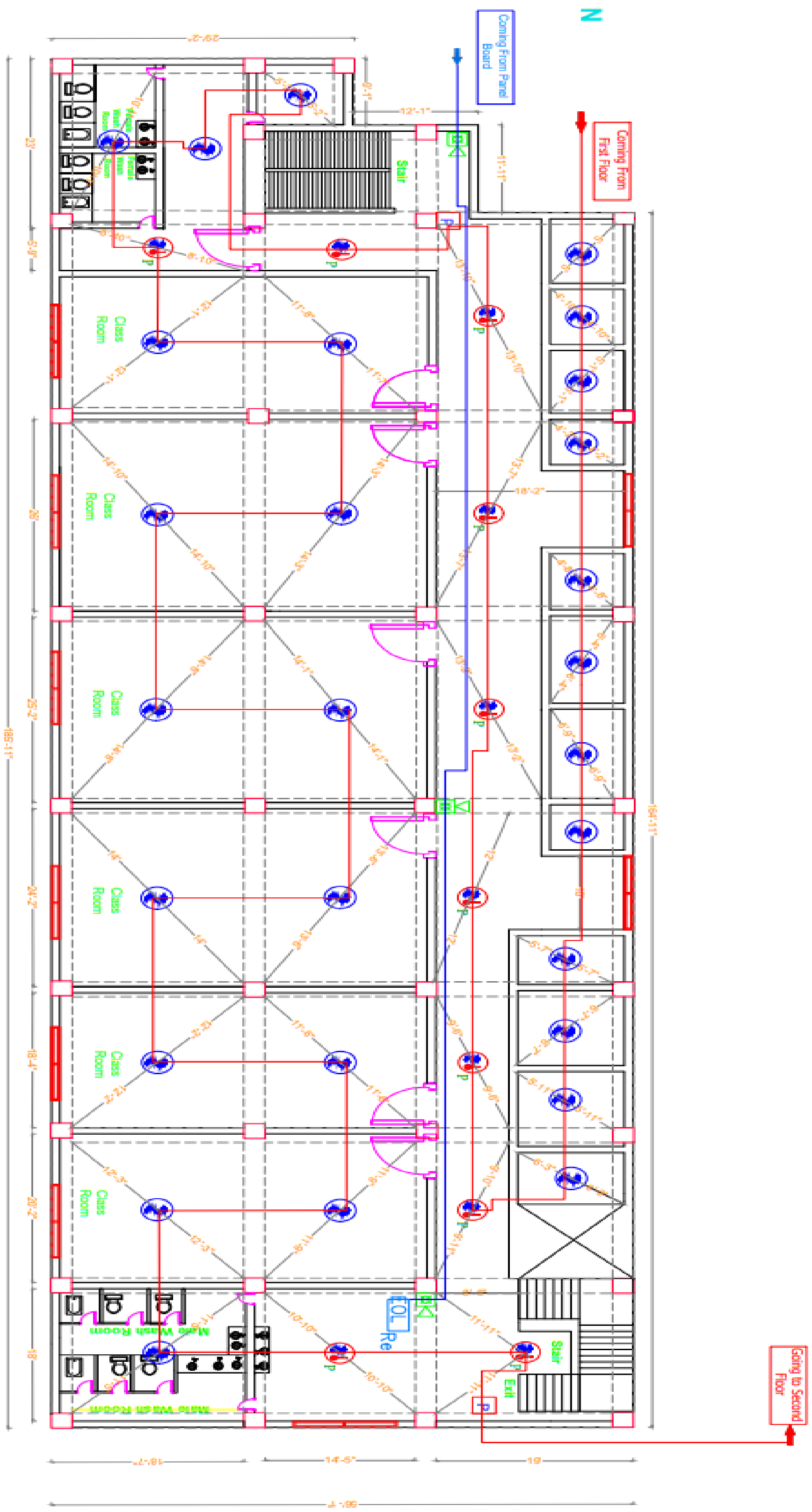


Figure 3.11: Proposed Design of Second Floor.

Third Floor:

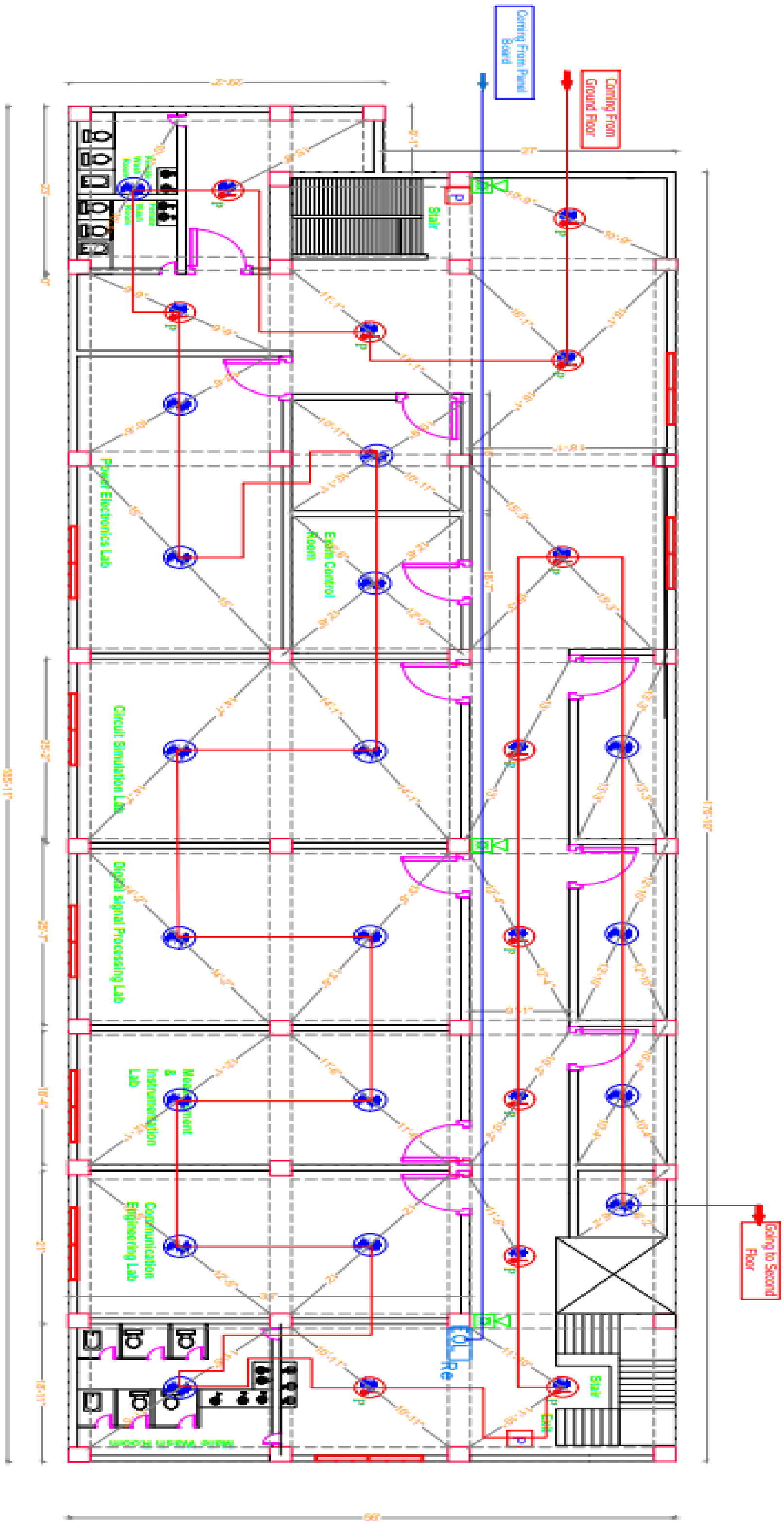


Figure 3.12: Proposed Design of Third Floor.

Corridors are the main evacuation routes, and they are illuminated with the help of Multi Sensor Detectors. These detectors are made to detect both smoke and heat and hence is more accurate as a fire detector. This way, a combination of two sensors reduces the false alarms and increases the percentage of real fire conditions recognizable. The Multi Sensor Detectors are mounted in the form of a grid along the length of the corridor to ensure that there is adequate coverage. For audible signal, bells are placed at strategic positions such as in the partitions of the building. These hooters are intended to produce a clear and audible alarm which should be able to wake up all occupants in that building to start evacuating immediately. The positioning of the hooters is strategically done in order to achieve adequate enhancing coverage without interference from walls and other structures.

Manual call points are installed on walls alongside stairs and other exit passages. These call points act as buttons whereby the occupants of a building can sound the fire alarm before the system can automatically detect the fire. The manual call points are both easily reachable and operable and are intended to be operated, no matter the stress level, by anybody.

The core of the construction is a control panel which is situated on the first level on the ground. This is the control panel through which all detectors, hooters and manual call points in the entire network are controlled. It also has the capability of remotely monitoring and controlling with an easy-to-use front end. The control panel also describes the current status of all connected devices to provide the building management and emergency crews with information about the detected fire source location. It also incorporates battery backup and multiple pathways for communication to ensure that it runs even in situation with power outages.

The EEE Building's proposed Smart Fire Alarm and Detection System consists of a control panel, a strong wire network, manual call points, smoke detectors, multi-sensor detectors, hooters, and manual call points. While multi-sensor detectors—which can detect heat as well as smoke—are positioned in hallways to lessen false alarms, smoke detectors are installed in labs and classrooms. The building is equipped with hooters that emit loud alerts, and manual call stations are placed close to the staircases and exits. As the primary monitoring and operating unit, it is housed on the ground floor control panel. Careful preparation is necessary during the installation procedure to guarantee ideal location and operation. Call points are conveniently located, hooters provide a broad audio coverage, multi-sensor detectors are installed in hallways, and smoke detectors are positioned in exposed places. The wiring of the system connects every.

CHAPTER 4
FIRE DETECTION SYSTEM FOR DIU EEE BUILDING

The design and implementation of a smart fire alarm and detection system for the Electrical and Electronic Engineering (EEE) building at Daffodil Smart City is a vital project aimed at ensuring the highest level of safety and security for its occupants and valuable equipment. This necessitates a state-of-the-art fire detection and alarm system that can not only detect potential fire incidents at an early stage but also respond swiftly and effectively.

4.1 Approved Design

The design phase focuses on tailoring the fire detection system to the specific needs and characteristics of the EEE building. This includes assessing the building's layout, identifying high-risk areas, and selecting appropriate detection technologies and equipment. The system should be integrated seamlessly with the building's existing infrastructure, ensuring compatibility and ease of use.

During the implementation phase, the system is installed and configured according to the design specifications. This includes placing sensors in strategic locations, connecting them to a central monitoring system, and testing the system to ensure it operates correctly. Effective implementation also involves training staff on how to use and maintain the system, as well as establishing procedures for responding to fire alarms.

Ground Floor:

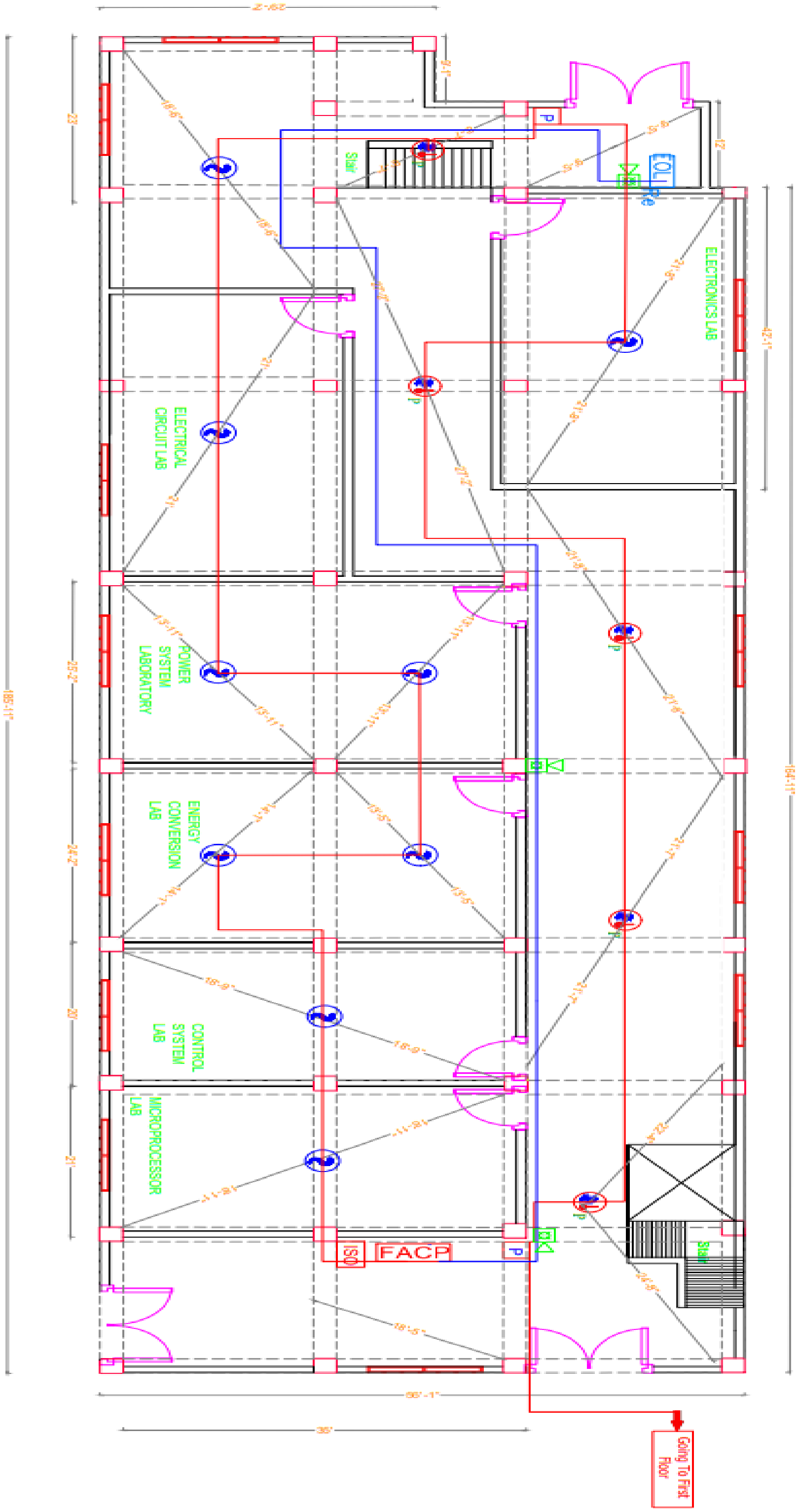


Figure 4.1: Approved Design of Ground Floor.

First Floor:

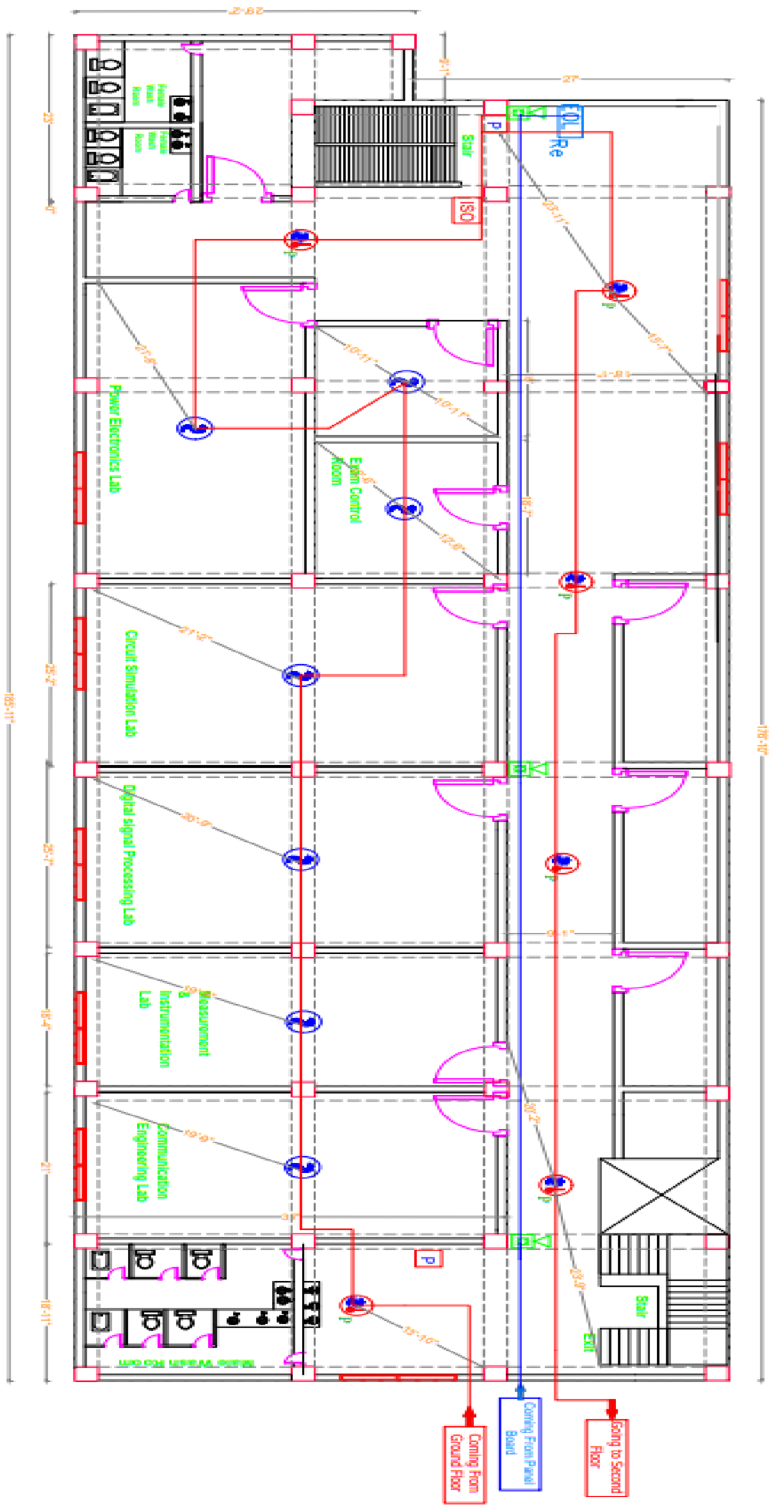


Figure 4.2: Approved Design of First Floor.

Second Floor:

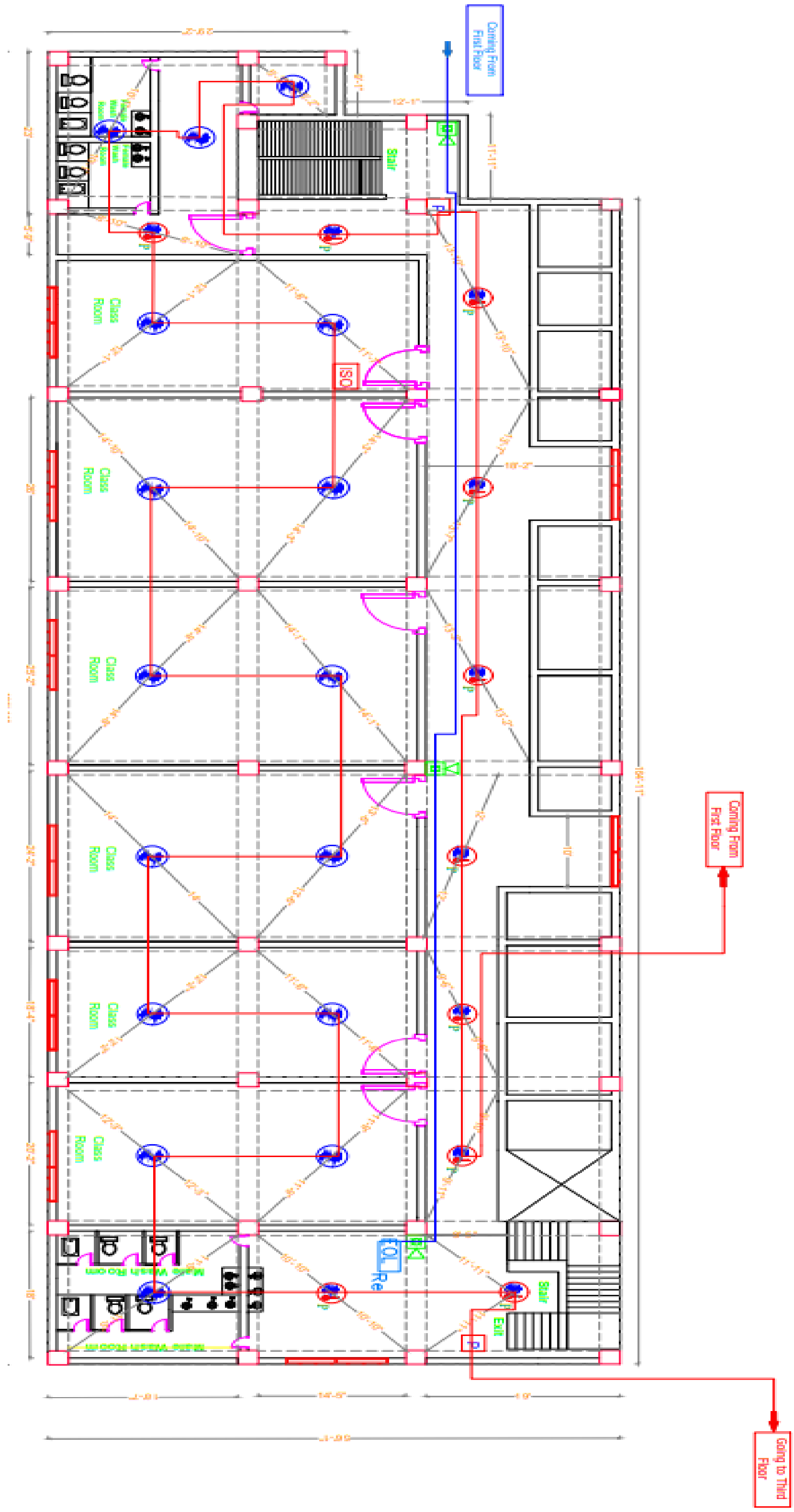


Figure 4.3: Approved Design of Second Floor.

Third Floor:

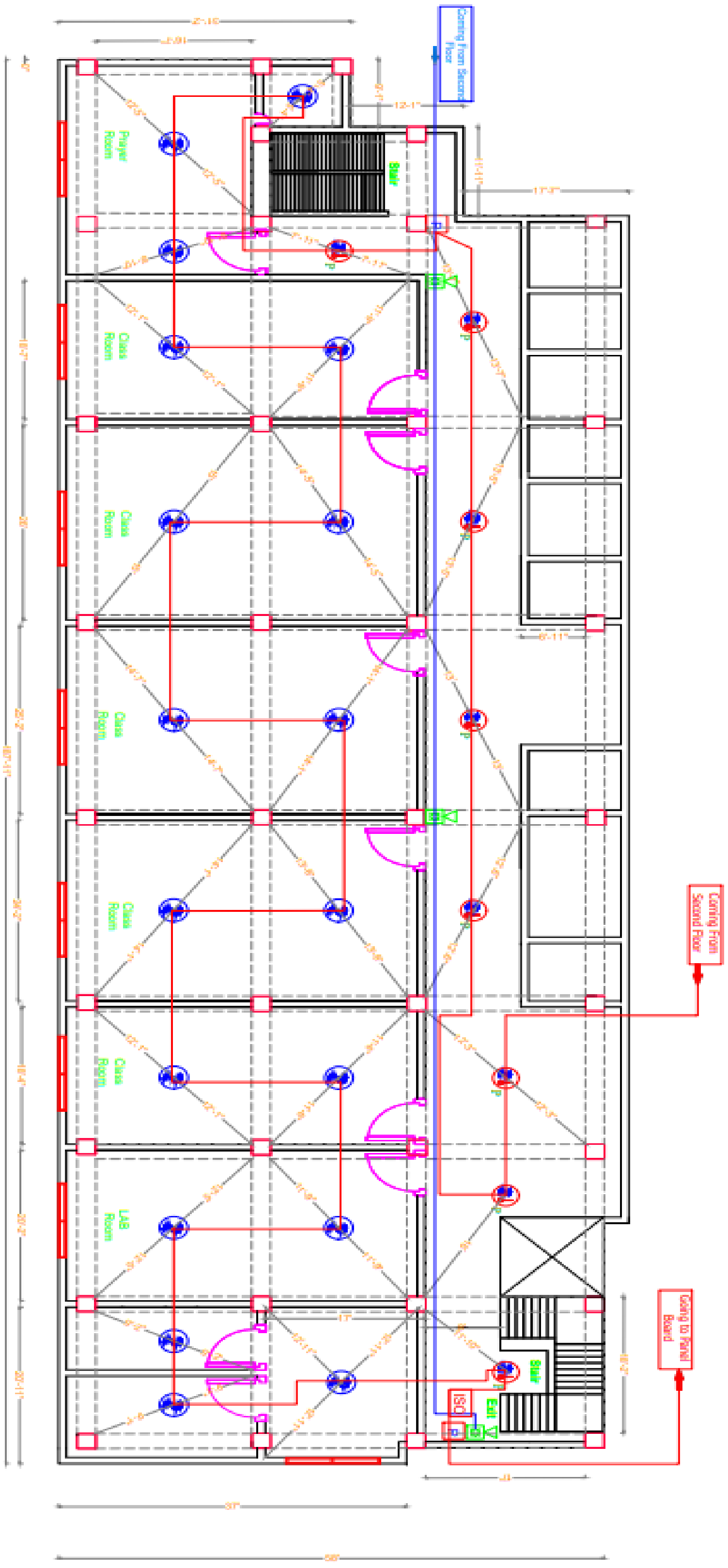


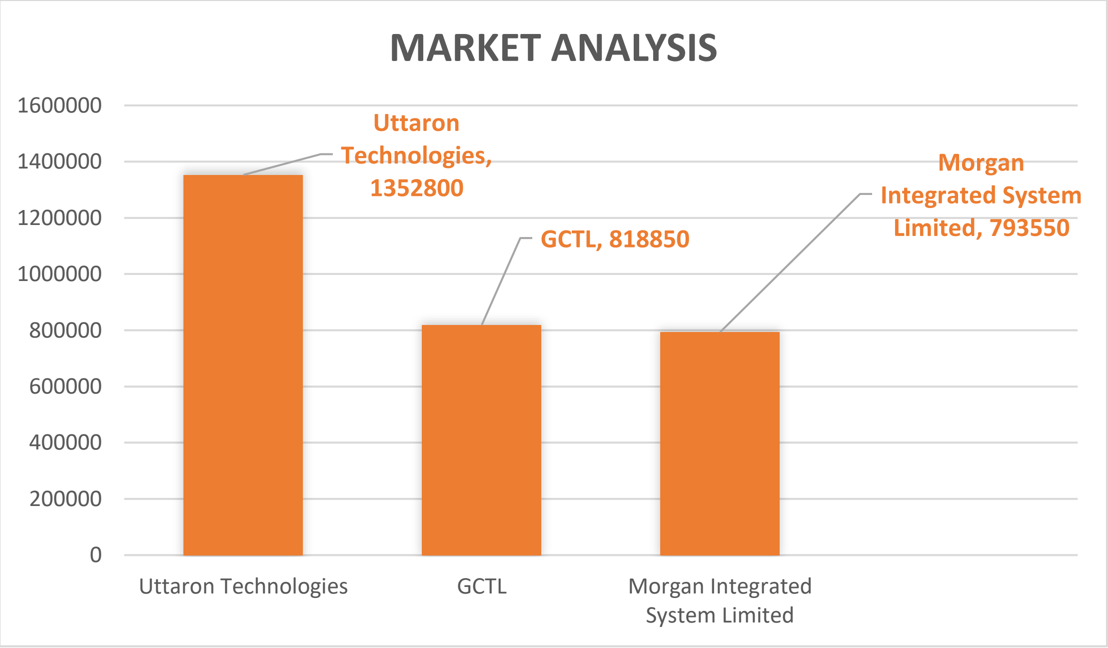
Figure 4.4: Approved Design of Third Floor

4.2 Market Analysis for Equipment

We Selecting Morgen Company Limited for the fire alarm system design project equipment for the EEE building at Daffodil Smart City is a strategic decision based on the company's reputation, advanced technology offerings, comprehensive product range, customization capabilities, compliance with safety standards, strong support services, cost-effectiveness, and positive client feedback. These factors collectively ensure that the fire alarm system will be reliable, efficient, and tailored to the specific safety needs of the EEE building.

Table 4.1: Market Analysis.

				Uttaron Technologies		**GCTL**		**Morgen Integrated System Limited**	
SL. NO.	**Particulars**	**Quantity**	**Unit**	**Unit**	**Total**	**Unit**	**Total**	**Unit**	**Total**
1	Fire Alarm Control Pannel	1	set	246000	246000	272600	272600	230000	230000
2	Smoke Detector (SD)	87	Pcs	7000	609000	3250	282750	2950	256650
3	Multi Sensor Detector (MD)	42	Pcs	8100	340200	3250	136500	3250	136500
4	Manual Pull Station	8	Pcs	7700	61600	6350	50800	10500	84000
5	Fire Alarm Sounder with Strobe	12	Pcs	8000	96000	6350	76200	7200	86400
				Total=	**1352800**	**Total=**	**818850**	**Total=**	**793550**



4.3 Budget Proposal

Table 4.2: Budget Proposal.

Budget

Cost Elements	
Equipment Cost	Electrical Tools
Logistic Cost	Others Cost

Cost type	Amount	Cost explanation
Equipment Cost	6,13,224.00/-	Such as smoke detectors, MULTI sensor detectors, Fire Alarm Control Panel (FACP), and manual call pull stations and hooter are the primary means of identifying the presence of a
Electrical Tools	1,00,00.00/-	Such as saddle, screw, royal plug, wire cutter, tester, pliers, drill machine, ladder, and battery for control panel-12V 7Ah are required to implement this project.
Logistic Cost	5,000.00/-	Due to various factors involved in the procurement, transportation, market analysis and handling
Others Cost	61,322.00/-	It's common practice to allocate a portion (10%) of the budget for unforeseen expenses or project contingencies. This ensures that unexpected challenges or changes during the implementation phase can be addressed without disrupting the project timeline or compromising the quality of the fire detection system

Equipment and materials

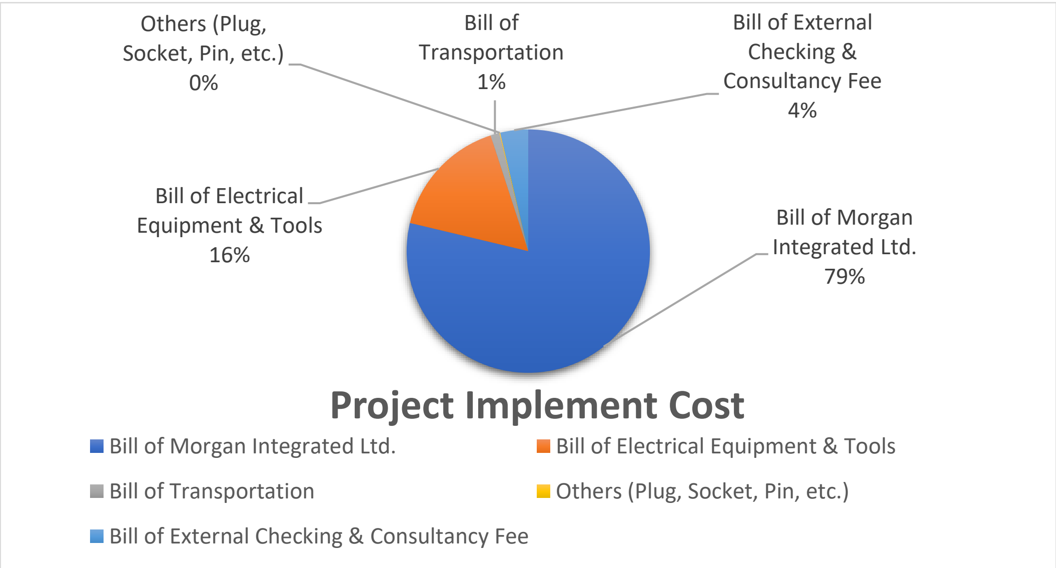
Item Type	Brand & Origin	Quantity	Unit Price	Total Price
SMOKE DETECTOR (SD)	Cooper, UK	33	2950	97350
MULTI SENSOR DETECTOR(MD)	Cooper, UK	19	3250	61750
MANUAL PULL STATION (MPS)	Cooper, UK	8	10500	84000
FIRE ALARM SOUNDER WITHSTROBE (B)	Cooper, UK	12	7200	86400
FIRE ALARM CONTROL PANAL(FACP) LOOP	Elite-RS, UK	1	230000	230000

CABLE (2c, 2.5mm)	Bangladesh	4	5341	21364
CABLE (2c, 1.5mm2)	Bangladesh	10	3236	32360
			Total=	**613224.00/-**
Cost Summary				
Equipment Cost	**Electrical Tools**	**Logistic Cost**	**Others Cost**	**Overall Total**
613224	10000	5000	61322	**689546.00/-**

4.4 Project Implement Cost

Table 4.3: Project Implement Cost.

Reason of Cost	Cost
Total Budget	**6,89,546.00/-**
Bill of Morgan Integrated Ltd.	5,30,700.00/-
Bill of Electrical Equipment & Tools	1,09,231.00/-
Bill of Transportation	7,939.00/-
Others (Plug, Socket, Pin, etc.)	830.00/-
Bill of External Checking & Consultancy Fee Muhammad Maruf Islam Head of Engineering Morgen Integrated Systems Limited	25,000.00/-
Total Bill=	**6,73,700.00/-**



4.5 Equipment Placement & Connection Diagram of Implementation

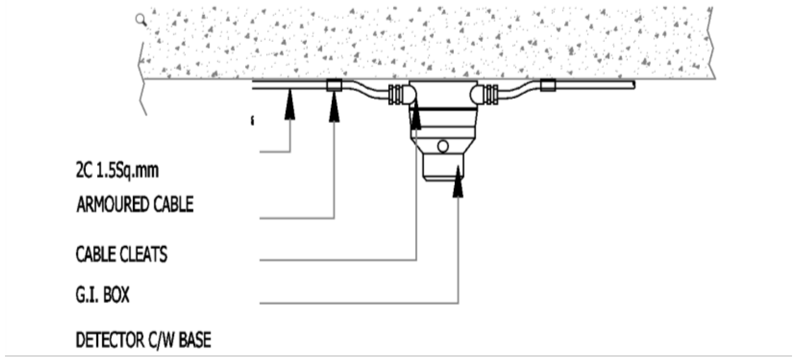


Figure 4.5: Fixed Details of Smoke Detector Surface Mounted

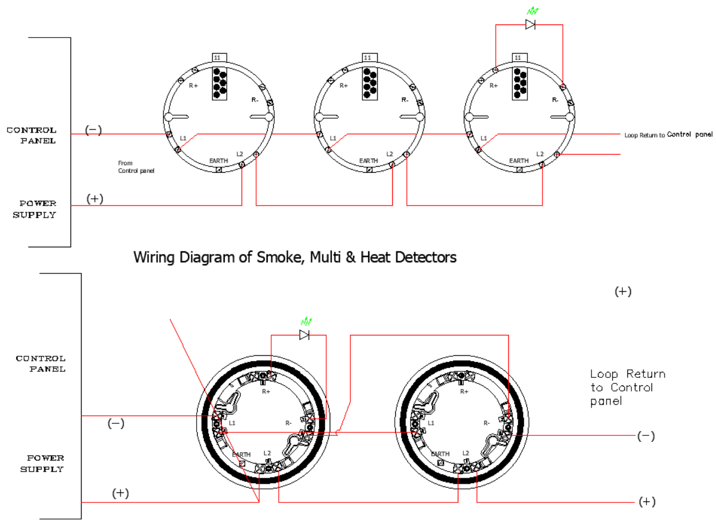


Figure 4.6: Connection Diagram of Detectors.

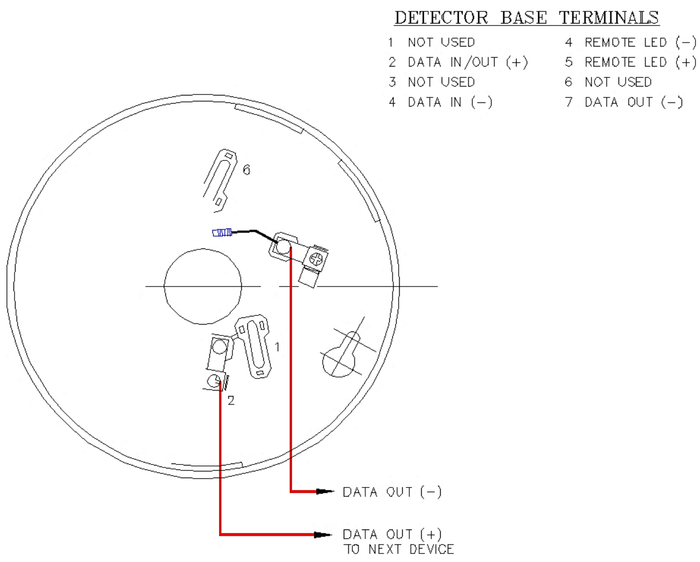


Figure 4.7: Detector on True Celling.

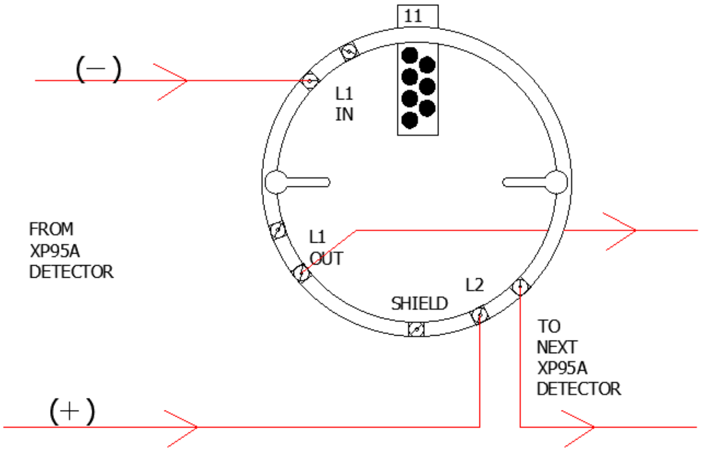


Figure 4.8: Wiring Diagram of ISO Base

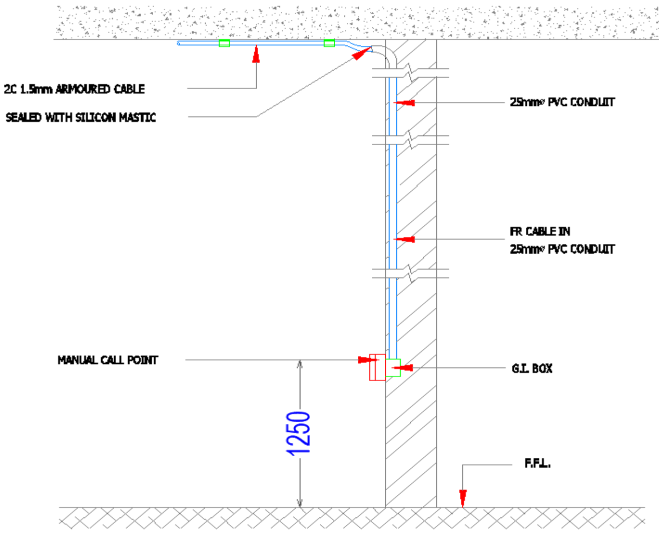


Figure 4.9: Installation Details of Manual Call Point

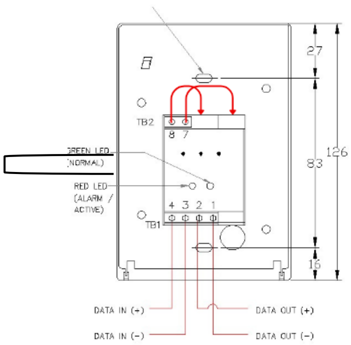


Figure 4.10: Connection Diagram of Addressable Manual Pull Station.

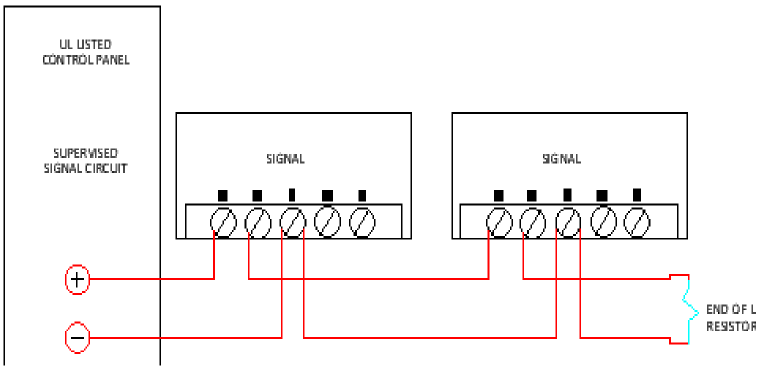


Figure 4.11: Conventional Series Wiring Diagram for Sounder and Strobe

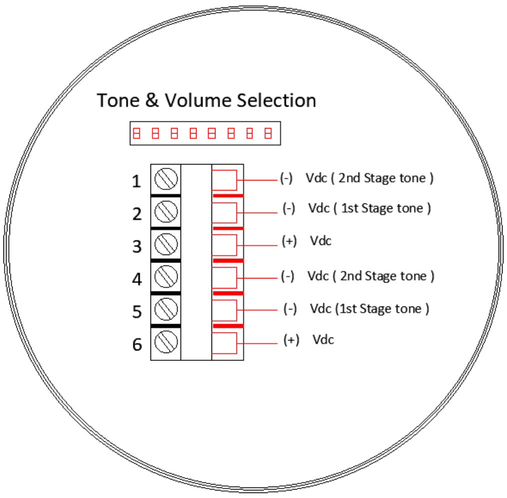


Figure 4.12: Wiring Configuration of Sounder

4.6 Final Design (After completing Implement)

Ground Floor:

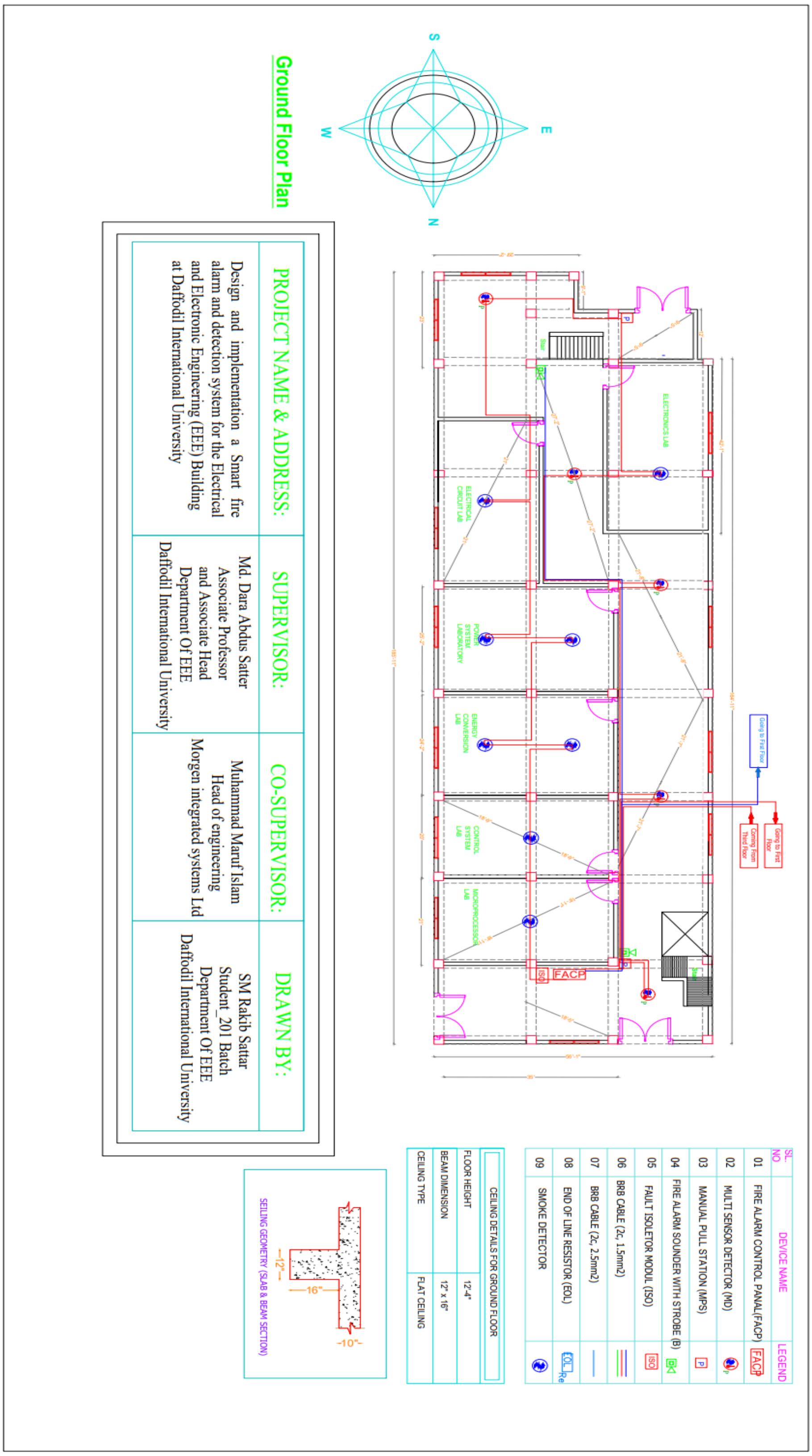


Figure 4.13: Final Design of Ground Floor.

First Floor:

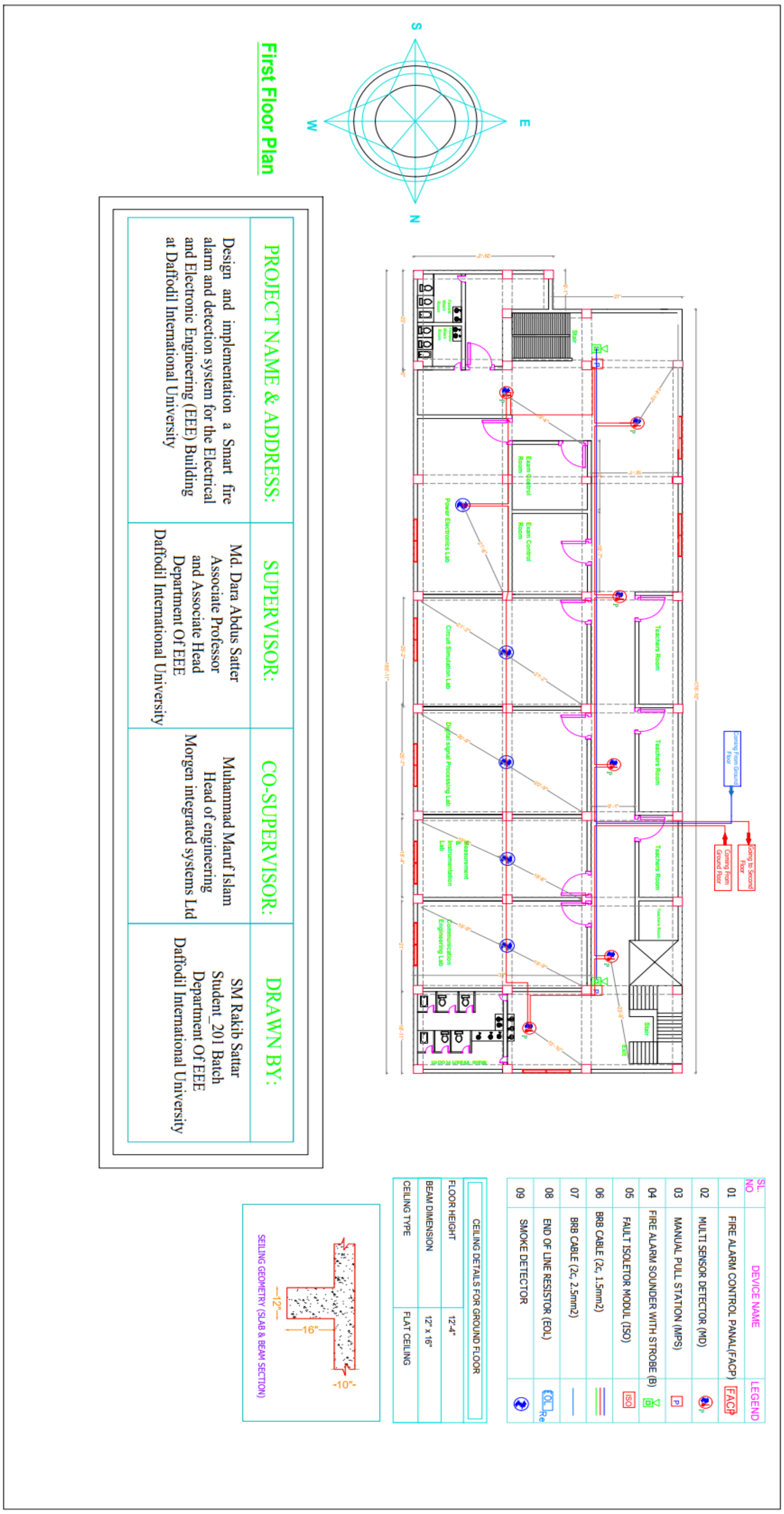


Figure 4.14: Final Design of First Floor.

Second Floor:

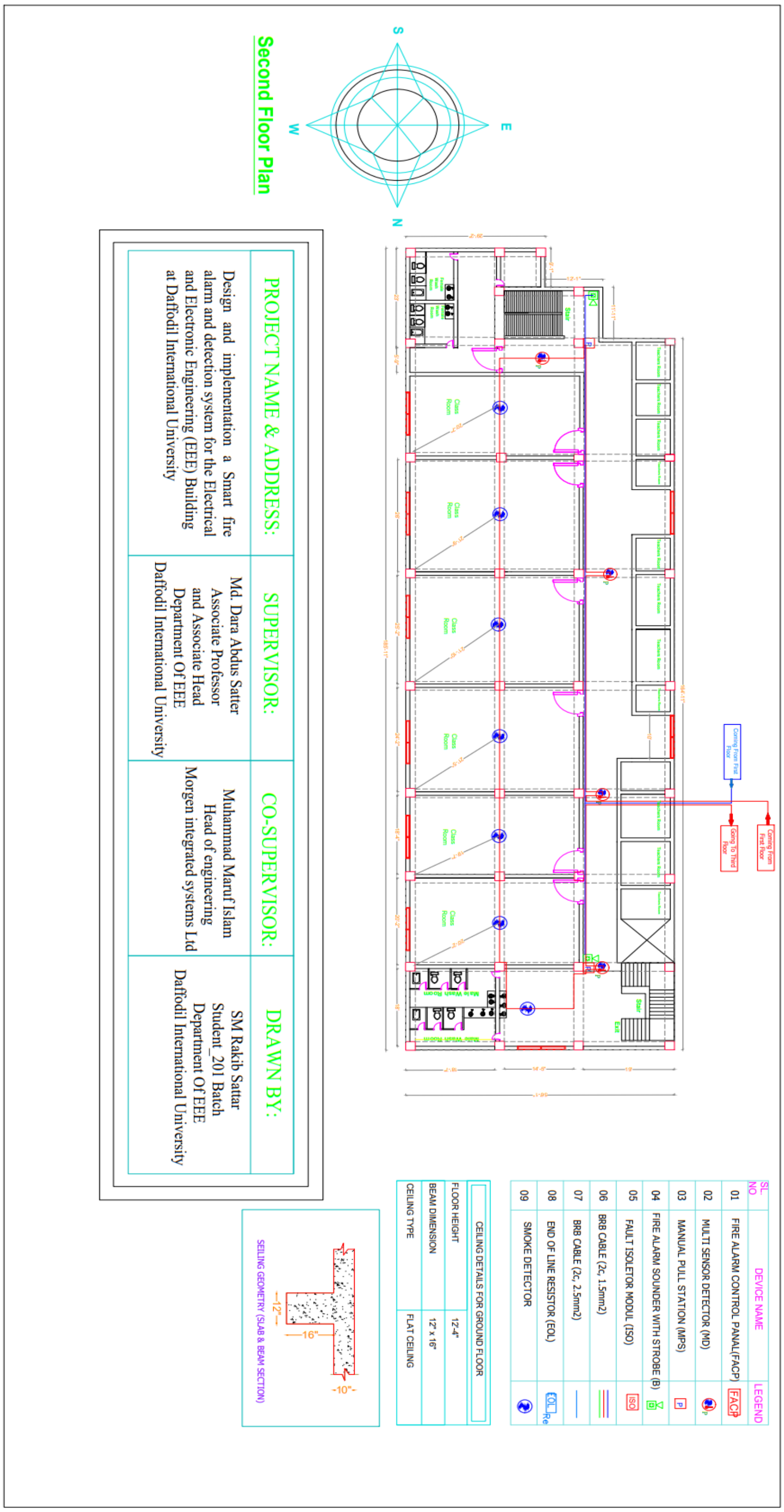


Figure 4.15: Final Design of Second Floor.

Third Floor:

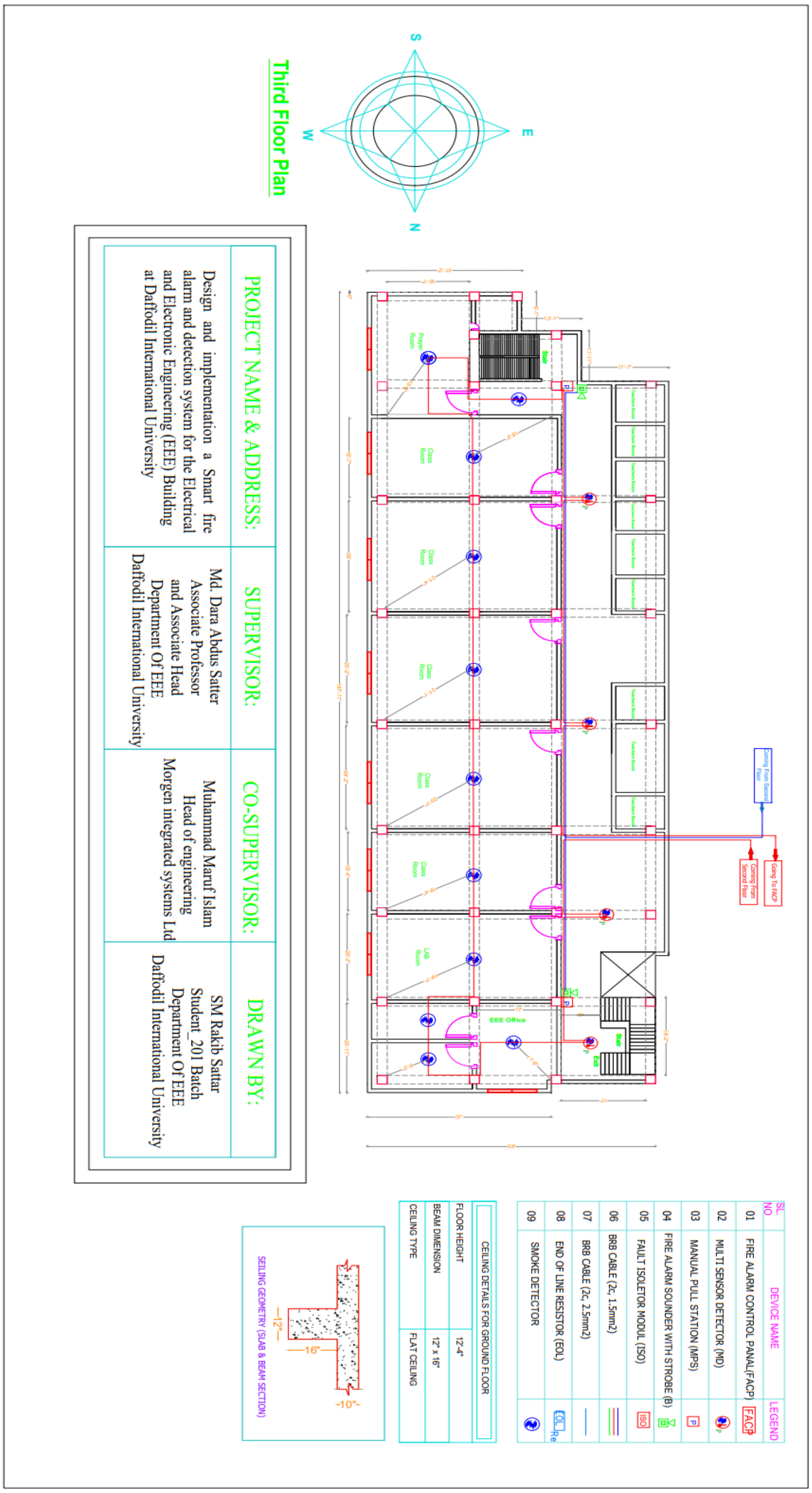


Figure 4.16: Final Design of Third Floor.

4.7 Equipment Location Board

Table 4.4: Equipment Location Board.

SL.	LOCATION	ROOM	Detector	Remark
1	Room No: 101	Microprocessor and Interfacing Laboratory	Smoke	
2	Room No: 102	Control System Laboratory	Smoke	
3	Room No: 103	Energy Conversion Laboratory	Smoke	
4	Room No: 103	Energy Conversion Laboratory	Smoke	
5	Room No: 104	Power System Protection Lab	Smoke	
6	Room No: 104	Power System Protection Lab	Smoke	
7	Room No: 105	Electrical Circuits Laboratory	Smoke	
8	Ground Corridor (North Gate Side)	Power Board	Multi	North Gate Side
9	Ground Corridor	North Gate	Pull	
10	Room No: 106	Electronics Laboratory	Smoke	
11	Ground Corridor (Middle of room number 105 & 106)	Corridor	Smoke	Middle of room number 105 & 106
12	Ground Corridor (Near of room number 104)	Corridor	Multi	Near of room number 104
13	Ground Corridor (Middle of room number 102 & 103)	Corridor	Multi	Middle of room number 102 & 103
14	Ground Corridor (South Gate Side)	Corridor	Pull	South Gate Side
15	Ground Corridor (South Gate Side)	Corridor	Multi	South Gate Side
16	1st floor Corridor (Front of Room Number 201)	Corridor	Multi	Front of Room Number 201
17	1st floor Corridor (South Stair Side)	Corridor	Pull	South Stair Side
18	1st floor Corridor (Male Washroom Side)	Corridor	Multi	Male Washroom Side
19	Room No: 201	Communication Engineering Laboratory	Smoke	
20	Room No: 202	Measurement & Instrumentation	Smoke	

		Laboratory		
21	Room No: 203	Digital Signal Processing Laboratory	Smoke	
22	Room No: 204	Circuit Simulation Laboratory	Smoke	
23	Room No: 205	Power Electronics Laboratory	Smoke	
24	1st floor Corridor (Female Washroom Side)	Corridor	Multi	Female Washroom Side
25	1st floor Corridor (North Stair Side)	Corridor	pull	North Stair Side
26	1st floor Corridor (Front of Room Number 206 B)	Corridor	Multi	Front of Room Number 206 B
27	1st floor Corridor (Front of Room Number 204)	Corridor	Multi	Front of Room Number 204
28	1st floor Corridor (Middle of room number 203 & IT Office)	Corridor	Multi	Middle of room number 203 & IT Office
29	2nd floor Corridor (Front of Room Number 315)	Corridor	Multi	Front of Room Number 315
30	2nd floor Corridor (Front of Room Number 311 & 304)	Corridor	Multi	Front of Room Number 311 & 304
31	2nd floor Corridor (North Stair Side)	Corridor	Pull	North Stair Side
32	2nd floor Corridor (Female Washroom Side)	Power Board	Multi	Female Washroom Side
33	Room No: 306	Classroom	Smoke	
34	Room No: 305	Classroom	Smoke	
35	Room No: 304	Classroom	Smoke	
36	Room No: 303	Classroom	Smoke	
37	Room No: 302	Classroom	Smoke	
38	Room No: 301	Classroom	Smoke	
39	2nd floor Corridor (Male Washroom Side)	Corridor	Smoke	Male Washroom Side
40	2nd floor Corridor (South Stair Side)	Corridor	Pull	South Stair Side
41	2nd floor Corridor (South Stair Side)	Corridor	Multi	South Stair Side
42	3rd floor Corridor (Front of Room	Corridor	Multi	Front of Room Number 401

	Number 401)			
43	3rd floor Corridor (Front of EEE Office)	Corridor	Pull	Front of EEE Office
44	3rd floor Corridor (Front of EEE Office)	Corridor	Multi	Front of EEE Office
45	EEE Office	Office	Smoke	
46	EEE Office	Room of the Head Sir	Smoke	
47	EEE Office	Room of the Associate Head Sir	Smoke	
48	Room No: 401	Classroom	Smoke	
49	Room No: 402	Classroom	Smoke	
50	Room No: 403	Classroom	Smoke	
51	Room No: 404	Classroom	Smoke	
52	Room No: 405	Classroom	Smoke	
53	Room No: 406	Classroom	Smoke	
54	Prayer Room	Namaz Room	Smoke	
55	3rd floor Corridor (Near of Prayer Room)	Power Board	Smoke	Near of Prayer Room
56	3rd floor Corridor (North Stair Side)	Corridor	Pull	North Stair Side
57	3rd floor Corridor (Middle of room number 405 & 406)	Corridor	Multi	Middle of room number 405 & 406
58	3rd floor Corridor (Front of Room Number 403)	Corridor	Multi	Front of Room Number 403

CHAPTER 5
RESULTS AND DISCUSSIONS

5.1 Results & Observations

After the installation of the project was completed, a comprehensive series of checks and observations were performed. The system components, which included smoke detectors, multi detectors, manual call points, and alarm sounders, were installed following the design specifications. Wiring and connections were carefully inspected to ensure they were secure and met the required safety standards. Initially, during the first attempt to check the system, not all detectors were visible on the Fire Alarm Control Panel (FACP). Faults were detected in several devices, including smoke detectors at positions 5, 19, and 21, as well as a multi-detector at position 58. These faults were attributed to issues such as short circuits and incorrect polarity (reversed positive and negative connections). These issues were subsequently resolved, and the detectors were correctly identified and displayed on the FACP the power supply was tested to confirm uninterrupted operation, including the functionality of backup power where necessary. Each detection device was tested individually to ensure proper operation; smoke detectors were triggered with test smoke, heat detectors were tested with a heat source, and manual call points were also checked. The control panel's functionality was confirmed, ensuring it could correctly receive and display alarms, control the sounders, and reset the system as needed. All alarm sounders were activated to verify they produced the required sound levels and functioned properly across all zones. Additionally, interconnections with other systems, such as emergency lighting or building management systems, were tested to ensure proper integration and response. After each test, the system was reset to confirm its ability to return to normal operation. A final inspection ensured all devices were correctly labeled and that the installation work met all required standards. The test results were thoroughly documented, and the system was successfully handed over for final approval and certification.

Figure 5.1: Running Fire Alarm Control Panel (FACP)

Completing a fire protection project not only bolsters the safety and compliance of a building but also significantly enhances its overall resilience and functionality. With the installation of advanced fire detection and suppression systems, the risk of fire-related damage is greatly minimized, protecting both the structure and its contents. This proactive approach to safety reduces the likelihood of severe fires, ensuring that any incidents are swiftly managed and contained, thus preserving property and minimizing disruption.
Moreover, the project ensures that the building adheres to all relevant safety standards and regulations, thereby avoiding potential legal repercussions and financial penalties. The implementation of clear evacuation routes, emergency lighting, and strategically placed signage ensures that occupants can evacuate safely and efficiently in the event of an emergency. This not only enhances safety but also improves the building's emergency preparedness and response capability.

The upgrades also contribute to financial benefits, such as reduced insurance premiums, thanks to the lower risk profile of the building. Occupants and stakeholders enjoy increased confidence and peace of mind, knowing that the building is equipped with state-of-the-art fire safety measures. The installation of these systems also enhances the building's market value, making it more appealing to potential tenants, buyers, and investors. Furthermore, the project strengthens the building's reputation, showcasing the commitment to safety and the well-being of its occupants. It supports the development of a culture of safety and preparedness among building staff and occupants, fostering an environment where emergency protocols are well understood and practiced. Regular fire drills and training sessions ensure that everyone is well-prepared to respond effectively in an emergency, reducing the likelihood of panic and confusion during actual incidents.

Overall, the successful completion of a fire protection project not only safeguards lives and property but also enhances the building's operational efficiency, regulatory compliance, and market appeal, making it a safer, more valuable, and more resilient asset.

5.2 Discussions

First off, we would say that this being our first project involving a Fire Detection System presented us with numerous challenges. One of the primary issues we encountered was working with Building AUTO CAD drawings. These technical drawings are essential for accurately mapping out the installation of fire detection and alarm systems. As newcomers to this aspect of the project, we had to invest significant time in understanding and creating precise layouts.

Another major challenge was conducting a market analysis for the necessary equipment. Since it was our first-time sourcing components for a fire protection project, we had to research extensively to identify the most suitable and advanced technologies available. This involved comparing various products, assessing their features, and determining their compatibility with our project requirements. Selecting a company that could provide reliable and trustworthy products was another hurdle. Given the critical nature of fire protection systems, it was imperative to partner with a supplier known for high-quality, dependable equipment. We had to evaluate multiple vendors, consider their reputation in the industry, review their product warranties, and ensure their equipment met all relevant safety standards and regulations. Implementing the system itself brought its own set of challenges. As we were dealing with new technologies and integrating them into an existing infrastructure, we faced technical difficulties and had to troubleshoot various issues. This required close collaboration with the equipment suppliers, technical support teams, and our own installation crew to ensure everything functioned correctly.

Overall, the experience was a steep learning curve, but it provided valuable insights into the complexities of fire detection and alarm systems. We gained practical knowledge in technical drawing interpretation, market research, vendor selection, and system implementation, all of which will be immensely beneficial for future projects. Despite the initial difficulties, the successful completion of this project marks a significant achievement and enhances our capability to manage similar projects more efficiently in the future.

CHAPTER 6
PROJECT MANAGEMENT

6.1 Task, Schedule and Milestones

Our official start date is July 1, 2023, and our official end date is June 30, 2024, following our work performance. Right now, this part of the document details the beginning and ending of a project and indicates the finishing of a significant assignment. It is possible to provide an explanation for the deviation from the introductory chapter's timeline or milestone.

During the overall project time frame, one major phase completion we achieved was the Project Kickoff. This milestone signified the project's successful launch and beginning, laying the foundation for all subsequent activities.

The Project Kickoff was particularly challenging because it involved several crucial tasks. Firstly, we had to work with Building Auto Cad drawings, which are essential for accurately mapping out the installation of the fire detection and alarm systems. As this was our first time handling such technical drawings, we dedicated considerable effort to understanding and creating precise layouts.

Secondly, we conducted a thorough market analysis for the necessary equipment. This phase required extensive research to identify the most suitable and advanced technologies available. We compared various products, assessed their features, and determined their compatibility with our project requirements. This step was vital in ensuring that we selected the best possible components for the system.

Another critical task during the Project Kickoff was selecting a reliable and trustworthy company to provide the equipment. Given the importance of fire protection systems, partnering with a reputable supplier was essential. We evaluated multiple vendors, considered their industry reputation, reviewed product warranties, and ensured their equipment met all relevant safety standards and regulations. The successful completion of the Project Kickoff was a significant milestone. It provided a solid foundation for the subsequent phases, such as system implementation and testing. Despite the initial difficulties, this phase's successful completion marked a significant achievement, enabling us to proceed with greater confidence and efficiency.

The timetable mismatch is explained by the fact that the opening chapter offers a high-level summary of the entire project performance period. In contrast, this section delves into the specifics of a single phase, emphasizing a significant accomplishment within that time frame. By focusing on the Project Kickoff, we underscore a crucial step in the overall project timeline, highlighting our ability to overcome initial challenges and set the stage for successful project completion.

6.2 Resources and Cost Management

1. Financial Resource Allocation:

Daffodil International University, provided the entire budget for the implementation of the fire detection system in the EEE building. This centralized financial support ensures that all costs associated with the project, including equipment procurement, installation, and testing, are covered. This approach streamlines budgeting and financial oversight, simplifying the management of expenditures throughout the project life cycle.

2. Budget Planning and Control:

With the university covering the full cost, there is a clear structure for budget planning and control. Detailed financial planning is crucial for ensuring that all expenses are anticipated and managed effectively. This involves creating a comprehensive budget that includes costs for equipment, labor, installation, and any contingencies. Regular monitoring of the budget helps in controlling costs and avoiding overspending. Accurate forecasting and financial tracking contribute to maintaining the project's financial health.

3. Resource Allocation and Utilization:

The university's funding not only covers financial costs but also facilitates the efficient allocation and utilization of resources. This includes human resources, such as project managers, engineers, and technicians, as well as physical resources like advanced fire detection equipment. Proper resource management ensures that the right personnel and equipment are available when needed, which is essential for the timely and effective implementation of the fire detection system.

4. Project Oversight and Accountability:

Our Supervisor's role involves overseeing the project, ensuring that both resources and costs are managed efficiently. His oversight includes monitoring the progress of the installation, managing the budget, and addressing any issues that arise. Accountability measures, such as regular progress reports and financial audits, are implemented to ensure transparency and adherence to the project plan. This oversight is crucial for ensuring that the project stays on track and meets its objectives.

6. Institutional Support and Efficiency:

The university's support extends beyond financial backing to include institutional resources and expertise. This support enhances the project's efficiency by providing access to university facilities, technical expertise, and administrative assistance. Efficient use of these resources contributes to the successful implementation of the fire detection system, ensuring that all aspects of the project are executed effectively and within the allocated budget.

In summary, the comprehensive financial support provided by Daffodil Smart City, along with the oversight and expertise of our Supervisor Sir, plays a crucial role in the effective management of resources and costs for implementing the fire detection system in the EEE building. This approach ensures that the project benefits from well-planned budgeting, efficient resource utilization, strategic vendor selection, and robust project oversight, leading to successful implementation and enhanced safety for the building's occupants.

CHAPTER 7
IMPACT ASSESSMENT OF THE PROJECT

7.1 Economical, Societal and Global Impact

The development and implementation of the smart fire alarm and detection system in the EEE Building of Daffodil Smart City have significant economical, societal, and global impacts. Economically, the project contributes to the enhancement of infrastructure by introducing advanced safety measures, potentially reducing the risk of property damage and financial losses due to fire incidents. Additionally, the project fosters employment creation through the need for skilled professionals for installation, maintenance, and monitoring of the system.

Societal, the system directly influences the safety and well-being of building occupants, including students, faculty, staff, and visitors. By providing timely detection and alerting mechanisms, the system helps in minimizing potential harm and casualties during fire emergencies, thereby improving the overall quality of life within the campus community.
On a global scale, the project aligns with sustainability goals by promoting efficient energy consumption and generation. The implementation of modern fire safety technologies reduces the likelihood of catastrophic events, thereby mitigating environmental impacts associated with fire incidents.

7.2 Environmental and Ethical Issues

The installation of a fire detection system involves several components that can impact the environment. Choosing equipment that is environmentally friendly and energy-efficient is essential. For instance, selecting sensors and alarms that use less power and have longer lifespans can reduce waste and energy consumption. Additionally, proper disposal and recycling of old equipment and packaging materials should be ensured to minimize environmental impact.

The project also requires attention to the potential environmental footprint of the installation process. Reducing construction waste, minimizing disruptions to the building's existing infrastructure, and using sustainable materials where possible are important considerations. It is crucial to ensure that the installation does not negatively affect the building's energy efficiency or contribute to increased resource consumption.

Ethical Issues:

From an ethical perspective, the primary concern is ensuring that the fire detection system meets all safety and regulatory standards. This includes using high-quality materials and technologies that provide reliable protection and do not compromise the safety of the building's occupants. Transparent communication with stakeholders about the system's capabilities and limitations is also important. Moreover, ethical vendor selection practices are essential. It is important to choose suppliers who adhere to fair labor practices and ethical business standards. Ensuring that the products are sourced responsibly and that the vendors operate transparently can contribute to ethical project execution. Finally, considering the privacy of occupants is another ethical issue. While the fire detection system needs to be effective in monitoring and alerting, it should not infringe upon individuals' privacy. Ensuring that the system collects only the data necessary for fire detection and maintains confidentiality is crucial. Addressing these environmental and ethical issues ensures that the fire detection system project is not only technically successful but also aligned with broader sustainability and ethical standards.

7.3 Utilization of Existing Standards or Codes

The project for implementing the fire detection system for the EEE Building at Daffodil Smart City adheres to several established standards, safety codes, and regulations to ensure compliance, effectiveness, and safety.

- **Bangladesh National Building Code (BNBC):**
  The BNBC provides comprehensive guidelines for building safety and construction practices in Bangladesh. For this project, the BNBC was consulted to ensure that the fire detection system meets local regulatory requirements and safety standards. The code covers aspects such as structural fire protection, means of egress, and fire detection and alarm systems. Adhering to BNBC guidelines ensures that the fire detection system integrates seamlessly with other safety measures in the building.

- **NFPA 72 (National Fire Alarm and Signaling Code):**
  NFPA 72 is a widely recognized standard developed by the National Fire Protection Association (NFPA) that governs the design, installation, and maintenance of fire alarm systems. Compliance with NFPA 72 was crucial for ensuring that the fire detection system is effective, reliable, and up-to-date with industry best practices. This standard address various aspects of fire alarm systems, including system design, installation practices, testing procedures, and maintenance requirements.

- **Device Installation and System Design:**
  Both BNBC and NFPA 72 provide detailed guidelines on the installation of fire detection devices such as smoke detectors, heat detectors, and manual pull stations. These standards ensure that devices are installed at appropriate locations and heights, considering factors like building layout and potential fire hazards. Proper installation is critical for the optimal performance of the fire alarm system.

- **System Testing and Maintenance:**
  Standards from both BNBC and NFPA 72 include requirements for system testing and maintenance. Regular testing ensures that the fire detection system functions correctly and meets performance expectations. Maintenance protocols are established to address issues such as device malfunctions, system updates, and overall system reliability. Adhering to these standards helps ensure that the fire alarm system remains effective throughout its operational life.

- **Compliance and Documentation:**
  Compliance with these standards also involves maintaining proper documentation, including system design plans, installation records, and maintenance logs. This documentation is essential for verifying that the system meets all regulatory requirements and for providing a basis for future inspections and audits.

By following the BNBC and NFPA 72 standards, the project ensures that the fire detection system not only complies with local regulations but also adheres to internationally recognized best practices. This approach enhances the system's reliability, effectiveness, and overall safety, providing peace of mind to stakeholders and occupants.

7.4 Other Concerns

In addition to adhering to standards and addressing environmental and ethical issues, there are several other concerns that need to be considered for the fire detection system project in the EEE Building:

1. System Integration:

Ensuring that the new fire detection system integrates seamlessly with existing building infrastructure is crucial. This includes compatibility with current electrical systems, integration with building management systems, and alignment with any other safety or alarm systems in place. Proper integration helps in avoiding conflicts and ensures the overall effectiveness of the fire detection system.

2. Training and Education:

Providing adequate training for building occupants and maintenance staff is essential for the effective operation of the fire detection system. Training should cover system usage, response protocols during alarms, and basic troubleshooting techniques. Well-informed users and staff can respond more effectively during emergencies and maintain the system properly.

3. System Scalability:

Considering future scalability of the fire detection system is important. The system should be designed to accommodate potential future expansions of the building or changes in usage. This includes ensuring that the system can be easily upgraded or expanded without requiring a complete overhaul.

4. Budget and Cost Management:

Effective budget management throughout the project is critical. This includes not only initial costs for equipment and installation but also long-term costs for maintenance and potential upgrades. Proper budgeting helps in avoiding unexpected financial strain and ensures that the project remains within financial constraints.

5. Communication and Coordination:

Maintaining clear communication and coordination among all stakeholders—including project managers, contractors, equipment suppliers, and university officials—is vital for the project's success. Effective communication helps in addressing any issues promptly and ensuring that all aspects of the project are aligned with the goals and requirements.

6. Risk Management:

Identifying and managing risks associated with the project is crucial. This includes assessing potential risks during installation, such as disruptions to building operations, and having contingency plans in place. Risk management strategies help in minimizing the impact of unforeseen issues and ensuring a smooth project execution.

7. Compliance with Insurance Requirements:

Ensuring that the fire detection system meets any specific insurance requirements for the building is important. Insurance policies may have particular standards or criteria that need to be met for coverage. Compliance with these requirements helps in maintaining valid insurance coverage and avoiding potential issues with claims.

8. Post-Implementation Review:

Conducting a post-implementation review to assess the performance of the fire detection system and gather feedback from users is valuable. This review helps in identifying any areas for improvement, addressing any unforeseen issues, and ensuring that the system continues to meet the needs of the building and its occupants.

Addressing these concerns helps in ensuring that the fire detection system project is successful, sustainable, and capable of providing reliable fire protection for the EEE Building.

CHAPTER 8
CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

We successfully implemented a state-of-the-art smart fire alarm and detection system specifically designed for the EEE Building at Daffodil Smart City. The project was carried out with a strong emphasis on meeting all design specifications and stakeholder needs, ensuring the system delivered precise and timely detection and alerting capabilities. The final design of the fire alarm system incorporated advanced sensors and detection technologies, which provided reliable and prompt warnings in the event of a fire. This greatly enhanced safety measures within the building, reducing the risk of property damage and protecting the occupants during potential fire emergencies.

The project has brought significant improvements to campus safety, contributing to a safer environment by offering robust fire detection and alerting mechanisms. Additionally, the integration of cutting-edge technology into the building's infrastructure represents a noteworthy advancement, aligning with modern safety standards and showcasing technological progress. The success of this project not only demonstrates our ability to address complex safety challenges with innovative solutions but also sets a new standard for future projects in fire detection and prevention. It highlights our commitment to excellence in delivering high-quality, advanced fire safety solutions, reinforcing our leadership in the field and paving the way for future advancements.

8.2 New Skills and Experiences Learned

We developed a deeper understanding of technical drawing interpretation, particularly Building AUTO CAD drawings, which are crucial for precise system installation. This experience enhanced our ability to create and modify layout plans accurately. Conducting thorough market research was another key learning area. We gained expertise in evaluating various fire detection technologies and comparing their features, which helped us identify the most suitable and advanced solutions for the project. Vendor selection was a critical component of the project. We learned how to assess potential suppliers, scrutinize their product warranties, and ensure their equipment met all relevant safety standards. This experience improved our skills in supplier evaluation and contract management. Implementing the fire detection system presented technical challenges that required effective problem-solving and troubleshooting. We enhanced our ability to work closely with equipment suppliers, technical support teams, and installation crews to address and resolve issues efficiently.

Overall, the project provided valuable insights into managing complex safety systems, from initial design to final implementation. We now have a better grasp of project management in the context of fire safety, which will be highly beneficial for future projects. This experience has strengthened our capabilities in technical planning, research, vendor management, and system integration.

8.3 Future Recommendations

Looking ahead, there are several recommendations to enhance future projects based on our experience with the fire detection system implementation. First, investing more time in initial planning and design phases can help identify potential issues earlier and streamline the process. Ensuring that all technical drawings are accurately prepared and thoroughly reviewed before installation can prevent complications and reduce delays. In terms of market research, expanding the scope of equipment evaluation to include more detailed assessments of emerging technologies and industry trends can provide additional options and ensure the selection of the most advanced and effective solutions. Building relationships with multiple suppliers and keeping abreast of new developments can also contribute to more informed decision-making. Vendor management is another area where improvements can be made. Establishing clearer communication channels and detailed contracts with suppliers can help mitigate risks and ensure that all equipment meets the required safety standards and performance expectations. During implementation, it is crucial to have a robust troubleshooting and support plan in place. Having dedicated technical support teams and clear protocols for addressing potential issues can minimize disruptions and ensure a smoother installation process.

Finally, incorporating feedback from all stakeholders, including end-users, into the project review process can provide valuable insights for future projects. Understanding their experiences and concerns can help refine project strategies and enhance overall effectiveness. By addressing these areas, future projects can achieve even greater success, delivering more efficient and reliable fire detection systems and setting higher standards for safety and technology integration.

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Appendix A
Turnitin Report

201-33-1065

ORIGINALITY REPORT

16%	13%	9%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	dspace.daffodilvarsity.edu.bd:8080 Internet Source	6%
2	collections.mun.ca Internet Source	1%
3	John Stephenson. " ", Routledge, 2013 Publication	1%
4	www.utexas.edu Internet Source	1%
5	dspace.bracu.ac.bd:8080 Internet Source	<1%
6	Fire Protection Association. "Fire Safety and Risk Management - For the NEBOSH National Certificate in Fire Safety and Risk Management", Routledge, 2014 Publication	<1%
7	Sujatha Banka, Bhavya Kanchanapalli, Bhuvaneshwari Annam, Akhila Akula, Sripriya Thirukkovalluru, Swapna Jarpula. "A Novel Method for Fire Detection and Alarming Notification using IoT Technology", 2023	<1%

Appendix B
Complex Engineering Problem Solving and Engineering Activities

Complex Engineering Problems (P) Solving		
	Attributes	Statement from students
P1	Depth of knowledge required	The project involves in-depth knowledge of electrical and electronic systems, fire detection technologies, sensor design, and control systems (K3 to K6 levels). Implementing a fire detection system requires an understanding of both hardware (sensors, detectors) and software for control and monitoring, making the problem solvable only with fundamental engineering principles.
P2	Range of conflicting requirements	Conflicting requirements likely arise during system design, particularly with safety standards, cost, and efficiency. Balancing between high-quality equipment, budget constraints, and meeting fire safety standards highlights wide-ranging technical and engineering conflicts.
P3	Depth of analysis required	The absence of an obvious solution requires abstract thinking and the formulation of unique models to design an efficient system. Decisions related to sensor placement, detection response time, and connectivity across floors demand originality in analysis.
P4	Familiarity of issues	Fire detection in a university building brings unique challenges, as it involves high occupancy and safety requirements. These are issues that aren't encountered in routine engineering projects and demand innovative, customized solutions.
P5	Extent of applicable codes	The project may involve designing beyond existing standards and codes of practice, especially if the fire detection system requires customization for the EEE building. Such scenarios push students to adapt standards or even propose new practices.
P6	Extent of stakeholder involvement and conflicting requirements	The project involves diverse stakeholders, including university administration, safety officers, students, and potentially external equipment suppliers. Each stakeholder has different priorities, such as cost, safety, and system performance, creating a complex network of requirements to satisfy.
P7	Interdependence	The problem is high-level and consists of various sub-problems, such as designing the detection system, ensuring compatibility with fire safety regulations, and managing cost constraints. The project involves system integration, making it an interdependent problem.

Complex Engineering Problems (P) Solving		
	Attributes	Statement from students
A1	Range of resources	The project uses a range of resources, from people (students, advisor, stakeholders) to equipment (sensors, controllers, wiring) and financial planning (budget analysis and supplier quotations). Managing all these resources effectively is crucial.
A2	Level of interaction	The project likely required resolving technical issues like sensor placement in complex building structures, wiring systems, and ensuring the system works in tandem with the building's existing infrastructure.
A3	Innovation	The project involves the creative use of existing fire detection principles, integrating them with modern technologies (e.g., smart systems, automation) in a novel environment. The innovative design, considering the university's unique layout and requirements, demonstrates the use of research-based knowledge.
A4	Consequences of society and environment	A well-designed fire detection system has significant societal implications, ensuring safety for the university community. Predicting and mitigating risks (like false alarms or system failures) adds to the project's complexity and consequences.
A5	Familiarity	While students may have encountered similar principles in coursework, the specific application in the university building extends beyond their previous experiences. The design challenges the students to apply engineering principles to a new context.

- **Engineering Knowledge:** Apply mathematical, scientific, and engineering knowledge to solve complex problems.
- **Problem Analysis:** Identify and analyze complex problems using foundational principles of mathematics and natural sciences.
- **Design/Development of Solutions:** Create designs that meet specified needs while considering public health, safety, and environmental impacts.
- **Investigation:** Conduct research and experiments to provide valid conclusions for complex problems.
- **Modern Tool Usage:** Apply modern engineering and IT tools to solve complex issues.
- **The Engineer and Society:** Assess the societal, health, safety, and legal implications of engineering work.
- **Environment and Sustainability:** Understand the environmental impact and sustainability of engineering solutions.
- **Ethics:** Uphold professional ethics and responsibilities.
- **Individual Work and Teamwork:** Function effectively both individually and in teams.
- **Communication:** Communicate effectively within the engineering community and with society.
- **Project Management and Finance:** Demonstrate knowledge of management principles in engineering contexts.
- **Life-long Learning:** Recognize the need for continuous learning in a rapidly changing technological landscape

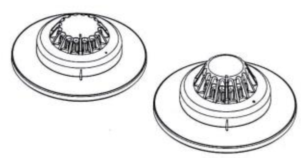
Appendix C
DATA SHEET of Components

Detector Manual Paper:

Installation Leaflet **PR207-148-556-03** June 2016

ULCAP320, ULCAPT340, ULCAH330

INSTALLATION INSTRUCTIONS for ANALOGUE ADDRESSABLE DETECTORS



IMPORTANT: This detector must be tested and maintained regularly following NFPA 72 requirements.
At a minimum, cleaning should be performed annually.

Detector Head:

Cooper P/N Menvier P/N JSB P/N	ULCAP320 ULMAP320 ULFX320	ULCAPT340 ULMAPT340 ULFX340	ULCAH330 ULMAH330 ULFX330
Type	Analogue Addressable Photoelectric	Analogue Addressable Opto/Heat Multi-Sensor	Analogue Addressable Rate of Rise & Fixed Heat
Base	WBA or UCAB300	WBA or UCAB300	WBA or UCAB300
Working Voltage	18 –30 VDC	18– 30 VDC	18 – 30 VDC
Voltage Waveform	Fil tered DC ± 1vmax ripple at 120Hz	Filtered DC ± 1vmax ripple at 120Hz	Filtered DC ± 1vmax ripple at 120Hz
Standby Current (Average)	220µA	220µA	220µA
Alarm Current (max)	5mA	5mA	5mA
Relay Current (max)	N/A	N/A	N/A
Start-upTime	2 seconds	2 seconds	2seconds
Sensitivity	2.55± 0.33%/ft	2.55± 0.33%/ft	N/A
Sensitivity Checker	Use No-Climb model TruTest (UL Listed)	Use No-Climb model TruTest (UL Listed)	N/A
Heat Element Rating	N/A	135°F	15°F/min + 135°F ROR +Fixed* 135°F Fixed * 194°F Fixed* **
Reset Time (max)	2 seconds	2 seconds	2seconds
Heat Detector Spacing	N/A	50 ft (heat alone operation)	50 ft
Ambient Temperature (max)	32-100°F	32-100°F	32-100 °F 32-50°F(194°F setting)
Mounting Position	Ceiling and Walls in open areas in open areas	Ceiling and Walls in open areas in open areas	Ceiling and Walls in open areas in open areas
Material	PC/ABS	PC/ABS	PC/ABS
Compatibility Identifier	W002	W002	W002

* These settings are programmed from the Panel
** Please fit Black Circle label on top surface of detector in the 194°F Fixed setting

Short Circuit Isolation:

Each of the detectors in his range contain an integral short circuit isolator, which operates between the -VE COM IN terminal and the -VE COM OUT terminal (terminals 1 & 2; see base wiring diagram overleaf).

The isolator operates in conjuction with the Analogue Addressable Control Panel when a low parallel resistance fault of typically 200 is presented between the +VE and -VE of the loop wiring.

Short Circuit Isolation Data (Integral with each detector)

Total Loop Resistance for correct operation of short circuit isolator	50Ω (max)
Parallel Fault Resistance to be seen at the Control Panel for isolators to open	200Ω (typ)
Continuous Current allowable through isolator	700mA (max)
Isolator Resistance in closed state	0.26Ω (max)
Leakage Current into direct short circuit with isolator open	14mA (max)
Voltage at which isolator changes from open to closed or closed to open state	3.8V to 11V
Maximum switching current of isolator	1.5A

EATON
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Installation Leaflet PR207-148-556-03

Choosing the right detector:

Photoelectric smoke detector (Opto) is suitable for most applications giving the fastest response to slow burning or smouldering fires which give rise to large visible smoke particles.

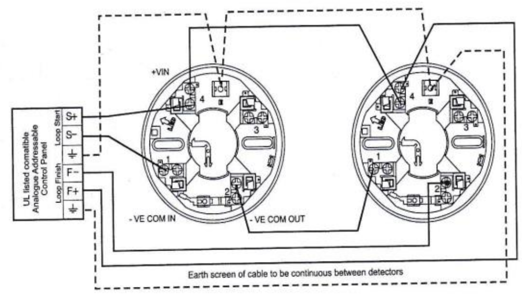
Opto-heat detector will respond better to fast clean burning fires yet maintain the advantage of optical detectors when detecting smouldering fires. The thermal enhancement of this detector allows a higher alarm threshold which provides a greater rejection of false alarms. The detector will also give an alarm at temperatures above 135°F.

Rate of Rise with Fixed Heat detector settings will detect a rapid increase in temperature or temperatures above 135°F and should be used in environments where the ambient conditions might cause false alarms if smoke detection were to be used, for example where there is ahigh level of dust, fumes, steam or smoke under normal conditions.

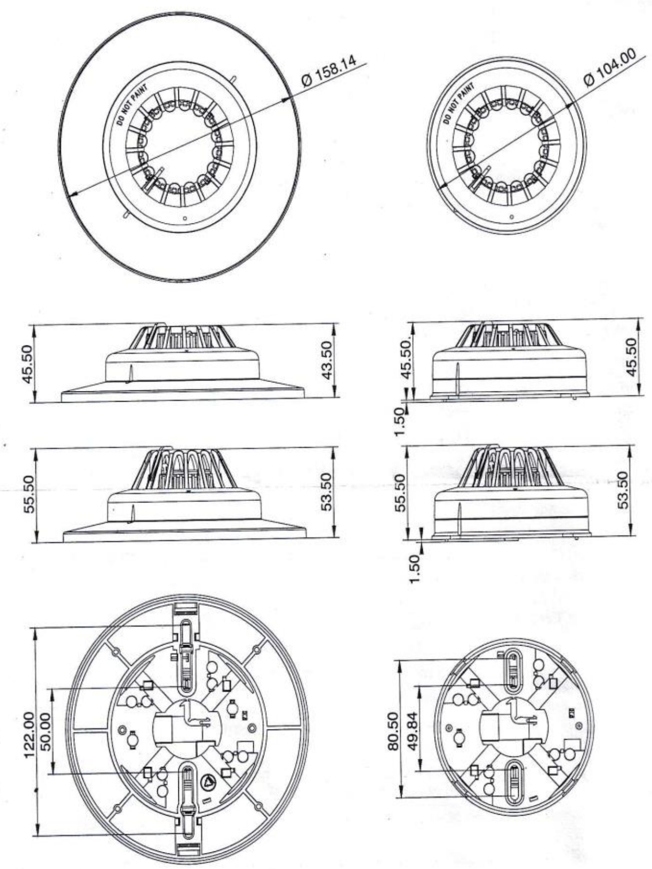
Fixed heat detectors settings will detect temperatures above 135°F or 194°F and should be used in environments where the ambient conditions might cause false alarms if smoke detection were to be used, for example where there is a high level of dust, fumes, steam or smoke under normal conditions.

For Photoelectric and Opto-Heat operation the detector automatically compensates for gradual increase in the scatter signal due to contamination e.g. dust build up.

ALL WIRING MUST CONFORM TO APPLICABLE LOCAL CODES



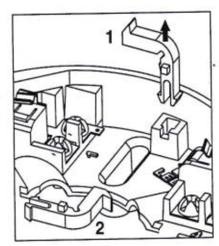
CAUTION - For System Monitoring , Do Not Loop Wires Under Terminals 1. Break Wire Run to Provided Supervision



Utilising Locking Tab

The mounting base includes an optional feature to prevent the removal of the detector without the use of a tool.

1. Remove the standard fit retaining clip.
2. Insert the locking clip which is located at the center of the base as shown.



Mount the detector onto the base as described in Detector Installation (see over) and rotate fully clockwise until it finally clicks.

The detector is now locked into position. Remove by utilising a suitable tool (eg a thin screwdriver) into the hole in the detector cover. Gently push the tool into the detector and rotate anticlockwise.

DETECTOR MOUNTING COMPATIBILITY

This detector base will mount all boxes ranging from 1.97" to 4.80" .
The most popular of these can be seen in the table below.

4 Inch Square	4 Inch Round	3.5 Inch Round	70mm	50mm
4 Inch Octagonal	3.5 Inch Octagonal	3 Inch Round	60mm	Single Gang

DETECTORS PLACEMENT

This section explains how to determine the number of detectors you need, and where to place them.

By following the guidelines listed in NFPA 72, base the number and location of detectors on an engineering survey of the area to be protected.

Factors to consider

- Contents to be protected
- Type of construction and use of structure
- Human occupancy
- Burning characteristics of contents
- Space involved
- Height of ceilings
- Surface condition of ceilings
- Total area
- Air movement—stratification
- Vent locations—velocities and dilution
- Deflections and obstructions

LOCATING DETECTORS

One smoke detector covers 450 to 900 square feet. One heat detector covers up to 2500 square feet. Consider local conditions and codes along with engineering evaluation to determine the proper spacing and specifications.

WARNING: HEAT DETECTORS ARE NOT LIFE SAFETY DEVICES. WHERE LIFE SAFETY IS A FACTOR SMOKE DETECTORS ARE RECOMMENDED.

Examples:

You may use 30-foot spacing on smooth ceilings for smoke detectors. You may use 50-foot spacing on smooth ceilings for heat detectors. Beams or other obstructions extending more than 18" below the ceiling reduce the effective range of the sensors. Such obstructions should designate a new separation point, and be considered a border for a new section.

Beams or other obstructions extending more than 8" but less than 18" require reduced spacing at the perpendicular of the obstructions.

NOTE: FOR INFORMATION ON DIFFERING STYLES OF CONSTRUCTION CONSULT THE NFPA HAND BOOK, SECTION 72

WARNING: DO NOT INSTALL COOPER SMOKE DETECTORS IN THE FOLLOWING AREAS:

- Closer than 4 inches to any side wall
- Where forced ventilation can dilute the smoke from a fire
- In known areas of combustion such as kitchens or furnace rooms
- In areas where steam may be present such as bath and shower rooms

Sensitivity Test:

1) The sensitivity of the smoke detectors are to be checked using TruTest from No Climb Ltd
2) For instructions for use, the TruTest User Manual must be followed.
3) This unit will subject the detector to a controlled ramp of aerosol smoke and displays the obscuration in %/ft. This value should be recorded at the point that the detector gives an alarm.
4) Check the detector sensitivity against the quoted range.
5) If the sensitivity is not within limits, the detector should be cleaned as defined in the Cleaning Procedure, and retested.
6) If this action does not result in acceptable sensitivity, replace the detector.

DETECTOR INSTALLATION

- Fit detector to mounting base and rotate clockwise until the detector drops into place.
- Continue to rotate clockwise until the detector clicks into place and the two location mark are align with one another.
- If the detectors are required to be locked into position, refer to the mounting base installation instructions (see over leaf).
- Smoke detectors are supplied fitted with dust covers for general protection against airborne contaminates. These must be removed from all detectors before the fire system is commissioned.
- NB. These dust covers do not provide adequate protection against quantities of dust generated by building work, sanding etc. Therefore, detectors should not be installed until this type of work has been completed.
- National Electrical Code installation proceedures must be followied as well as any special regulations of the local authority having jurisdiction
- Only use 12-22 AWG wiring with the screw terminals on the detector base
- Smoke detectors are not to be used with detector guards unless the combination has been evaluated and found suitable for that purpose.

TESTING

All detectors must be tested following installation or routine service and maintenance. It is recommended that these tests are carried out by a competent person.

Authorised personnel must be informed that the fire system will be temporarily out of service before commencing testing. To prevent unwanted alarms, ensure that the the panel is in test mode and it may be appropriate to disable some or all of the sounder circuits. When all tests are complete, restore panel to normal operation and notify authorised personnel that the system is operational.

Smoke Detectors:

- Subject the detector to be tested to a controlled amount of an approved synthetic smoke aerosol via a smoke detector test pole. Suitable products are available for example, from No Climb Products Ltd.
- Check that the red LED on the detector latches into alarm within 30 seconds.
- Ensure that the control panel activates into alarm.
- Reset the detector from the control panel unless automatically reset by the panel in test mode.
- This procedure will test the smoke sensing circuitry of an Opto/Heat Detector.

Heat Detectors:

- Using a heat gun or hair dryer capable of generating temperatures of up to 203°F (95°C), direct the heat source towards the heat sensing elements, visible through the side the outer cover, from a distance of 6" to 12" (15 to 30cm). Care should be taken not to allow the plastic surface temperature to exceed 230°F(110°C) otherwise damage may occur.
- When the temperature reaches the 'Alarm Temperature' (see Specifications table), check that the red LED on the detector latches into alarm.
- Ensure that the control panel activates into alarm.
- Reset the detector from the control panel unless automatically reset by the panel in test mode.
- This procedure will test the heat sensing circuitry of an Opto/Heat Detector.

Maintenance:

Only minimal maintenance can be performed on this range of detectors as they do not contain any site serviceable parts. The frequency of maintenance and will depend on the environment to which the detector is exposed but should be at least annually. Dusty or damp environments will demand more frequent maintenance.

- Remove the detector from its mounting base.
- Use a vacuum cleaner to remove dust build up from around the smoke entry apertures of a smoke detector, or from around the heat sensing element of a heat detector.
- For smoke detectors, visually inspect the insect mesh for blockages. If these can not be cleared by vacuuming, the detector must be replaced.
- Re-fit detector to its mounting base and test as described above.
- Detectors that fail the testing procedure must be replaced.

MANUAL CLEANING PROCEDURE

Photoelectric and Opto/Heat Detectors

Tools you will need:

- Small flat blade screwdriver
- Small soft-bristled artist's paint brush
- Denatured alcohol
- Clean dry compressed air

Note:

Use only lint-free materials when cleaning the chambers of the photoelectric smoke detector. Use of fibrous material may result in false alarms.

Remove and Disassemble the Detector:

Follow the instruction below to prepare the detector for cleaning:

1) Remove the detector from the BASE by rotating the CAP anti-clockwise
2) Disassemble the Chamber assembly from the CAP. Holding the CAP/Chamber assembly in one hand, placing a screwdriver under one snap tab to release and repeat for all 4 tabs until the assembly is free from the CAP, as shown in **diagram 1**
3) Remove the Ring Seal from the Chamber Assembly
4) Disassemble Gauze Chamber (do not remove gauze) from the Chamber assembly. Place a screwdriver next to a Snap Tab and rotate anti-clockwise as seen in **diagram 2.**

Clean the detector:

1) Lightly swab the Optical area as indicated in **diagram 3** with denature alcohol and the small soft-bristled brush.
2) Use dry cleaned compressed air to dry the optical unit and remove any remaining particles
3) Clean the chamber cover and surrounding plastics in the same manner.

Reassemble the detector:

1) Locate the 2 DOT markings on both the Gauze chamber and its mating part and press the snap fixing home as seen in **diagram 4**
2) Ensure the Ring Seal is located correctly on the Chamber assembly and that the LED window is visible through the recess on the Seal
3) Locate the 2 ARROWS on both the Chamber Assembly and the CAP and press the snap fixings firmly home as seen in **diagram 5** ensuring all 4 snap fixings are correctly seated.
4) Replace the Detector back onto the BASE. Rotate the Detector Clockwise until the clicks into position.

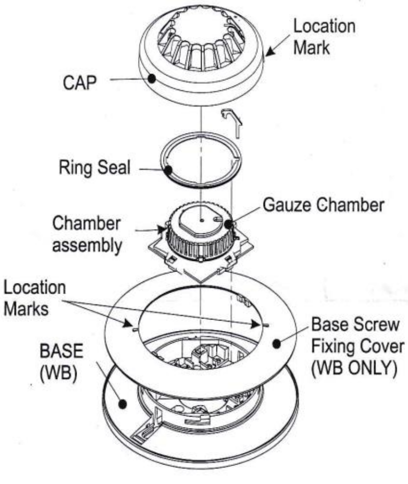


Diagram 1

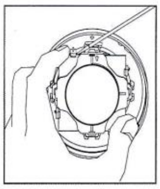


Diagram 2

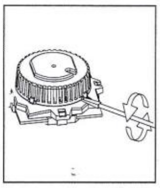


Diagram 3

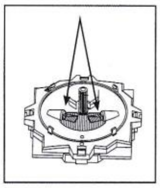


Diagram 4

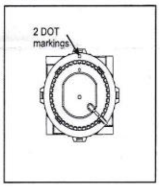
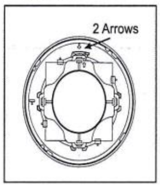


Diagram 5



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Price Quotation from Uttaron Technologies:

UTTARON TECHNOLOGIES

Audit • Consultancy • Design & Drawing • MEP Works • Trading

PRICE QUOTATION FOR FIRE ALARM & DETECTION SYSTEM SUPPLY

Date: 25th February 2024

Attention: **Mr. S M Rakib Sattar**

Daffodil International University (DIU)
Daffodil Smart City (DSC), Birulia, Savar
Dhaka - 1216, Bangladesh

Reference: UTL/DIU/QOT/240225

Title: Price Quotation for Fire Alarm & Detection System Supply at Daffodil International University (DIU)

SL	ITEM DESCRIPTION	QTY	UNIT	UNIT PRICE (BDT)	TOTAL PRICE (BDT)
A	FIRE ALARM CONTROL PANEL & DEVICES				
	Brand: SD3 **Country of Origin:** France **Country of Manufacture:** France/Germany **Approval:** BOSEC EN54, AFNOR CE CPD/CPR				
1	**ADDRESSABLE FIRE ALARM CONTROL PANEL (FACP)** **Model:** HEPHAIS 1600 NE COMFORT **Features:** 400 ADDRESSES, 2 master loops or 4 spur circuits (open circuit with max 32 addresses), USER INTERFACE FRONT PANEL (command and control) TFT COLOR GRAPHIC DISPLAY 4.3inches, 1000 ZONES, 2700 memory events, 2 monitored sounders lines + 3 programmable output relays, 1xRS232 serial output for remote control panel, 2 programmable inputs, RS422 JBUS monitoring output. TCPIP Connection for safe remote monitoring interface. Space for 2 internal batteries 12V/12Ah.	1	PCS	246,000.00	246,000.00
2	**ADDRESSABLE OPTICAL SMOKE DETECTOR** **Model:** OA05 **Features:** Microprocessor-based, 1 programmable remote alarm indicator output, 8 levels sensitivity setting.	87	PCS	7,000.00	609,000.00

UTTARON TECHNOLOGIES APT A02, 3E SOUTH KALLYANPUR, DHAKA

Project Office: House # B/139, Lane # 22, New DOHS, Mohakhali, Dhaka – 1206, Bangladesh
Headquarters: Configure Shadhona, 3E South Kallyanpur, Mirpur Road, Dhaka – 1207, Bangladesh
HP | +88 0167-8631632 | +88 0197-UTTARON (+88 0197-8882766) | **Email:** info@uttaron-technologies.com | **Web:** uttaron.webs.com

3	**ADDRESSABLE HEAT DETECTOR** **Model:** TA05 **Features:** Static or/and rate of rise, microprocessor based, 1 programmable remote alarm indicator output, 6 levels sensitivity setting.	0	PCS	6,800.00	0.00
4	**ADDRESSABLE MULTICRITERIA DETECTOR** **Model:** MA05 **Features:** Multicriteria or combined, microprocessor based,1 programmable remote alarm indicator output, 8 levels sensitivity setting.	42	PCS	8,100.00	340,200.00
5	**ADDRESSABLE MANUAL CALL POINT** **Model:** DMA05 **Features:** Resettable with key without breaking glass, integrated isolator, red colour.	8	PCS	7,700.00	61,600.00
6	**PLUG IN ISOLATOR BOARD** **Model:** ICC05 **Features:** To be plugged in S05SE base for 05 detectors. **ADDRESSABLE OUTPUT MODULE**	0	PCS	2,400.00	0.00
7	**Model:** ETC05-B **Features:** Backbox, isolator integrated, NO or NC monitoring for input, relay output NO-NC 30V/1A. **ADDRESSABLE INPUT/OUTPUT MODULE**	0	PCS	9,600.00	0.00
8	**Model:** ETC05-B **Features:** Backbox, isolator integrated, NO or NC monitoring for input, relay output NO-NC 30V/1A. **CONVENTIONAL SOUNDER + FLASH**	0	PCS	9,600.00	0.00
9	**Model:** DSF 2000-RR **Features:** 3 different sounds, 97dB, low current consumption, IP21C.	12	PCS	8,000.00	96,000.00
				SUB-TOTAL AMOUNT [A] (BDT) =	**1,352,800.00**

UTTARON TECHNOLOGIES APT-402, 3E SOUTH KALLYANPUR, DHAKA

B	FIRE RATED CABLES				
	Brand: Tianjie **Country of Origin:** China **Country of Manufacture:** China **Approval:** UL LISTED				
1	**FIRE ALARM SLC CABLE** **Specifications:** 1x2Cx1.5mm2	1	MTR	70.00	70.00
2	**FIRE ALARM NAC CABLE** **Specifications:** 1x2Cx2.5mm2	1	MTR	90.00	90.00
				SUB-TOTAL AMOUNT [B] (BDT) =	**160.00**

GRAND TOTAL AMOUNT [A + B] (BDT) = 1,352,960.00
IN WORDS: TAKA THIRTEEN LAC FIFTY-TWO THOUSAND NINE HUNDRED SIXTY AND PAISA ZERO ONLY

TERMS & CONDITIONS

1. Price offer is valid for thirty (30) days since the date of submission.
2. 70% advanced payment with the confirmed Purchase Order.
3. Rest 30% within three (03) days of goods delivery.
4. Delivery time: Within 7 – 14 working days after order confirmation.
5. All prices are exclusive of AIT, VAT and other Govt. Costs.
6. Additional charges may apply for any services requested outside of mentioned supply scope.

BANK DETAILS

Bank Name: Islami Bank Bangladesh Limited Account Name: UTTARON TECHNOLOGIES Account Number: 20502090100198502 Branch Address: Shyamoli Branch, Dhaka Routing Number: 125264305 Swift Code: IBBLBDDH209

Yours Sincerely,

Engr. Summit Sayem

Managing Director
Cell No. +88 0167-8631632
summit@uttaron-technologies.com

Price Quotation from GCTL:

GCTL
Intelligent Business Solution

House # 42 (5th Floor)
Road # 10, Sector- 4
Uttara, Dhaka-1230

Ref : GCTL/DIU/Fire Alarm/B3/2702 February 27, 2024

To,
Daffodil International University
Daffodil Smart City, Ashulia, Dhaka

Subject : Price Proposal of Addressable Fire Detection System for Daffodil International University.

Dear Sir,
Thank You for giving us the opportunity to submit the Price Proposal of Addressable Fire Detection System. We hope you will find our solution reliable and cost effective to fulfill your requirements.

We are Germany Computer and Telecom Limited (GCTL)-the company with 19 years' experience on total IT Infrastructure, Automation and Security Market. We own many valuable business organizations as our clients from the beginning and still going on because of our Product Quality, Service, Support and Commitment.

Our company specializes in providing Hardware, Solution and Service on Server, Server Rack, CCTV System, Access Control, Time Attendance, Fire Detection System, Flap, Tripod & Car Barrier gate , Bollard & Retractable gate , Baggage Scanner , Under Vehicle Surveillance System (UVSS) , Metal detector gate Car Parking, Ticketing and guidance Solution as well as providing Customized Software integration and Software Development for Business. There is a professional team of Engineers, Technicians working within our company.

During our existence in a market we receive positive feedback from our customers. We are enlisted solution provider for many well-known corporate offices, Government offices and Banks in Bangladesh. Some of our happy clients are as follows:

- AB Bank Ltd.
- Bangladesh House Building Finance Corporation
- Bank Asia Ltd.
- Bangladesh Public Administration Training Centre
- ICB Islami Bank
- Drug International Limited
- Meghna Bank Ltd.
- DHS Motors Limited (Honda)
- Mutual Trust Bank Ltd.
- GSK Bangladesh
- NCC Bank Ltd.
- Delco Business Associate Ltd (Hamid Group)
- NRB Bank Limited
- Dhaka University
- ONE Bank
- Kayaba Group
- Islami Bank Bangladesh Ltd.
- National Museum of Science and Technology
- Probashi kollan Bank
- The Institute of Chartered Accountants of Bangladesh (ICAB)
- Shajalal Bank
- Bangla CAT
- CITI Bank (Citi Technology Infrastructure)
- Bangladesh Submarine Cable Company Limited
- Rangs Group
- Windy Group
- D.C Office, Chittagong
- Akiz Group
- ACI Limited
- Seven Circle Cement
- Walton Ltd
- Bashundhara City Development Limited
- bKash Ltd.
- Fariha Knit Tex Ltd
- Linde Bangladesh Limited
- Bangladesh Jute Research Institute
- National Security Agency
- DBL Pharmaceuticals Ltd.
- LABAID Group

If you prefer we can arrange personal meeting with you in order to further describe the services of our company and the value you can get from our cooperation. Please, inform me whether it is convenient for you if we visit you at your convenient time.

I will be looking forward for our future cooperation.

Sincerely

Sabbir Alam
Manager || Business Development

(+88) 01847213868-71 www.gctlbd.com info@gctlbd.com Germany Computer & Telecom Ltd

House # 42 (5th Floor)
Road # 10, Sector- 4
Uttara, Dhaka-1230

SL	Item and Description	Unit Price	Qty.	UOM	Total Price
01	Intelligent Addressable 2 Loop Control Panel Per Loop (200 devices in one loop) with inbuilt fault isolator (Touch Screen) Model : CF30002G Brand: Eaton/Cooper, UK Certification: LPCB Warranty : 01 Year	2,72,600.00	01	Pc	2,72,600.00
02	Intelligent Addressable Optical Smoke Sensor With Base (Inbuilt fault isolator) Model : CAP320+CAB300 Brand: Eaton/Cooper, UK Certification: LPCB/VDS Warranty : 01 Year	3,250.00	87	Pcs	282,750.00
03	Intelligent Addressable Multi-Mode Heat Sensor With Base (Inbuilt fault isolator) Model : CAH330+CAB300 Brand: Eaton/Cooper, UK Certification: LPCB/VDS Warranty : 01 Year	3,250.00	0	Pcs	0.00
04	Intelligent Addressable Multi Sensor Detector With Base (Inbuilt fault isolator) Model : CAH330+CAB300 Brand: Eaton/Cooper, UK Certification: LPCB/VDS Warranty : 01 Year	3,250.00	42	Pcs	136,500.00
05	Intelligent Addressable Surface/Flush Call Point (Inbuilt fault isolator) Model : CBG370S Brand: Eaton/Cooper, UK Certification: LPCB	6,350.00	08	Pcs	50,800.00
06	Micro Single Channel Input Unit (Recognised as Input Unit) (Inbuilt fault isolator) Model : MCIM Brand: Eaton/Cooper, UK Certification: Intertek	3,250.00	0	Pc	0.00
07	Micro Single Channel Output Unit (Recognised as Output Unit) (Inbuilt fault isolator) Model : MCOM Brand: Eaton/Cooper, UK Certification: Intertek	3,250.00	0	Pc	0.00
08	Conventional Sounder With Flasher Model : FL-RL-R-S Brand: Eaton/Cooper, UK Certification: LPCB/VDS	6,350.00	12	Pcs	76,200.00
09	Fire Rated FPLR Cable 2C X1.5 mm2 Brand: TIANJIE, China Certification: UL	95.00	01	RM	
10	Fire Rated FPLR Cable 2C X2.5 mm2 Brand: TIANJIE , China Certification: UL	122.00	01	RM	**As per require**
11	PVC Pipe & Flexible Pipe	51.00	01	RM	
	Installation & Other:				
12	Cabling Laying & Termination Charge	20	01	RM	

(+88) 01847213868-71 www.gctlbd.com info@gctlbd.com Germany Computer & Telecom Ltd

House # 42 (5th Floor)
Road # 10, Sector- 4
Uttara, Dhaka-1230

	Fault Isolator Module Built In Cooper System	13 Included	0 Pc			0.00
	Installation of Fire Alarm Device System at Dhaka City	14 1,000.00	149 Pc			149,000
					Total Amount	**967,850.00**
					VAT(7.5%) & AIT(03%)	101,625.00
					Grand Total (Including VAT)	**1,069,475.00**

In Words : Ten Lac Sixty Nine Thousand Four Hundred and Seventy Five BDT Only.

N.B.: Final Bill Will Be According To Actual Cable Measurement.

Terms & Conditions

A. Offer Validity : offer valid for 30 Days of Submission.

B. Delivery Period: 8 to 12 weeks or ex-stock basis availability After receiving PO..
C. Payment Terms : 80% payment with work order and 20% with Delivery.
D. Mode of Payment: Cash payment or Account payee cheque. Will made in name of "Germany Computer and Telecom Ltd."
E. VAT & Tax : Price With VAT, Tax.
F. Warranty :
We will provide a 12 (Twelve) months service Warranty from the date of delivery. The warranty covers material, design, and manufacturing faults, and does not cover wear, tear, or consumable items.

It is highly recommended to use UPS to avoid Voltage and Power Fluctuation.

Please note, if any of the delivered products is/are damaged/broken/distorted/dented for gross or intent negligence by the end-user, repaired/modified/reinstalled/relocated without the written consent of Germany Computer & Telecom Ltd. (GCTL), there will not be any further warranty coverage. The warranty also doesn't cover improper use, overload on the ramp, natural disaster, any willful physical damage, burn case, lightning, spike, surge, sag, short circuit, overload, or unsafe voltage level. Furthermore, the acts of flooding or prolonged water exposure to supplied equipment are not covered under warranty terms. The end user need to perform Operation, Routine Maintenance, Standard Operating & Safety Procedures by the Guidelines & safety considerations.

A. Service Support During Warranty Period

If any of the supplied items malfunctions, we will send our skilled service engineer whenever required per the below lead time:
(1) 24X7 remote support via mobile, online, whatsapp.
(2) Within 24 to 48 hours site considered for Inside Dhaka City.
(3) Any service issue notified to us on Friday/holiday will be addressed on the next working day.

B. Installation & Training

Our Technical Team will do the installation after the delivery at the convenient time of the end user. Our engineer will provide local training after the installation of all the items.

Any civil work, site readiness-associated work, power connection, or networking cabling at the installation point is not within our scope.

With Best Regards

Sabbir

Germany Computer & Telecom Ltd.

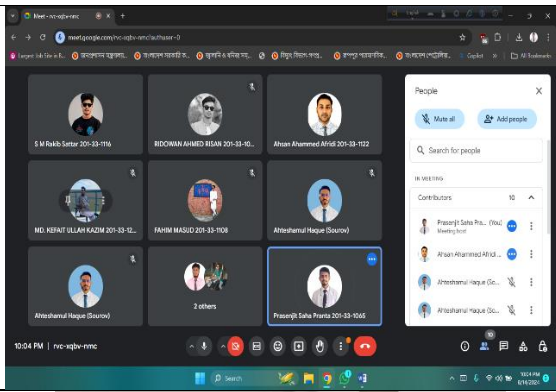
Sabbir Alam
Business Development Manager
Cell: +880-1847213868

Price Quotation from Morgen Integrated System Limited:

SL.	Name of Equipment	Brand & Origin	Quantity	Unit	Unit Price (BDT)
1	SMOKE DETECTOR (SD)	Cooper, UK	87	Nos	2950
2	HEAT DETECTOR (HD)	Cooper, UK	0	Nos	2900
3	MULTI SENSOR DETECTOR (MD)	Cooper, UK	42	Nos	3250
4	MANUAL PULL STATION (MPS)	Cooper, UK	8	Nos	10500
5	FIRE ALARM SOUNDER WITH STROBE (B)	Cooper, UK	12	Nos	7200
6	OUTPUT MODULE (O MOD)	Cooper, UK	0	Nos	2850
7	INPUT MODULE (I/O MOD)	Cooper, UK	0	Nos	2850
8	FIRE ALARM CONTROL PANAL (FACP) LOOP	Elite-RS, UK	1	Nos	230000
9	FR CABLE (2c, 1.5mm2)	LLT, China	1	Coil	7400
10	FR CABLE (2c, 2.5mm2)	LLT, China	1	Coil	9400

Live photos of our work:





S M Rakib Sattar 201-33-1116
Ahsan Ahammed Afridi 201-33-1122
FAHIM MASUD 201-33-1108
Ahteshamul Haque (Sourov)
2 others
Prasenjit Saha Pranta 201-33-1065
People
Mute all
Add people
Search for people
Contributors
10:04 PM | rvc-xqbv-nmc

RR KABEL