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**DEPARTMENT OF CONSTRUCTION ECONOMICS AND
MANAGEMENT**

FINAL YEAR PROJECT REPORT

**Assessing the effectiveness of fire safety management in halls of residence in
Makerere University**

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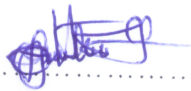
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A RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF CONSTRUCTION
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I, **OCIRA IGINITIUS**, declare that this work, or any part thereof, except where due acknowledgment and references have been made, has not previously been submitted to this University or any other institution for the purpose of assessment, publication, or any other academic award.

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APPROVAL

This is to certify and approve that OCIRA IGINITIUS under my supervision has completed a research project titled “**Assessing the effectiveness of fire safety management in halls of residence in Makerere University**” and is now prepared for submission for the award of a Bachelor of Science in Quantity surveying by the Department of Construction Economics and Management, Makerere University.

Signature.....

Semanda Julius

Date

15/12/2020

DR. SEMANDA JULIUS

DEDICATION

This report is dedicated to my family, the Lanana family of Nwoya District in Northern Uganda, whose unwavering support, encouragement, sacrifices, and belief in my potential have been instrumental throughout my educational journey.

I also dedicate this work to my friends who have tirelessly supported, motivated, and inspired me throughout my studies. Their encouragement and companionship have contributed significantly to my academic achievements and personal growth.

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Special thanks go to my loving parents, Mr. Opoka Charles and Mrs. Opoka Lilly Rose, who have supported me financially, morally and for standing with me at every step of my life. I am what I am today because of how they have continually believed in me. I also love to extend my appreciation to my brothers and sisters for standing with me, praying for me and for the courage they instill in me unceasingly. Thank you.

Finally, I want to extend my heartfelt thanks to all students who helped in collecting data for my research.

ABSTRACT

This study assessed the effectiveness of fire safety management in halls of residence at Makerere University, focusing on Mary Stuart Hall, Lumumba Hall, and Mitchell Hall. The study aimed to assess the availability and adequacy of fire safety management aspects, determine the challenges affecting fire safety management, and identify appropriate measures for improving fire safety management in halls of residence.

A quantitative research approach employing survey design was adopted. Data were collected using structured questionnaires administered to students residing in the selected halls of residence. Out of 114 questionnaires distributed, 94 were completed and returned, representing a response rate of 82.4%. Data were analysed using descriptive statistics, including frequencies and arithmetic mean scores.

The findings revealed that most fire safety management aspects were inadequate. Fire alarm systems, fire safety inspections, fire safety training programmes, emergency exits and evacuation plans, fire drills, and fire extinguishers were found to be either inadequate or unavailable. Only good housekeeping practices and maintenance of electrical installations were rated as adequate. The study further established that inadequate firefighting equipment, passive attitudes towards fire safety by both management and students, and inadequate building design features such as escape routes and fire detection systems were the major challenges affecting fire safety management.

The study identified the provision of adequate firefighting equipment, installation of fire detection and alarm systems, regular inspection and maintenance of fire safety equipment, and improved emergency preparedness measures as the most effective strategies for enhancing fire safety management. The study concludes that fire safety management in the selected halls of residence is generally inadequate and requires significant improvement. It recommends increased investment in firefighting equipment, regular fire safety training and drills, installation of fire detection systems, and the development and enforcement of comprehensive fire safety policies.

Keywords: Fire safety management, halls of residence, fire preparedness, fire detection systems, firefighting equipment, emergency preparedness, Makerere University

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LIST OF ACRONYMS

CSIR Council for Scientific and Industrial Research

ILO International Labour Organization

KMA Kampala Metropolitan Area

NFPA National Fire Protection Association

OSHA Occupational Safety and Health Administration

UK United Kingdom

US United States

USFA United States Fire Administration

CHAPTER ONE: INTRODUCTION

1.0.0 Introduction

This chapter presents the background to the study, the problem statement, research objectives, significance of the study, justification of the study, and the scope of the study.

1.1.0 Background

Fire is known to claim thousands of lives every year worldwide. In the United States alone, approximately 4,000 people die annually due to fire-related incidents, while direct property losses are estimated at about US\$8.6 billion (U.S. Fire Administration, 2007).

In Africa, particularly in South Africa, fire outbreaks have also posed a serious threat to communities. A study by the Council for Scientific and Industrial Research (CSIR) revealed that 39 fire incidents occurred in informal settlements, resulting in 31 deaths, destruction of approximately 4,000 informal dwellings, and leaving more than 2,000 people homeless (Council for Scientific and Industrial Research (CSIR), 1996).

In Uganda, fire incidents continue to cause significant social and economic losses. A report by the Directorate of Fire Prevention and Rescue Services indicated that, in 2015, the country was losing approximately UGX 30 billion annually due to fire accidents. The report further noted that the situation was likely to worsen due to rapid population growth and urbanization. According to the Fire Brigade (2010), fire-related incidents accounted for the largest proportion of emergency calls handled in the country, with the Kampala Metropolitan Area (KMA) contributing approximately 68% of all emergency calls recorded nationwide.

Analysis of Fire Brigade reports further revealed that 40% of the fires extinguished had no established causes. Among incidents where causes were identified, electrical short circuits accounted for 16%, followed by charcoal stoves, candles, and cigarettes at 15%. Other causes included arson (12%), overheating (3%), sparks (3%), failed brakes (3%), negligence (3%), uncontrolled burning (2%), gas cylinders (1%), welding activities (1%), and unattended electrical appliances (1%) (Fire Brigade, 2010).

Fire incidents have been reported in schools across many parts of the world, and it is unlikely that any country has been completely spared from this challenge. Such incidents have resulted in devastating loss of life, destruction of property, and disruption of educational activities. A survey conducted in the United Kingdom by the Arson Control Forum (2006) revealed that nearly half of the schools surveyed had experienced fire incidents serious enough to require intervention by fire and rescue services within the previous three years.

Similarly, fire outbreaks have been a significant challenge in many primary and secondary schools in Uganda. These incidents have resulted in loss of life and extensive property damage. One notable example is the Budo Junior School fire incident of April 2008, in which 19 pupils lost their lives (Daily Monitor, 2008).

Depending on their magnitude and severity, fire incidents often lead to school closures, destruction of property, injuries, deaths, and psychological trauma among students and staff (Blackaby, 2007). These effects demonstrate the need for effective fire safety planning and management within educational institutions.

Fire outbreaks have also occurred in higher institutions of learning. In May 2018, a fire incident was reported at Mary Stuart Hall of Residence at Makerere University. Although the incident occurred during the university vacation period, considerable property was destroyed and five students were hospitalized, according to reports published by The Observer (2018). During the same month, another fire outbreak was reported at Baheesi Hostel of Makerere University Business School, resulting in substantial loss of students' personal property (The Observer, 2018).

These incidents demonstrate the vulnerability of educational institutions to fire hazards and highlight the importance of effective fire safety management systems. With appropriate fire prevention measures, emergency preparedness, and response strategies in place, many fire outbreaks can be prevented, controlled more effectively, and their impacts on life and property significantly reduced.

1.2.0 Problem statement

Fire incidents continue to occur in learning institutions, causing loss of lives, destruction of property, and disruption of academic activities. Despite these risks, fire safety management practices in halls of residence at Makerere University remain inadequate. The rapid spread of fire and delays in response often increase the severity of damage. Although effective fire prevention measures, preparedness, and stakeholder involvement can reduce fire risks, these practices are not always fully implemented. Therefore, this study seeks to assess fire safety management practices in halls of residence at Makerere University and identify measures for improving fire prevention and response.

1.3.0 Objectives of the study

1.3.1 Major objective

Assessing the effectiveness of fire safety management in halls of residence in Makerere University.

1.3.2 Specific objectives

1. To assess the availability and adequacy of fire safety management aspects in halls of residence at Makerere University.
2. To determine the challenges/influencing factors affecting fire safety management in halls of residence.
3. To determine appropriate measures for improving the effectiveness of fire safety management in halls of residence at Makerere University.

1.4.0 Significance of the study

This study will help students and university administrators understand effective ways of managing fire incidents and improve awareness of key fire safety management practices. The findings will support the prevention, preparedness, and control of fire outbreaks in schools and other learning institutions in Uganda.

1.5.0 Justification of the study

This study is important because inadequate attention to fire safety management can result in significant loss of lives, destruction of property, and disruption of academic activities,

particularly in halls of residence and hostels where students live. Effective fire prevention, preparedness, and response measures are therefore essential to minimize fire risks and enhance safety within learning institutions.

1.6.0 Scope of the study

1.6.1 Geographical scope

The study was conducted at Makerere University and focused on selected halls of residence within the university, specifically Mary Stuart Hall, Lumumba Hall, and Mitchell Hall.

1.6.2 Time scope

The study was conducted for a period ranging from January 2020 to March 2020.

1.6.3 Content scope

The study focused on fire safety management in halls of residence in Makerere University.

CHAPTER TWO: LITERATURE REVIEW

2.0.0 Introduction.

This chapter discusses the available literature about the study which includes a background of fire safety, definitions and other relevant aspects of fire safety management.

2.1.0 Definition of terms used in fire safety management

2.1.1 Fire

Fire is a rapid chemical reaction involving the oxidation of a combustible material in the presence of heat and oxygen, resulting in the production of heat, light, and combustion products. The occurrence and continuation of fire depend on the presence of three essential components: fuel, heat, and oxygen. These components are commonly referred to as the fire triangle (National Fire Protection Association [NFPA], 2020).

In learning institutions, fire risks may arise from several sources, including electrical faults, cooking appliances, improper handling of flammable materials, and human negligence. Therefore, understanding the causes and behavior of fire is essential for developing effective prevention and control measures.

2.1.2 Fire safety

Fire safety refers to the measures, practices, and systems designed to prevent the occurrence of fire and reduce the risk of injury, death, and property damage in the event of a fire outbreak. These measures include fire prevention, early detection, emergency response, evacuation procedures, and installation of firefighting equipment (International Labour Organization (ILO), 2015).

In halls of residence, effective fire safety requires cooperation among students, university management, and other stakeholders to ensure compliance with safety procedures and timely response during emergencies.

2.1.3 Fire safety management:

Fire safety management refers to the systematic coordination of policies, procedures, and activities aimed at preventing fires and reducing their impact on people and property. According to Nadzim and Taib (2014), fire safety management involves activities such as inspection, fire prevention, training, emergency planning, maintenance of firefighting equipment, and evaluation of fire risks.

A comprehensive fire safety management system should include fire risk assessment, awareness training, regular inspections, emergency evacuation planning, and maintenance of fire protection systems. Effective management ensures that occupants understand their responsibilities and can respond appropriately during fire emergencies.

2.2.0 Types of fires

Fires are classified according to the type of fuel involved. Proper classification is important because different types of fires require different extinguishing methods (Occupational Safety and Health Administration [OSHA], 2019).:-

2.2.1. Class A

Class A fires involve ordinary combustible materials such as wood, paper, cloth, and plastics. These fires are commonly extinguished using water-based extinguishing agents.

2.2.2. Class B

Class B fires involve flammable liquids and gases such as petrol, oil, and cooking gas. Suitable extinguishing agents include foam, carbon dioxide, and dry chemical extinguishers.

2.2.3. Class C

Class C fires involve electrical equipment or energized electrical systems. These fires require non-conductive extinguishing agents such as carbon dioxide or dry chemical powder

2.2.4. Class D

Class D fires involve combustible metals such as magnesium and sodium. They require specialized extinguishing agents.

2.2.5. Class K

Class K fires involve cooking oils and fats, commonly associated with kitchens. They require wet chemical extinguishing agents.

Understanding fire classifications is important in halls of residence because students commonly use electrical appliances and cooking equipment, which may increase fire risks if poorly managed.

Class of fire	Cause	Type of extinguishers to use
Class A	Driven by common materials such as wood, etc.	The frequently used extinguisher is water
Class B	Fueled by flammable and combustible liquids	Dry chemical, foam, vaporizing liquids, carbon dioxide and water fog
Class C	Arise in electrical apparatus where non-conducting quenching proxies	Dry chemical, carbon dioxide, and vaporizing liquids
Class D	Transpire in explosive metals such as magnesium	Special powders such as sodium chloride, dry sand or salt
Class K	Occur in cooking medium	cooking oil, fat, alcohol

Table 1: Classes of fire

2.3.0 Causes of fire

Fire outbreaks in buildings are commonly associated with human activities, mechanical failures, and environmental conditions.

2.3.1 Fault from Electrical wirings

Electrical faults are among the leading causes of fires in residential and institutional buildings. Poor wiring, overloaded circuits, faulty appliances, and inadequate maintenance can generate excessive heat that may ignite combustible materials (Craighead, 1995).

In university halls of residence, the use of multiple electrical appliances by students can increase the risk of electrical overloads if electrical systems are not properly managed and monitored.

2.3.2 Arson

Arson refers to the deliberate setting of fire with the intention of causing destruction or damage. It is considered a criminal act and may result in severe loss of life and property.

2.3.3 Gas Leakage

Gas leakage occurs when combustible gases escape from storage containers or pipelines and come into contact with an ignition source. Gas leaks can cause fires or explosions, especially in areas where cooking activities take place (Mannan & Lees, 2005).

2.3.4 Smoking Materials

Improper disposal of cigarettes and smoking materials can cause fires when they come into contact with combustible materials. Smoking remains a significant fire risk in residential environments.

2.3.5 Over Heating Equipment

Electrical equipment may overheat due to overloading, poor maintenance, or prolonged use. Excessive heat generated from faulty equipment can ignite nearby combustible materials and result in fire outbreaks.

2.3.6 Flammable Material

Flammable materials are substances that can ignite easily and burn rapidly. They can be common materials that are at most work sites in gas, liquid and solid forms. Examples of flammable materials are celluloid, petrol, spirit etc.

2.4.0 Fire safety management

Fire safety management involves the planned coordination of activities aimed at reducing fire risks, protecting occupants, and minimizing losses associated with fire incidents. Effective fire safety management requires the identification of fire hazards, implementation of preventive measures, emergency preparedness, and continuous monitoring of safety systems.

According to the International Labour Organization (ILO, 2015), effective fire safety management should integrate risk assessment, training, maintenance of fire protection systems, emergency procedures, and regular evaluation of safety practices. In learning institutions, fire safety management is particularly important due to high occupancy levels, diverse user behavior, and the presence of electrical and cooking facilities.

2.5.0 Fire safety plan

A fire safety plan is a structured document that outlines procedures and responsibilities for preventing, responding to, and recovering from fire incidents. According to Chow (2001), an effective fire safety plan should include prevention measures, emergency response procedures, training programs, and maintenance schedules.

A fire safety plan for halls of residence should include:

(a) Fire Prevention Measures

Fire prevention involves activities aimed at reducing the likelihood of fire occurrence. These include:

- Regular inspection of electrical installations.
- Proper storage of flammable materials.
- Control of cooking activities.
- Prohibition of unsafe practices such as unauthorized electrical connections.

(b) Emergency Response Procedures

Emergency procedures guide occupants on actions to take when a fire occurs. These include:

- Raising the alarm.
- Contacting emergency services.
- Evacuating occupants.
- Assembling at designated safe areas.
- Helping vulnerable people.

(c) Maintenance of Fire Protection Systems

Fire protection equipment must be regularly inspected and maintained to ensure functionality during emergencies. This includes fire extinguishers, alarms, emergency lighting, fire doors, and escape routes.

2.6.0 Fire safety management duties

Effective fire safety management requires clearly defined responsibilities among building occupants, administrators, and safety personnel.

2.6.1 Fire safety training and awareness training

Training is an important component of fire safety management because occupants must understand how to prevent fires and respond during emergencies. According to OSHA (2019), fire safety training should cover:

- Causes of fire.
- Use of fire extinguishers.
- Emergency evacuation procedures.
- Reporting fire incidents.
- Roles during emergencies.

In university halls of residence, students should receive regular fire safety awareness training because their actions directly influence fire risk levels.

2.6.2 Emergency action plan

An emergency action plan provides procedures to follow during fire emergencies. According to NFPA (2020), an effective emergency action plan should include:

- Emergency escape routes.
- Alarm procedures.
- Communication methods.
- Evacuation responsibilities.

- Emergency contacts.

Regular fire drills are essential because they help occupants become familiar with evacuation procedures and reduce panic during actual incidents.

2.6.3 Regular Inspection and maintenance of fire protection equipment

Regular inspection and maintenance of fire protection equipment should be done to make sure that the equipment is reliable and functional at any time. These equipment may include fire extinguishers, alarm systems and other equipment that may be used in firefighting. It is also important to keep records of these inspections and maintenances in a fire safety register.

2.6.4 Inspection and maintenance of the building and its services

Fire safety equipment must be regularly inspected to ensure reliability. Fire extinguishers, alarms, sprinklers, and hydrants should be tested and maintained according to established safety standards.

Poor maintenance of fire equipment may result in failure during emergencies, increasing the risk of injuries and property loss.

2.6.5 Maintenance of buildings and services

Building maintenance plays an important role in fire prevention. Faulty electrical wiring, damaged equipment, and poor housekeeping can increase fire risks.

Regular inspection of electrical systems, appliances, and building structures helps identify hazards before they result in fire outbreaks.

2.7.0 Fire protection systems in buildings

Fire protection systems are designed to detect, control, and extinguish fires while protecting building occupants.

2.7.1 Fire detection systems

Fire detection systems identify signs of fire such as smoke or excessive heat and provide early warnings. Common detection systems include smoke detectors and heat detectors.

Early detection allows occupants to evacuate quickly and enables emergency response teams to control the fire before it spreads.

2.7.1.1 Smoke Detectors



Figure 1: An illustration of a smoke detector

Note: Adopted from Wikipedia

2.7.1.2 Heat Detectors



Figure 2: An illustration of a heat detector

Note: Adopted from Wikipedia

2.7.2 Sprinkler systems

Fire sprinkler systems automatically release water when heat from a fire activates the sprinkler head. They are effective in controlling fire growth and reducing damage.

Although sprinklers are more common in commercial buildings, their use in high-occupancy residential facilities can significantly improve fire protection.



Figure 3: An illustration of a sprinkler head

Note: Adopted from Wikipedia

2.8.0 Research Gap

Existing literature has extensively examined fire causes, fire protection systems, and general fire safety practices in buildings. However, limited studies have focused specifically on fire safety management practices within university halls of residence in Uganda.

Most available studies focus on industrial buildings, workplaces, and general institutional facilities, with less emphasis on student accommodation environments where fire risks may differ due to occupancy patterns and student behavior.

Furthermore, limited information exists regarding the effectiveness of fire prevention measures, availability of firefighting equipment, students' awareness, emergency preparedness, and response mechanisms in Makerere University halls of residence.

Therefore, this study seeks to assess fire safety management practices in selected halls of residence at Makerere University, specifically Mary Stuart Hall, Lumumba Hall, and Mitchell Hall.

2. 9.0 Conceptual Framework

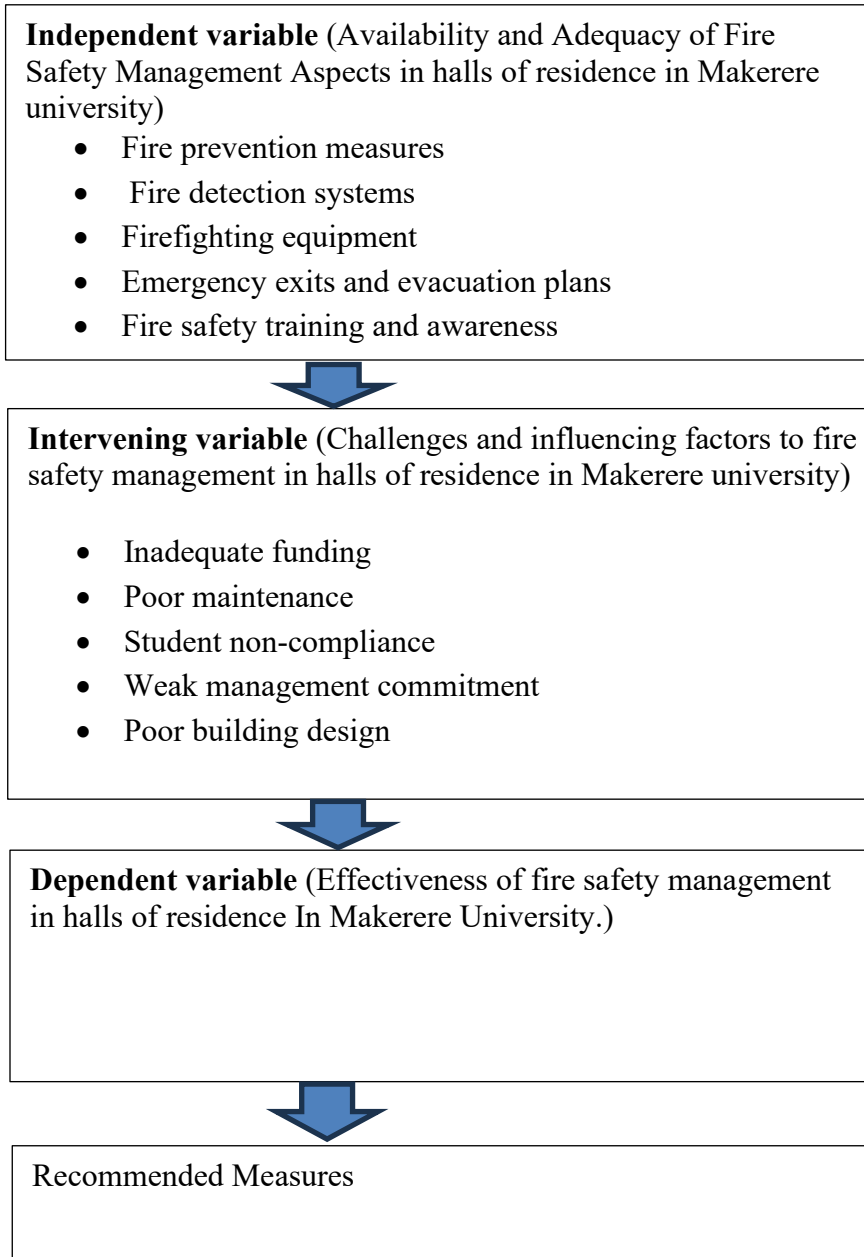


Figure 4: An illustration of the conceptual framework

The framework assumes that the **effectiveness of fire safety management** in Makerere University halls of residence depends on the adequacy and implementation of key fire safety management aspects, namely fire prevention measures, fire detection systems, firefighting equipment, emergency preparedness, training and awareness, and fire safety policies and

inspections. These aspects directly influence the level of preparedness and ability to prevent or respond to fire emergencies.

However, the relationship may be influenced by intervening factors such as funding availability, management commitment, student compliance, building design, maintenance practices, and enforcement of fire safety regulations. When these factors are favorable, the effectiveness of fire safety management is enhanced, leading to reduced fire risks and improved protection of lives and property

CHAPTER THREE: METHODOLOGY

3.1.0 Introduction

The purpose of this chapter was to present the methodological issues related to the way the research was conducted. This section thus aims at laying out the methods that were used to satisfy the objectives of the research. The main objective of the research was to assess the effectiveness of fire safety management in halls of residence in Makerere University

The methodology was selected based on the various strategies which are suitable for the research and in addition it required justification of an appropriate research strategy prior to choosing the most appropriate method for the research.

3.2.0 Research Approach

The study was approached quantitatively. The approach makes use of quantitative numerical data according to which precise and accurate descriptions can be based. The quantitative research approach formed the basis for the research design on which the study was based.

3.3.0 Research Design

According to (Polit & Hungler, 1985) research design was defined as a systematic plan established for carrying out a research study. There are thus seven types of research designs namely experimental, survey, case study, comparative, observational, action research, and mixed method

The research design for this study was based on the objectives of the study which was to assess the effectiveness of fire safety management in halls of residence in Makerere University. This was therefore done by majorly carrying out surveys using the questionnaires to gather the data. Therefore, descriptive research was used in this study.

3.4.0 Research population

According to Lingayas (2012), a research population refers to the entire group of subjects or individuals from whom conclusions are intended to be drawn. In this study, the research population comprised of students residing in Mary Stuart Hall, Lumumba Hall, and Mitchell Hall, which are halls of residence at Makerere University.

3.5.0 Sampling Techniques

The sampling technique used in this study was probability sampling, specifically simple random sampling, which was employed to select respondents from students residing in the selected halls of residence at Makerere University. This technique was chosen because it gives each member of the study population an equal and independent chance of being selected, thereby reducing selection bias and improving the representativeness of the sample. According to Sarjinder (2003), simple random sampling is a straightforward and fair method of selecting a sample from a larger population since every individual has an equal probability of inclusion.

3.6.0 Sample size

The sample size was calculated using the formula below which according to Cochran (1963) is suitable for large and unknown populations.

$$n = \frac{Z^2 pq}{d^2}$$

Where,

n-the desired sample size

Z-the standard normal deviation at the required confidence level

d-the statistical significance (level of precision)

p-the proportion in the population estimated to have characteristics being measured.

q= (1-p)

Therefore, the sample size based on a 95% confidence level with an accuracy of (+-) 5.5% and variability in population of 90% the n was calculated as

$$\frac{(1.96^2) \times 0.9 \times 0.1}{(0.055)^2}$$

= 114.2

=114

3.7.0 Data Collection methods

Data was collected through questionnaires

3.7.1 Questionnaires

The questionnaires were designed and ensured that they generated sufficient and the desired information. This was ascertained through comprehensive literature review through published technical papers, reports from organizations as well as newspapers and other sources on the internet.

3.7.3 Analysis of data

Frequency analysis was used for the various aspects of fire safety management that would be influencing in a building. It was again used to identify the challenges to fire safety management and to determine the best methods for Improving fire safety management in halls of residence.

3.8.0 Ethical Considerations

The researcher obtained permission from relevant university authorities before conducting the study. Participation was voluntary, and respondents were informed about the purpose of the study. Confidentiality and anonymity were maintained by ensuring that respondents were not required to provide their names. The information collected was used strictly for academic purposes.

CHAPTER FOUR; FINDINGS AND DISCUSSION

4.1.0 Introduction

This chapter presents the analysis, interpretation, and discussion of data collected through the survey questionnaires. Data was collected from students residing in three halls of residence at Makerere University, namely Mary Stuart Hall, Lumumba Hall, and Mitchell Hall.

4.2.0 Response rate

A total of 114 questionnaires were delivered to students from each of the three halls of residence. Of these only 94 responses (81.6%) were obtained as summarized in the table below

Hall	Questionnaires delivered	responses	Response rate
Mary Stuart	38	31	81.6%
Lumumba	38	34	89.5%
Mitchell	38	29	76.3%
Total	114	94	82.4%

Table 2: Response rate

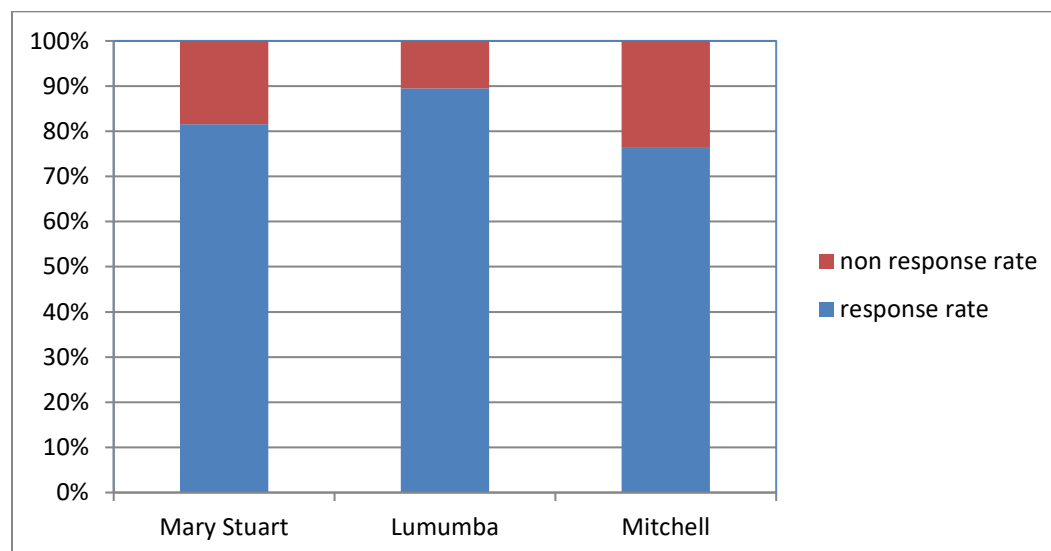


Figure 5: Bar chart illustrating the response rate per hall of residence

The responses for both halls of residence were within the acceptable response rate in accordance with (Mugenda and Mugenda, 1999) who suggested that any response rate above 50% is adequate enough considering the quantitative data manually collected.

4.3.0 Year of study for the respondents

The table below summarizes the years of study of the students. This indicates how long the respondents have

Hall	1 st Year	2 nd Year	3 rd Year and above
Mary Stuart	13(41.9%)	10(32.2%)	8(25.8%)
Lumumba	15(44.1%)	7(20.6%)	12(35.0%)
Mitchell	14(48.2%)	11(34.5%)	4(17.2%)
Total	38(44.6%)	28(29.9%)	24(25.5%)

Table 3: Years of study of the respondents

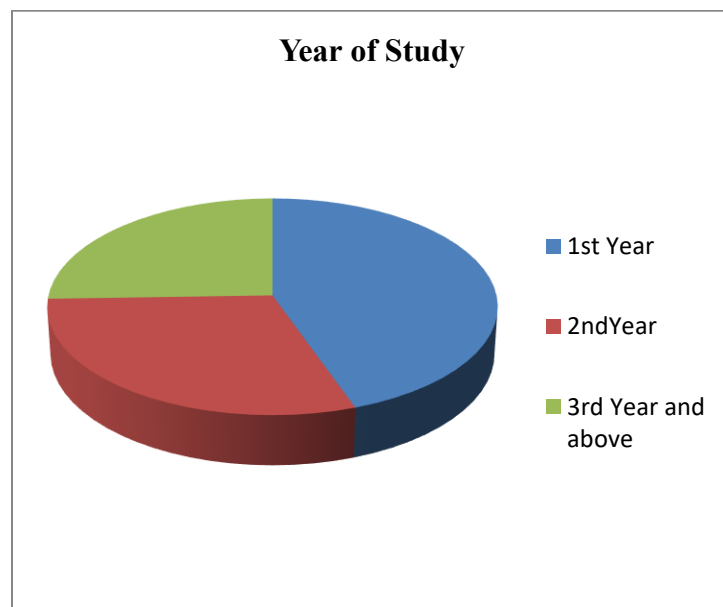


Figure 6: Pie chart illustrating the years of study of the respondents

4.4.0 Experience with fire outbreak

The respondents' experience with fire outbreaks in their respective halls of residence was asked and 4 (4.26%) had experienced outbreaks in one way or the other. However, 95.74% had not experienced any outbreaks at all.



Figure 7: Pie chart illustrating the respondents' experience with fire

4.5.0 Availability and Adequacy of Fire Safety Management Aspects in Makerere University Halls of residence

The aspects of fire safety management identified from the literature review were presented to the respondents, who were asked to assess their availability and adequacy using a four-point Likert ranging from 1 to 4. The responses obtained were analysed and presented in the table below. The mean score for each aspect was calculated using the formula provided below.

$$\text{Mean Score} = \frac{\sum(f \times x)}{N}$$

Where,

f = frequency of respondents

x = assigned Likert scale value

N = total number of respondents

Likert scale interpretation

Mean Score Range	Interpretation
1.00 – 1.75	Very inadequate / Not available
1.76 – 2.50	Inadequate
2.51 – 3.25	Adequate
3.26 – 4.00	Very adequate

Table 4: Interpretation of Likert scale 1

Aspect		Frequency				Total Score	Mean
		1	2	3	4		
1	Fire extinguishers	38	47	9	0	159	1.69
2	Fire alarm systems; i.e. Detectors etc.	94	0	0	0	94	1.00
3	Fire safety inspections	94	0	0	0	94	1.00
4	Fire safety training programmes	93	1	0	0	95	1.01
5	Fire drills	76	18	0	0	112	1.19
6	Good housekeeping practices	0	12	45	37	307	3.27
7	Maintenance of electrical installations	7	13	56	18	273	2.9
8	Emergency exits and evacuation plans	89	5	0	0	99	1.05

Table 5: Availability and adequacy of fire safety management aspects in Makerere university halls of residence

The findings presented in Table 5 indicate that most fire safety management aspects in the selected halls of residence were inadequate. Fire alarm systems and fire safety inspections recorded the lowest mean score of 1.00, implying that respondents perceived them as either unavailable or highly inadequate. Fire safety training programmes (Mean = 1.01), emergency exits and evacuation plans (Mean = 1.05), and fire drills (Mean = 1.19) were also rated as inadequate. These findings suggest that the halls of residence lack essential preparedness mechanisms required for effective fire prevention and emergency response.

The inadequacy of fire alarm systems and emergency preparedness measures raises concerns regarding the ability of occupants to detect and respond promptly to fire emergencies. According

to the National Fire Protection Association (NFPA, 2020), early detection and warning systems are among the most important components of an effective fire safety management programme because they facilitate rapid evacuation and reduce fire-related losses.

The study further revealed that fire extinguishers were inadequate, with a mean score of 1.69. This finding implies that even where firefighting equipment may exist, its availability and adequacy are insufficient to support effective first-response firefighting efforts..

However, good housekeeping practices obtained the highest mean score (Mean = 3.27), indicating that respondents considered them adequate. Maintenance of electrical installations also scored relatively high (Mean = 2.90). These findings suggest that some preventive measures aimed at minimizing fire risks are practiced within the halls of residence. Good housekeeping helps reduce combustible materials and ignition sources, thereby lowering the likelihood of fire outbreaks. The findings support the views of the International Labour Organization (2015), which emphasized the importance of maintaining clean and orderly environments as a strategy for preventing workplace and institutional fires.

Overall, the findings indicate that although some preventive measures are practiced, the majority of critical fire safety management aspects are inadequate, exposing students and property to significant fire risks.

4.6.0 Challenges/influencing factors affecting fire safety management in halls of residence

This section aimed to determine the probable challenges influencing fire safety management in the halls of residence. The respondents were requested to rate the extent to which the identified factors affect fire safety management using a four-point Likert scale ranging from 1 to 4. The responses were analysed, and the arithmetic mean score for each factor was calculated to determine the level of influence of each challenge on fire safety management.

Likert scale interpretation

Mean Score Range	Interpretation
1.00 – 1.75	Low Influence
1.76 – 2.50	Moderate influence
2.51 – 3.25	High influence
3.26 – 4.00	Very High Influence

Table 6: Interpretation of Likert scale 2

Challenge/Influencing factor		Frequency				Total score	Mean	Ranking
		1	2	3	4			
1	Passive attitude of management towards fire safety management	5	17	39	33	288	3.06	2
2	Passive attitude of students towards personal fire protection	6	15	35	38	255	2.71	3
3	Building design giving little/inadequate escape routes and fire detection system	14	22	37	21	253	2.69	4
4	Lack of knowledge of fire safety management	20	34	23	17	225	2.39	6
5	Lack of/inadequate firefighting and detection equipment and devices in the halls	10	13	30	41	290	3.09	1
6	Inadequate water to support installation and operation of some firefighting equipment	32	25	28	9	175	1.86	7
7	Poorly enforced or lack of related policies and regulations in learning institutions	25	11	48	10	231	2.46	5

Table 7: Challenges to fire safety management in halls of residence

The findings in Table 7 indicate that inadequate firefighting and fire detection equipment was the most significant challenge affecting fire safety management in the halls of residence, with a

mean score of 3.09. This suggests that respondents strongly believed that the lack of adequate equipment limits the ability of the university to prevent, detect, and control fire outbreaks effectively.

Passive attitudes of management towards fire safety management ranked second with a mean score of 3.06. This implies that respondents perceived inadequate commitment by university management towards fire safety initiatives. Effective fire safety management requires strong leadership, resource allocation, and enforcement of safety regulations. According to Nadzim and Taib (2014), management commitment is a critical factor influencing the success of fire safety programmes within organizations.

The passive attitude of students towards personal fire protection also emerged as a significant challenge, with a mean score of 2.71. This finding suggests that some students may not prioritize fire safety practices or may engage in risky behaviours that increase fire hazards. Similar observations were made by Chow (2001), who noted that human behaviour is a major contributor to fire incidents in residential buildings.

Building design limitations, including inadequate escape routes and fire detection systems, obtained a mean score of 2.69. This finding highlights the importance of incorporating fire safety considerations during building design and construction. Poor building design can hinder evacuation efforts and increase the severity of fire incidents.

Lack of knowledge regarding fire safety management and inadequate enforcement of fire safety policies were also identified as challenges, although they were perceived to have a relatively lower influence. Nevertheless, these factors remain important because awareness and compliance play a critical role in reducing fire risks and promoting preparedness.

Overall, the findings demonstrate that both physical and behavioural factors contribute to ineffective fire safety management in the halls of residence. Addressing these challenges requires a combination of infrastructural improvements, management commitment, and awareness creation among students.

4.7.0 Ways of improving fire safety management in halls of residence

Respondents were asked to rate the extent to which the proposed mitigation measures would improve fire safety management in halls of residence using a four-point Likert scale ranging from 1 to 4. In addition, respondents were given an opportunity to propose other measures that were not included in the questionnaire but which they considered important for improving fire safety preparedness in the halls of residence. The arithmetic mean score for each measure was calculated, and the results are presented in the table below.

Likert scale interpretation

Mean Score Range	Interpretation
1.00 – 1.75	Strongly Disagree
1.76 – 2.50	Disagree
2.51 – 3.25	Agree
3.26 – 4.00	Strongly Agree

Table 8: Interpretation of Likert scale 3

Ways of improving fire safety management in halls of residence		Frequency				Total score	Mean	Ranking
		1	2	3	4			
1	Regular inspection and maintenance of fire safety equipment	0	0	48	46	328	3.49	3
2	Installation of adequate fire detection systems such as smoke detectors and alarms	0	0	35	59	341	3.63	2
3	Provision of adequate and accessible fire extinguishers	0	0	24	70	352	3.74	1
4	Conducting regular fire safety training for students and staff	0	5	53	36	313	3.33	5
5	Carrying out routine fire evacuation drills	0	15	41	38	305	3.24	7
6	Displaying clear emergency evacuation plans and fire safety signage	0	4	47	43	321	3.41	4
7	Compliance of students to smoking restrictions in the halls of residence	2	16	45	31	293	3.12	8
8	Creation of a fire safety policy for buildings in learning institutions and ensuring compliancy to these laws	0	7	56	31	306	3.26	6

Table 9: Ways of improving fire safety management in Makerere university halls of residence

The findings presented in Table 9 indicate that respondents strongly supported the provision of adequate and accessible fire extinguishers as the most effective measure for improving fire safety management, with a mean score of 3.74. This finding reflects the importance respondents attach to the availability of firefighting equipment in controlling fires at their early stages and minimizing damage.

Installation of adequate fire detection systems such as smoke detectors and alarms ranked second with a mean score of 3.63. The finding supports the recommendations of the National Fire Protection Association (NFPA, 2020), which emphasizes the importance of fire detection systems in providing early warning and facilitating timely evacuation during emergencies.

Regular inspection and maintenance of fire safety equipment was also highly rated, with a mean score of 3.49. This suggests that respondents recognize the importance of ensuring that firefighting equipment remains functional and reliable at all times. According to OSHA (2019), regular inspection and maintenance are essential for the effectiveness of fire protection systems.

Displaying clear evacuation plans and fire safety signage obtained a mean score of 3.41, while regular fire safety training programmes recorded a mean score of 3.33. These findings demonstrate that respondents appreciate the importance of awareness creation and preparedness in improving fire safety management. Training enhances occupants' knowledge of fire prevention and emergency response procedures, thereby reducing panic and confusion during emergencies.

The creation and enforcement of fire safety policies also received strong support from respondents. Effective policies provide guidance on responsibilities, standards, and compliance requirements necessary for maintaining safe residential environments.

Overall, the findings suggest that improving fire safety management in Makerere University halls of residence requires a comprehensive approach involving the provision of adequate firefighting equipment, installation of fire detection systems, regular maintenance, awareness creation, emergency preparedness, and enforcement of fire safety policies.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATION

5.1.0 Introduction

This chapter aims to draft conclusions from the discussions of the collected, presented and analyzed data and thereafter draw recommendations from the conclusions.

5.2.0 Conclusions

Based on the findings of the study, the following conclusions were made:

1. The majority of fire safety management aspects in the selected halls of residence were found to be inadequate. Fire alarm systems, fire safety inspections, fire safety training programmes, emergency exits and evacuation plans, fire drills, and fire extinguishers were either unavailable or insufficiently provided. This indicates that the halls of residence are not adequately prepared to prevent, detect, or effectively respond to fire emergencies.
2. Good housekeeping practices and maintenance of electrical installations were the only fire safety management aspects found to be relatively adequate. This suggests that some efforts towards fire prevention exist, although they are not sufficient to ensure comprehensive fire safety management.
3. Inadequate firefighting equipment was identified as the most significant challenge affecting fire safety management. Other major challenges included inadequate management commitment to fire safety, passive attitudes among students towards personal fire protection, and building design limitations such as insufficient escape routes and fire detection systems.
4. Respondents considered the provision of adequate firefighting equipment, installation of fire detection systems, regular maintenance and inspection of fire safety equipment, and improved emergency preparedness measures as the most effective strategies for improving fire safety management.
5. Overall, fire safety management in the selected halls of residence at Makerere University was found to be ineffective and requires substantial improvement to ensure the safety of students and property.

5.3.0 Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. Makerere University management should provide adequate and accessible firefighting equipment, including fire extinguishers, hose reels, and other firefighting appliances in all halls of residence.
2. Fire detection and alarm systems should be installed and maintained in all halls of residence to facilitate early detection and warning in case of fire outbreaks.
3. The University should establish a routine programme for inspection, testing, and maintenance of all fire safety equipment to ensure their reliability and effectiveness.
4. Regular fire safety training and awareness programmes should be conducted for students, wardens, and hall administrators to improve knowledge and preparedness for fire emergencies.
5. Fire evacuation drills should be conducted periodically to familiarize occupants with emergency procedures and evacuation routes.
6. Clear evacuation plans, directional signage, and emergency assembly points should be displayed prominently within all halls of residence.
7. Makerere University should develop and enforce a comprehensive fire safety policy for all residential buildings and ensure compliance with relevant fire safety regulations and standards.
8. Future hall construction and renovation projects should incorporate adequate fire safety provisions, including sufficient escape routes, fire-resistant materials, and modern fire detection systems.
9. Students should be sensitized on personal responsibility in fire prevention, including adherence to smoking restrictions and safe use of electrical appliances.
10. Further studies should be conducted in other university residential facilities and educational institutions to establish broader evidence on fire safety management practices and preparedness.

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APPENDIX
RESEARCH QUESTIONNAIRE



MAKERERE UNIVERSITY
COLLEGE OF ENGINEERING, DESIGN, ART AND TECHNOLOGY
DEPARTMENT OF CONSTRUCTION ECONOMICS AND MANAGEMENT
Research Questionnaire

Dear Sir/Madam,

I am OCIRA IGINITIUS, a student of Makerere University, pursuing a Bachelor of Science degree in **QUANTITY SURVEYING**. I am conducting research on the topic; “**Assessing the effectiveness of fire safety management in Makerere university halls of residence**” The information provided will be treated with utmost confidentiality. I kindly request you to spare some time and answer the following questions.

PERSONAL DATA

1. Hall: Mary Stuart ☐ Lumumba ☐ Mitchell ☐
2. Year of study; 1styear ☐ 2ndyear ☐ 3rdyear and above ☐
3. Have you ever had an experience with fire

Yes ☐
No ☐

SECTION 1: AVAILABILITY AND ADEQUACY OF FIRE SAFETY MANAGEMENT ASPECTS

Indicate the extent to which the following fire safety management aspects are available and adequate in your hall of residence.

Rating Scale:

1 = Not Available

2 = Inadequate

3 = Adequate

4 = Very Adequate

Aspect					
		1	2	3	4
1	Fire extinguishers				
2	Fire alarm systems; i.e. Detectors etc.				
3	Fire safety inspections				
4	Fire safety training programmes				
5	Fire drills				
6	Good housekeeping practices				
7	Maintenance of electrical installations				
8	Emergency exits and evacuation plans				

SECTION II: CHALLENGES/INFLUENCING FACTORS AFFECTING FIRE SAFETY MANAGEMENT

Indicate your level of agreement with the following statements.

Rating Scale:

1 = Strongly Disagree

2 = Disagree

3 = Agree

4 = Strongly Agree

Challenge/Influencing factor					
		1	2	3	4
1	Passive attitude of management towards fire safety management				
2	Passive attitude of students towards personal fire protection				
3	Building design giving little/inadequate escape routes and				

	fire detection system				
4	Lack of knowledge of fire safety management				
5	Lack of/inadequate firefighting and detection equipment and devices in the halls				
6	Inadequate water to support installation and operation of some firefighting equipment				
7	Poorly enforced or lack of related policies and regulations in learning institutions				

SECTION III: MEASURES FOR IMPROVING FIRE SAFETY MANAGEMENT

Indicate the extent to which you agree that the following measures would improve fire safety management.

Rating Scale:

1 = Strongly Disagree

2 = Disagree

3 = Agree

4 = Strongly Agree

Ways of improving fire safety management in halls of residence					
		1	2	3	4
1	Regular inspection and maintenance of fire safety equipment				
2	Installation of adequate fire detection systems such as smoke detectors and alarms				
3	Provision of adequate and accessible fire extinguishers				
4	Conducting regular fire safety training for students and staff				
5	Carrying out routine fire evacuation drills				
6	Displaying clear emergency evacuation plans and fire safety signage				
7	Compliance of students to smoking restrictions in the halls of residence				
8	Creation of a fire safety policy for buildings in learning institutions and ensuring compliancy to these laws				

OPEN-ENDED QUESTION

What additional recommendations would you suggest to improve fire safety management in Makerere university halls of residence.

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END