

Evaluation of firefighting service facilities in Bayero University Kano (new campus)

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Abstract:

Firefighting service facilities are range of tools and appliances designed to extinguish fire, and mitigate widespread fire. The equipment's protect building operation from harm and severe damage in case of fire outbreak disaster. It is evident from the literature that a significant number of tertiary institutions in Nigeria lacks adequate firefighting equipment's, thereby putting the academic buildings exposed to risk as well as the end users. The study seeks to evaluate the firefighting services facilities in Bayero University, Kano (BUK). The study employed quantitative approach. Purposive sampling technique was used to identify 377 respondents from 26,380 respondents. Questionnaires were administered to the end users of the academic buildings in BUK. Findings from the study reveal that there are limited or shortfall of firefighting service facilities in the study area. Interestingly, the end-users of the academic buildings lack basic knowledge on fire safety and prevention measures. The study further recommends provision of modern and adequate firefighting facilities in all academic buildings. Lectures and training should be organized by the departments or faculty to create more awareness among the end-users of academic buildings in BUK.

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1. Introduction

Firefighting service facility is a range of tools and appliances that are designed to extinguish fire, when used correctly. This facility will protect the operator from harm and the property from damage [1]. A study by the Fire Disaster Prevention & Safety Awareness Association of Nigeria (FDPSAAN), [2] revealed that there is significant low level of awareness on fire safety in Nigeria. About 20% of the total population of the country has basic fire safety knowledge, while 80% lack such knowledge. Asodike and Abraham [3] in their survey practice in some schools in Port Harcourt opined that perhaps the rare incidence of fire outbreak in schools in Nigeria accounts for the lack of acquisition, installation and maintenance and/or servicing of the firefighting equipment ranging from extinguishers, sprinklers, hydrant, alarm and bells, fire hose cabinet, sand buckets and failure to organize periodic safety training for staff and students. The function of these emergency services is to protect the life of people and their properties [4]. An emergency service provision procedure involves many essential components involved in rescue operations. According to Burtles [5], measures taken for fire emergency preparedness should also include accessibility to the building by fire fighters. Calams [6], the stages of fire are: ignition, growth, full development and burn out. The ignition stage starts with a combination of heat, oxygen and fuel, causing a little fire. This can easily be put out using an extinguisher. Olufemi [7] reported that a combination of

carelessness and lack of fire-fighting equipment saw these fires escalate quickly beyond manageable levels.

Fire-fighting facilities is one of the components neglected or giving less priority from the commencement to completion of many public buildings Nigeria [8]. the notable problems facing fire services facilities, ranges from inadequacy/absence of the firefighting equipment and lack of awareness on emergency fire safety measures; these leads to high loss of lives and serious damage to the building when there is fire outbreak [9]. The importance of firefighting service facilities cannot be over emphasized. Each facility covers demand within a defined proximity, such as the distance standards reported by NEMA [10].

1.1 The Concept of Fire Fighting Facilities

Fire-fighting facilities according to Zhang and Jiang [11] refers to the general term of equipment and facilities set in buildings, such as automatic fire alarm system, automatic sprinkler system, and fire hydrant system to prevent and extinguish building fires. It is an important facility to ensure building fire safety and personnel evacuation safety, and it is an important part of modern buildings. According to Calams [6], the stages of fire are: ignition, growth, full development and burn out. The ignition stage starts with a combination of heat, oxygen and fuel, causing a little fire. This can easily be put out using an extinguisher. According to Adekunle, *et al.* [12], fire is caused in buildings as a result of improper wiring and faulty installation of electrical equipment. Anaglatey [13] also observed that fire in

institutional buildings result from poor electrical designs and illegal connections to other sources of electricity. Boateng [15] reported that severe winds and harmattan causing contact between high-tension wires, can also lead to fire outbreaks. Another consideration in site planning as explained by Hopper [15] is that the drive-way layout should be such that there is a cul-de-sac or t-turn on one end of an access way for fire vehicles (fire engine). The fire hazard level of a building determines both the distance between fire extinguishers and the type of extinguisher to be placed within a building.

According to Andrew and Martin [16] lack of awareness by staff and students as to the priority of combustible and flammable material waste management is also responsible for poor management of waste. Carlton [17] opined Fire safety awareness means analyzing the possible risks of fire in your vicinity and taking prevention measures to ensure minimum damage and safe exit of the entire person exposed to fire. Different fire safety awareness approaches are adopted at different locations. However, the priority of every approach is the safe and successful evacuation of people trapped in a building in case of fire. For efficient fire safety awareness, proper fire safety training is crucial. A professional fire safety program involves the necessary steps one must undertake in the event of a fire. Well planned and practice fire safety training can prepare you mentally and physically to keep your mind calm during an emergency situation so that you can take the necessary steps to mitigate the damage. Cote [18], fire emergency safety plans are important as they influence the level of preparedness in case of a fire disaster. Fire safety preparedness or the lack thereof effects the psyche of building occupants, especially in areas where have been incessant cases of fire outbreak.

Carlton [17] also highlighted the points that make fire safety awareness a crucial practice that must be observed at schools, workplace and other place that is prone to fire hazard as follows:

- a. Training to respond during a fire: fire safety awareness is important to make sure that individuals know how to respond during a fire hazard. It is important that one should keep calm and know the basic measures that should be undertaken when fire breaks out. One of the major steps towards fire safety awareness is recognizing the basic properties of fire. To prevent the fire, keeping the sources of fuel and ignition apart [17].
- b. Safety of those who are physically or mentally challenged: adequate fire safety awareness not only helps in protecting oneself from fire related hazard but can also prove beneficial for protecting those who are not able to help themselves. This might include physically and mentally challenged people, old aged people, kids and pets [17].
- c. Containing fire: in such areas such as theatres, classrooms and place of work (offices) fire safety awareness become even more important as a fire breakout in such places can lead to death and damage to property and other assets. Ensure proper fire safety equipment is installed. With proper safety awareness, you can help in safe evacuation and it could be beneficial in putting out the fire. Fire safety awareness

also involves learning how to operate various fire safety equipment such as smoke alarms, fire extinguisher and sprinklers [17].

1.2 Fire Fighting Equipment's for Public Buildings

Firefighting equipment may vary according to the structure's age, size, and industry. Karolina & Sylwester [19] reported that, any public/business building must contain all or some of the following

1.2.1 Smoke Detector

Smoke Detector is the fastest and most reliable way to detect fires, which represent so-called first line of protection and fire warnings on a premise. It detects smoke presence within the first minutes, which helps in controlling fire before it drastically spreads. Smoke detector is installing in ceiling and the test typically provides activation within 2minutes 10seconds. Another advantage; it detects low-energy fires that emit a small amount of heat more than any other fire detectors [20].

1.2.2 Fire Sprinkler System

Fire Sprinkler System is an efficient part of any fire protection system, serving as the first line of defense against sudden fires. A fire sprinkler system provides enough water to suppress the flames before going out of control. Sprinkler are installed too close to walls with 10-15ft maximum spacing. They offer safe protection, giving extra time for a safe evacuation of the building [21].

Types of Sprinklers;

- a. Wet Sprinkler System
- b. Dry Sprinkler System
- c. Pre-action Sprinkler System

1.2.3 Fire Pillar Hydrant

A fire pillar hydrant is a vital part of any fire protection system, offering a connection point that accesses a water source in time of need. It is a column-shaped structure that provides pressurized water to aid firefighters during the whole process of fire extinguishing. Fire pillar hydrants must be available and equally spaced distance of 500ft maximum and 400ft minimum in public areas, drawing the necessary quantity of water. Although they may not operate for a long time, they must be tested continuously to guarantee their efficiency if a fire breaks out suddenly. If needed, firefighters use a wrench to remove the valve cover, and then, water flows into the hose, attacking the flames [22].

1.2.4 Fire Hose Cabinets

The Fire reel hose Cabinet is a steel box placed in public areas and buildings, used to store the required fire equipment. It is designed to protect the fire hose rack assembly, fire extinguisher, and fire hose reel against theft and rubbish. With high-quality steel, easy installation, and small occupation, the fire hose reels must be located 4m of an exit, while the maximum distance spacing is 35m and generally separate hose reels are to be provided and install for each story of the building [23].

1.2.5 Fire Extinguisher

Fire Extinguisher is a cost-effective and most powerful way to attack Class A fire, caused by solid materials such as paper, wood, and more. An extinguisher operates by spraying a jet at the firebase; fire-extinguisher is use to cool the flame, and avoiding the re-ignition. Fire extinguishers are installing on walls with maximum distance spacing of 75ft within the building [24].

Types of Fire Extinguishers;

- a. Water fire extinguishers
- b. Foam fire extinguishers
- c. Dry Powder fire extinguishers
- d. Wet Chemical fire extinguishers
- e. Carbon dioxide fire extinguishers

1.2.6 Fire Alarm Systems

Fire Alarms give an early warning before the flames go out of control, protecting lives and property. If you think fire alarms aren't important think again! In case of a sudden fire, a few more seconds can be enough to save lives. Multi-story buildings must have an alarm system fitted on every floor to detect smoke and break into sirens in case of emergency. An alarm system can't suppress a fire but can alert the responsible to react accordingly. Public buildings are supposed to be provided with affordable, high-quality fire alarm systems to protect the lives of the occupants [25].

2. Methodology

This paper adopts survey research design, because it attempts to evaluate the firefighting service facilities in Bayero University, Kano (new campus). Targeted populations of 26,380 were identified, the research decided

to use purposive sampling technique by focusing on 377 as sample size determined based on Saunders et al., [25] model require no calculation because they have developed a table for selecting an appropriate deserve sample size. This study has employed a quantitative approach, in which statistical computation was used in analyzing the data collected. Descriptive analysis method using the Statistical Package for Social Science (SPSS) to evaluate the firefighting service facilities in Bayero University, Kano (new campus). The target was 377 respondents that were realized based on the Saunders et al., [25] and the response was 333 with a response rate of 88%.

3. Findings

The table below, reveals that many of the fire emergency safety facilities do not exist in the study area. The appliances (fire extinguisher and sand buckets) are the equipment's commonly found within the facilities of the study area. This is understandable, as full-scale firefighting and protection emergency systems are measures incorporated in buildings to protect the occupant's lives and properties. However, (88%) of the respondents indicated that the devices do not exist or fall shortage while only (12%) of the respondents opted for the existence of the firefighting equipment.

However, it could be noted from the above that the major firefighting equipment in existence in the institution is fire extinguisher and sand bucket, this shows that other effective firefighting facilities were grossly unavailable or has fallen short. The non-availability of these equipment's will definitely threaten or endanger the safety of the occupants.

Table 1: Finding on emergency firefighting facilities in the study area

Facilities/Equipment	Mean	Standard Deviation	Rank
1. Fire alarm system	1.50	0.500	18 th
2. Fire hose	1.67	0.469	17 th
3. Fire suppression system	1.73	0.441	16 th
4. Fire fighting vehicle	1.73	0.439	15 th
5. Heat detector	1.74	0.436	13 th
6. Smoke detector	1.74	0.434	13 th
7. Fire extinguisher ball	1.75	0.431	12 th
8. Fire cabinet	1.77	0.418	10 th
9. Fire fighters gloves	1.77	0.418	10 th
10. Fire blanket	1.78	0.480	9 th
11. Fire pillar hydrant	1.80	0.394	6 th
12. Emergency safety sign	1.80	0.394	6 th
13. Sprinkler system	1.83	0.374	5 th
14. Firefighting pumps	1.83	0.369	4 th
15. Fire bucket	1.15	0.366	19 th
16. First aid safety kid	1.80	0.363	6 th
17. Fire doors	1.87	0.332	3 rd
18. Fire suit/protection gear	1.87	0.329	2 nd
19. Fire extinguisher	1.12	0.325	20 th
20. Flamezorb	1.88	0.017	1 st

Source: Field survey, (2023)

From the Table 2, shows that (94.6%) of the respondents are not fully aware of the emergency fire safety measures. While (5.4%) of the response indicated that they have never participated in a fire drill and are not aware of the procedure measure to be taken or followed when there

is a fire outbreak in the building. Therefore, it could be deduced from the above that majority occupants are lacking the basic knowledge of fire incidence measures and the operation of the scarcely available firefighting service facilities.

Table 2: Findings on the Level of Awareness on Emergency Fire Safety Measures of respondents.

Awareness	Mean	Standard Deviation	Rank
1. Are you aware of any emergency exit route in your department	2.97	1.427	2 nd
2. Have you use any fire extinguisher facility to quench fire outbreak	1.98	1.399	3 rd
3. Are you aware of the location of the install firefighting facilities in the building	3.67	1.294	1 st
4. Are you aware of any emergency contact within the university	1.89	1.236	4 th
5. Have attend any fire prevention/safety activity organized by fire rescue department	1.76	1.141	5 th
6. Have you receive any training by your department	1.69	1.116	7 th
7. Are you aware that the use of elevators during a fire outbreak should be avoided	1.72	1.102	6 th
8. Are you aware of the procedure to follow when there is fire outbreak	1.65	1.010	9 th
9. Have you receive any pamphlet or leaflets containing emergency procedure and evacuation plans from your department or faculty	1.67	0.954	8 th
10. Have you ever participated in fire drill in the University	1.50	0.869	10 th

Source: Field survey, (2023)

Ogajo [26] add that fire safety is influenced by the availability of firefighting equipment, awareness of resident's, fire protection and prevention measures as well as mitigation measures adopted by various players.

4. Conclusion

This study which was conducted in Bayero University, Kano (new campus) has shown that the institution has fallen short of firefighting services facilities within the academic buildings of the university. However, facilities like sand bucket and fire extinguisher are the most commonly found and used firefighting facilities in the study area, and they are not as effective as the modern facilities. Major facilities that are not in existence include flame Zorb, sprinklers, smoke detector, fire alarm system and fire hydrant. And they are the most effective firefighting service facilities that should be given more priority in the study area. Furthermore, the occupants are lacking the basic knowledge on fire safety prevention measures. Therefore, there is low level of awareness on the preventive measures among the occupants in the study area.

Recommendation

The study recommends the below suggestion;

- Modern and sufficient fire extinguishing equipment should be provided and install according to standard all through the institution facilities.
- The university should periodically organize public lecture/training on firefighting equipment to create awareness among the occupants.
- Pamphlets or leaflets containing emergency procedures and evacuation plans should be distributed to the occupants in order to provide knowledge against sudden fire outbreak.
- Proper and regular routine maintenance culture should be adopted to ensure the existing facilities are well maintained and ready for use at all time.

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