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A Study of Fire Safety in Hostel Design: Case Study of Nnamdi Azikiwe University, Anambra State, Nigeria

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Abstract:
In addition to offering residents a comfortable indoor environment, a hostel structure must also secure their safety. Hostel buildings should be made to be easily able to handle such emergencies and prevent unfavorable fire incidence since it concerns the safety of the building's residents. This is due to the necessity of fire safety and protection. The study aims to determine what causes fires and how to make hostels safer. Through case studies and interviews, data for the study was gathered. A case study was carried out in hostel in three universities: Nnamdi Azikiwe University, Awka, University of Nigeria Enugu campus, and Babcock University, Ogun state. The analysis of the data showed that both passive and active methods are used to ensure fire safety in buildings. The active measures include the control of smoke and heat propagation in buildings by either the natural or forced ventilation of fire compartments. In contrast, the passive measures are related to building materials and the response of the building construction to the fire. The study suggests that a comprehensive approach should be used to ensure fire safety in hostel buildings and designs, taking into account factors like building compartmentalization, fire-resistant building components, automatic sprinkler, and fire alarm systems, fire hydrants, firefighting appliances, providing open spaces, and muster points with proper signages.

Keywords: *Fire, safety, hostel, system, measure, building*

1. Introduction

1.1. Importance of the Research

The research aims to study fire safety measures in the design of hostels at Nnamdi Azikiwe University with a view to enhancing preventive safety measures. In order to achieve the above-stated aim, the researcher shall be working with the following objectives:

- Understanding fire safety measures in hostel buildings,
- Examining design considerations for fire safety

1.2. Background/Current Understanding

A hostel is described as a business that provides inexpensive housing, food for tourists, and a place for students to live. It is also characterized as a low-cost, shared-room ('dormitory') lodging that admits single travelers or groups for short-term stays and offers common spaces and community services (Wikipedia Encyclopedia). It also said that the establishment must provide short-term, communal (dormitory-style) housing for individual visitors to be termed a hostel. However, many hostels provide both single rooms.

In most academic institutions, the hostel has become an opportunity to develop and improve educational quality.

Building fires can be caused by a variety of circumstances.

According to Health and safety blog (2018), fire causes may be classified into the following categories.

1.2.1. By Accident

An accident is defined as an unplanned incident that causes shock, harm, and damage to life and property. Accidental fires are an emergency or unrestricted source of combustion; fires from this source might be caused by a thunder strike, malfunctioning electrical equipment, and wiring systems, or fire spread.

1.2.2. Carelessness

Failure of building occupants to take appropriate safety procedures may result in fire breakouts. If not swiftly controlled, fire from this source spreads throughout the building.

1.2.3. Willful Act

These are fires caused by the purposeful and intentional actions of inhabitants or other people. Roughly one-third of all arson fires are impossible to avoid.

Effective fire safety in buildings goes beyond meeting codes. It requires a systematic and diligent approach on the part of the architect for fire prevention, protection, and control in all aspects of building design, construction, and use. (Wilkinson, 2016). Fire and light are created when the three elements heat, oxygen, and fuel combine quickly. According to Suryoputro (2018), the presence of the three fundamental elements or constituents of fire, also known as fire's own everlasting triangle, is necessary for the occurrence of fire. They are:

- Heat,
- Oxygen, and
- Combustible substances (fuel)

Suryoputro (2018) pointed out that if one of the elements is absent or removed, combustion will not occur.

2. Methods and Materials

The study's proposed approach to data collecting and analysis included a description of the research theme and sample data, as well as research procedures and research tools. Primary and secondary data gathering methods were used to get the information for this study.

2.1. Primary Investigation

Primary investigations of information are first-hand data obtained or explored by the researcher himself. The primary bases of data include:

2.1.1. Observation

A few public and private universities in Nigeria should be visited to learn:

- How to control and prevent fires,
- What steps should be taken to ensure that human lives are prioritized during building design, and
- What are the best things to do when a fire breaks out to prevent loss of life and property

Additionally, the facilities would be evaluated. The researcher might hope to learn first-hand information about fire safety precautions in hostel designs thanks to the visit. The researcher will pay particular attention to the crucial concerns pertaining to his line of work as an architect, such as design and organization, building components, adequate space, and building structural stability.

2.2. Secondary Investigation

Information from secondary investigations is data that has already been gathered in earlier studies that are pertinent to this study. Books, journals, published and unpublished articles, and other reference materials all contain the data needed for this inquiry. The secondary database includes:

2.2.1. Literature Review

Getting information from different books, e-books, periodicals, articles, newspapers, journals, etc., is part of this. The researcher would examine and extract the information pertinent to his study while citing the article's author. Websites: The researcher would go to websites that addressed topics connected to his study and gather pertinent data, citing the webpage in the process.

2.3. Case Studies

Architectural case studies evaluate current structures that are pertinent to a proposed design. This case study aims to evaluate current schools' effectiveness, identifying their achievements and failings to develop designs that will adopt the best practices now in use and address the schools' weaknesses. Based on how closely the various case studies related to the study's focus—fire safety in hostel designs—they were chosen. Based on the hostel's location, the number of guests in the area around it, and the number of years it has been operational, local case studies were chosen. In designing this proposed library, conclusions from the examination of the numerous case studies will serve as a guide.

3. Results

The result in this section comprises the case studies the researcher focused on, which are Robert Akonobi Postgraduate Hostel Nnamdi Azikiwe University, Nkrumah postgraduate hostel Enugu, and Babcock University Postgraduate Hostel Ogun State.

3.1. Robert Akonobi Postgraduate Hostel Nnamdi Azikiwe University, Akwa

Robert Akonobi Postgraduate Hostel, Akwa is a bungalow building located at Nnamdi Azikiwe University Awka, Anambra state. Nigeria.

3.1.1. Layout and Organization

A bungalow contains students' room with toilet and bathrooms, entrance lounge (common room), kitchen, laundry, store, and courtyard. The building with a courtyard in the middle contains 14 bedrooms, each accommodating 3 students. The room is 3.8 x 5.4m, consisting of 3 wardrobes and 3 bed spaces. The building houses both male and female postgraduate students.

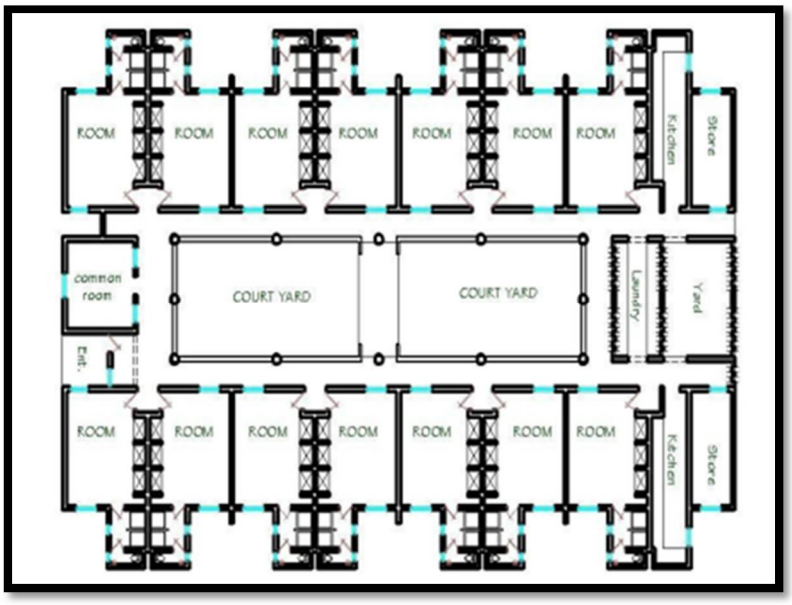

Figure 1: Floor Plan of Postgraduate Hostel Unizik, Awka.
Source: Author

Figure 2: Showing the Court Yard and the Corridors (Horizontal Means of Escape)
Source: Author

Figure 3: Show Escape Route
Source: Author's Fieldwork

3.1.2. Building Materials

- Aluminum roofing sheets and timber trusses are used to construct the roof
- Doors are offered in flush and wooden panel configurations
- Fiber ceiling tiles that are strung at the height of 2.8m make up the ceiling
- The walls are constructed from chunks of sandcrete
- The windows have an aluminum frame and are composed of metal
- All of the floorings are built of cement screed, save the walkways (face brick interlock)

3.1.3. Appraisals

With the inclusion of the courtyard, cross ventilation was accomplished, and a simple exit was made available in the event that a fire broke out inside the hostel. Fire resistance was not a factor in the building's design. Fire-resistant doors and walls were not used in the hostel to prevent the spread of the fire and enable occupants to flee in case of fire. Equipment for first-aid firefighting, which could help the fire department when they arrive, is not provided. Examples include hydrant systems, fire hose reels, extinguishers, fire buckets, fire blankets, and so forth.

3.2. Nkrumah Postgraduate Hostel Enugu

Nkrumah postgraduate hostel is a 2-storeyed building located at the University of Nigeria Enugu campus (UNEC) in Enugu state Nigeria.

3.2.1. Layout and Organization

The hostel's design is typical of a classic hall of residence, consisting of a two-story block with student rooms, an entrance, a lounge, a hall supervisor's office, a porter's lodge, and a hall warden's office. On each level, each wing includes 14 bedrooms connected by a single loaded hallway. The link with a comparable layout has 13 bedrooms. A basement level may be found in one of the wings. The hostel's overall Z-shaped layout has 97 bedrooms, each of which is suited for one student (this is evident in the size of the room). The room is 2.4 by 4.2 feet and has a simple arrangement with furniture that includes a fixed closet, mobile desk, chair, and bed. The amenities supplied indicated that the facility was initially built for male students alone. The building now houses both female and male postgraduate students, with one wing dedicated to each gender.

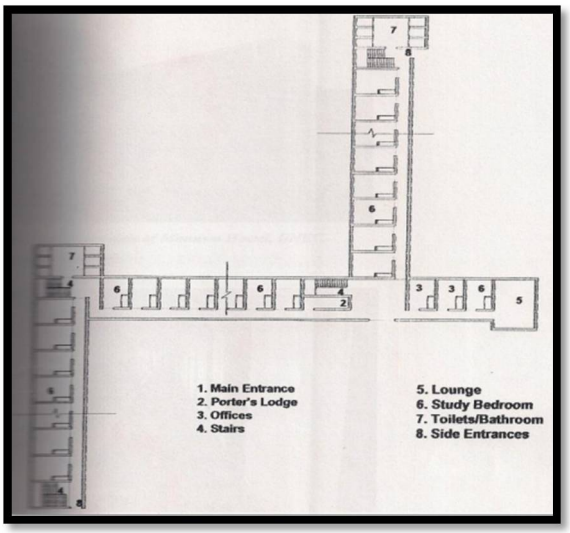

Figure 4: Unec Hostel Ground Floor Plan

Figure 5: *The Approach Façade of the Hostel*
Source: Author's Fieldwork

3.2.2. Building Materials

- The roof is built of aluminum roofing sheets and wood trusses
- The doors are flat wooden doors
- For the topmost floor, the ceiling is perforated asbestos ceiling tile hanging at the height of 2.6m and reinforced concrete slab for the lower floors. Sandcrete blocks are used to build the walls
- The windows are made of glass louvers with a wooden frame

3.2.3. Appraisals

The width of the escape (corridor) is adequate; nevertheless, it is being utilized as an improvised kitchen, which narrows it and turns it into a possible fire source rather than an escape route. A vertical escape route was provided in the event of an inferno. The building's design did not take fire resistance into account. The building's design did not take fire resistance into account. In the event of a fire, fire-resistant doors and walls were not utilized in the hostel to limit the spread of the fire and allow inhabitants to escape. There is no provision for first-aid firefighting equipment that can assist the fire department when they arrive. For example, hose reels are first-aid devices used by inhabitants and firemen that are attached to a pressurized water supply. Extinguishers, fire buckets, fire blankets, hydrant systems, etc., are other similar items.

3.3. Babcock University Postgraduate Hostel Ogun State

On May 10, 1999, Babcock University received its license and accreditation. The University Administration recently decided that all Babcock University students, including undergraduate and postgraduate, would now live in campus hostels. Babcock University in Ilisan-Remo, Ogun State, has dedicated a 500-person hostel to the late Felicia Adebisi Dada. Prof. Kayode Makinde, the Vice Chancellor, stated that the hostel was named after Dada because of the type of life she led.

3.3.1. Layout and organization

On the ground level, there is a 2-man room for handicapped people. A Hall Master's residence (3-bedroom flat) is offered in keeping with Babcock University's legacy of improving student welfare. This flat is connected to the hostel complex but has its own entrance. The Hostel Block is also connected to a 650-seat Activity Hall. Students can use this multi-purpose hall. The total floor area of the hostel is 5360sqm. The structure has four levels. The Activity Hall is 500 square meters in size.

Figure 6: Room Layout of Babcock University Hostel

3.3.2. Building Materials

The roof is built of aluminum roofing sheets and wood trusses. The doors are flat wooden doors.
For the topmost floor, the ceiling is perforated PVC ceiling tile hanging at the height of 2.8m and reinforced concrete slab for the lower floors. Sandcrete blocks are used to build the walls. The windows are made of glass louvers with a wooden frame.

3.3.3. Appraisals

Vertical means of escape in case of any inferno was provided. Fire resistance construction was not considered in the design of the building. Compartmentation was not considered in the design of the building. The building was chained together, allowing the fire to spread easily.

No provision was made for first aid firefighting gadgets that can aid the fire brigade when they arrive.

4. Discussion

The findings were based on the researcher's principal investigative strategy, and the conclusions were based on the architectural layout and design of the numerous Case studies being examined. The study was limited in that the relevant authorities only permitted the researcher to gather data they deemed appropriate for public consumption. As a result, certain information was kept secret. In conclusion, the researcher would like to recommend that positive and healthy regulations should be put into place so that future researchers will have access to comprehensive and sufficient information that will allow them to make meaningful contributions to the body of existing knowledge.

5. Conclusion

In order to address the inherent difficulties associated with fire in hostel structures, the studies carried out during the study process were combined into this thesis. Case studies were thoroughly examined to have a compound analysis and solution, and all positive aspects were employed to the research's advantage. Without a doubt, when the project is finished, it will provide effective fire safety in the sense that the issues and attitudes surrounding fire in hostels have been addressed through a design strategy that aids in:

- Preventing fire ignition,
- Warning residents when a fire has started,
- Providing escape routes, and
- Limiting fire spread through the appropriate use of materials and construction techniques

This increases firefighter and occupant safety.

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