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Abstract

Fire causes huge losses every year, typically measured by property loss, [illegible] deaths and injuries. High-rise buildings have received considerable attention in fire safety world over decades across the globe because the effect of fire outbreak is not limited to building or occupants alone, even the communities around are concerned with fire safety. The study is aimed at assessing fire safety management practices in high rise buildings. The population of the study was drawn from high-rise buildings in Abuja. Purposive sampling technique was used for selection of the high-rise buildings, while simple random technique was employed for the selection of respondents for questionnaire administration which were occupants and users of the buildings. The study revealed that in spite of availability of firefighting equipment majority of the respondents could not handle fire safety equipment and also incapable of discerning the required action to take in the event of fire incidents and even unsure about their functionality. However there are different factors affecting the integration of fire safety equipment in high buildings, but size of building, type of building and type of occupant/occupancy building are considered the most impacting factors. The study recommended that the functionality of installed basic fire safety equipment should be ensured and regular maintenance of the equipment should be carried out to guarantee the safety of lives and properties in fire situations.

Keywords: Abuja; Fire safety; High rise building; Safety practices

Introduction

Fires can occur anywhere, at any time in buildings, automobiles, and outdoors. Fires that affect our homes are often the most tragic and the most preventable. The annual fire outbreaks in Federal Capital Territory Abuja, was estimated to be about 444 with fatalities deaths of approximately 194 (Federal Fire Service (FFS), [illegible] instance, every year over 75% of civilian fatalities occur as a result of fires in residential buildings. It reported that between 2007 and 20 civilian fire casualties in residential buildings accounted for 81% of fatalities (Topical Fire Report 2011). Fire causes huge losses every year, typically measured in property loss, human deaths and injuries.

vehicle access (Prashant, 2007). Much earlier observation by the American National Standard Institute (2004) shows that these buildings are generally considered as one that is taller than the maximum height which people are willing to walk up; it thus requires mechanical vertical transportation. High-rise buildings became possible with the invention of the elevator (lift) and cheaper, more abundant building materials. The growing number of high-rise building projects worldwide has introduced new challenges in vertical delivery (Chang *et al*., 2011). As the height of buildings grows, the efficiency of vertical transportation drops exponentially, thus affecting the safety, cost and overall schedule of projects (Wei *et al*., 2015).

Fire Safety in High-Rise Buildings

The rapid growth of urban population globally, specifically the development of mega cities and the increase in incidences of non-accidental fires has prompted careful consideration of fire 'safety' in populated urban centres. Among the incidences of non-accidental fires captured globally included the terrorist attack fires in the World Trade Centre on 11 September, 2001 in USA (Chow, 2001a), Arson fires in a bank, in universities in Beijing (Chow, 1995) and underground railway arson fires in South Korea and Russia (Chow, 2001a). Fundamentally, fire safety codes of buildings deal with accidental fires. But with the terrorist attack of World Trade Centre and several other rson incidences, non-accidental fire because with so and arson fires is getting quite higher than usual (Chow, 2001a; Chow, 2001b).

Modern architectural features, such as the utilization of numerous glass wares for constructions, might constitute extra problems. Cracking and falling down of glass panels as a result of explosion or failure of the fittings for putting in place the glass panels would provide greater air intake rate to support combustion and eventually cause greater heat emission that could result in severe damages (Hong Kong Fire Services Department, 1998). Amongst the fire safety challenges of high-rise buildings are: accessibility of firemen and delivery of equipment for rescuing people and combating of fires are upward through lifts or staircases; direct rescuing through ground applications from the exterior of buildings is impossible; basic routes of escape for occupants are downward by lifts or staircases; direct application of water by fire fighting jets from the outside the building is impracticable or much stalled and fire fighting techniques (application of water, fire ventilation amongst others) are usually applied from the interior of buildings (Chow, 2001a).

Fire Safety Management Practices

Fire is an indispensable need in human life and our existence depends on it as we cannot live without it for cooking, heating and other needs. In spite of its significance to human existence, when fire is not efficiently controlled users may suffer from minor to fatal injuries and at times death (Spadaccini, 1998). effects of fire outbreak could also

temporary or permanent closure of buildings, among other things (Agyekum, Ayarkwa and Amoah, 2016). To reduce the consequential effects of fire, there is need for effective fire safety management. Fire safety management has been defined by Howarth (1999) as the implementation of policy, standards, tools, information and practices to the task of analysing, evaluating and controlling fire safety by a manager. Fire safety management practices is very essential in the concept of providing total safety in a building and its occupants.

In order to achieve effective management practices, it is encouraged that at all times, an effective fire safety management measures should be instituted to forestall unforeseen circumstances. A plethora number of researchers have studied and identified several fire safety management practices in around the world (e.g. Chow, 2001a; Agyekum *et al.*, 2016). Woon and Suleiman (2015) submitted that the number of studies available on this concept attest to the significance of having a good fire management practice culture to reduce the incessant outbreak of fire and its consequences. Chow (2001a & b), in a review on fire safety management and application to Hong Kong, stated that fire safety management has at least three parts which include to: ensure that the fire safety measures

new technology on fire [illegible] installation" (p. 54).

Fire safety management practice [illegible] important features of fire safety [illegible] buildings which is carried out so as [illegible] ensure that there is a fire safety [illegible] management plan for the building. This according to Nadzim and Lai (2004), involves the co-ordination of some plans or programs geared towards the prevention of destruction that often occur as a result of fire. Chow (2001a) asserted that it is important for a new building to adopt engineering approach to fire safety provisions by incorporating fire safety management at the design stage of the building. Contrarily, Othuman-Mydin (2014) posited that fire safety provision is infrequently a priority during the design process or its long-term use, but they are only integrated to meet the building code or an insurance requirements or recommendation. However, as building owners or users are getting more aware about the likely or impending risk that may occur due to fire, their perceptions are changing and of course policy makers regularly begin to view fire safety costs which they considered to be more than their value, until the fire occurred differently (Addai *et al.*, 2016). Figure 1 shows the components of fire safety management practice for buildings.

Figure 1: Components of Fire Safety Management
Source: Othuman-Mydin (2014)

John (2012) and Woon and Suleiman (2015) viewed a building as a multi-functional agent of environmental change, which acts as modifier of natural environment. A very important requirement within a building to enable it serve the purpose for which it is acquired or acquired or occupied is safety, safety of lives and property and more so on life, a lot of money is spent by the owner of a building and the occupant of that same building to provide a reasonable level of safety within the building. Despites all this incidentally and unexpected threat to the safety of lives and property borne. Fire outbreak in a building poses a great threat to the safety of lives and property within a building, most especially in high-rise building and where adequate measure is not taken can also adversely affect adjourning building or property fire is described as a mass of brings as a fuel, a tank or incandescence or conflagration being a disturbance, the fire is an unwanted fire. In most time, fire-fighters are being blamed for fire incident in public building, and all their possible loopholes seriously explored (Oludare, 2000) but little has been said or explored about the activity of the other stakeholders in the construction and use of public buildings, who oftentimes responsible for the causes of fire outbreak. Makanjuola *et al.* (2009) reported that fire safety practices are aspect that have suffered great neglect among designers and users of public buildings, this may be due to uncared attitudes and ignorance on the part of building owner and users.

Fire safety management practice in high-rise building is of importance here because of the following challenges itemized by Chow (2005; 2006): it is characterised with long evacuation time; impossible direct rescue by ground applications from the building exterior; impossible direct water application by firefighting jets from the building exterior; the downward nature of the escape routes for occupants through staircases or lifts increases the risk; difficulty of firemen in accessing and delivering equipment to rescue people and fight the fire; and firefighting techniques are to be used inside the building for 'suppressing' or 'extinguishing' the fire, 'controlling' is insufficient. These problems underscore the reason why Building Control Guidance Note (2007) stated that multi-storey building will require corridors lobbies and stair ways enclosed by structure with a minimum fire resistance of 30 minutes and equipped with fire resisting or smoke, stop doors and emergency lighting.

Methodology

This study examines the fire safety management practices in high-rise buildings in Abuja using mixed methods approach to have a better understanding of the subject matter.

The quantitative strand of the study involves the use of structured questionnaire, while the qualitative strand includes personal observations and interview with the occupants of the selected high-rise buildings as well as fire service personnel; however, the current paper presents only the questionnaire survey and personal observations conducted by the researchers. Purposive sampling technique was used for the selection of high-rise buildings, while simple random technique was employed for the selection of respondents for questionnaire administration and interview which included occupants, users of the buildings and fire service personnel. In this study, any building of 15-metre height and above (five or more storeys or floors) was assumed as a high-rise building due to lack of skyscrapers in the study area. High-rise buildings were chosen as unit of analysis in this study because of their peculiar characteristics such as quick spread of fire, difficulty of evacuation and challenges often encountered to put out the fire (Liu *et al.*, 2012). Six high-rise buildings in Abuja which comprise Sheraton Hotel, NICON Insurance building, Radio House, Bank of Industry, Federal Secretariat Complex building Phase II and Unity House all in Abuja were examined. In addition to this, data were sought from professionals such as architects, builders, mechanical and electrical engineers in the built environment based in Abuja and Fire Service Headquarters Abuja because of their knowledge, involvement in either the design or construction of the buildings. The variables included in the questionnaire were derived from extensive review of relevant literature. Out of 250 questionnaires self-administered and distributed to the target respondents, 225 responses were collected (90% response rate).

Results and discussion

Analysis of Questionnaire Survey

Majority of the respondents fall within the range of 31 – 40 years representing 35.55%, 31.11% represents those that are between the ages of 41 – 50, 19.11% are within the ages of 21 - 30 and 14.22% above 50years, while, no respondent was below 21years. This distribution is an indication of an active working population made up of youths within the ages of 21 years and 50 years. Respondents who are above 50 years of age, who could likewise be categorised as aged people are the most likely and vulnerable victims of fires, due to their reduced agility.

Table 1: Age Group of Respondents

Age group	Frequency	Percentage	Valid percentage	Cumulative percentage
21 - 30	43	19.11	19.1	19.1
31 – 40	80	35.56	35.6	54.7
41 – 50	70	31.11	31.1	85.8
Above 50	32	14.22	14.2	100
Total	225	100	100	

From Table 2, majority of the gone through tertiary institutions. 19.1% of the respondents have No

formal education, 4.89% have Secondary education. The educational level of respondents determines to a large extent the ability to understand, embrace and apply fire safety strategies and management practices. It also guarantees the ability to read and understand instructions on buildings and fire safety equipment for the reduction and mitigation of fire risk.

Table 2: Educational Status of Respondents

Educational status	Frequency	Percentage	Valid percentage	Cumulative percentage
Secondary education	11	4.89	4.9	4.9
Non-formal education	32	14.22	14.2	19.1
Tertiary education	182	80.89	81.0	100.1
Total	225	100	100	100.0

Majority of the respondents work in buildings of 11 – 15 floors representing 78.67%, 16.44% of the respondents work in buildings with 5 – 10 floors while, 4.89% work in buildings with 16 – 20 floors. The more floors a building possess translates to more risk and fire hazard in the event of fire outbreak.

Table 3: Type of Building

Number of floors	Frequency	Percentage	Valid percentage	Cumulative percentage
5 – 10	37	16.44	16.4	16.4
11 – 15	177	78.67	78.7	95.1
16 – 20	11	4.89	4.9	100.0
Total	225	100	100	-

Majority of the respondents uses general office representing 57.35%, 26.22% of the respondents work in single user buildings, 14.22% work in 2 – 3 users' buildings and 2.22% in other types such as hotel. With the general office users representing the majority, it implies a higher risk of fire due to the high population of users with diverse backgrounds, degree of negligence and ignorance of fire risk in high-rise buildings.

Table 4: Type of Office Accommodation

Number of users in building	Frequency	Percentage	Valid percentage	Cumulative percentage
Single User	59	26.22	26.2	26.2
2 – 3 Users	32	14.22	14.2	40.4
General Office	129	57.35	57.4	97.8
Others	5	2.22	2.2	100.0
Total	225	100	100	

Table 5 shows that majority of the respondents (83.11%) make use of high-rise buildings on a daily basis, 12% of the respondents use the high-rise building weekly, with 4.89% fortnightly. The frequency of building usage implies the magnitude exposure to fire risk, of which majority are exposed daily to the risk of high-rise building fire.

Table 5: Building Usage

How often building is used	Frequency	Percentage	Valid percentage	Cumulative percentage
Daily	187	83.11	83.1	83.1
Weekly	27	12.00	12.0	95.1
Fortnightly	11	4.89	4.9	100.0
Total	225	100	100	

Table 6 indicates that majority of the respondents representing 95.11%, 83.56%, 83.11% and 57.33% are of the opinion that Storage of highly flammable materials, smoking, electrical faults, and renovations respectively constitute risk of fire in high-rise buildings. Whereas, 24% and 14.22% of the respondents are of the opinion that cooking and arson respectively constitute risk of fire implying that 76% and 85.78% are of the opinion that cooking and arson respectively do not constitute risk of fire.

Table 6: Fire Risk in High-Rise Building

Potential fire risk	Frequency	Percentage	Valid percentage
Smoking	188	83.56	83.6
Electrical faults	187	83.11	83.1
Arson	32	14.22	14.2
Cooking	54	24.00	24.0
Renovations	129	57.33	57.3
Storage of highly flammable materials	214	95.11	95.1

Majority of the respondents have witnessed fire incidence in high-rise building representing 50.67% while, 49.33% have not witnessed fire in high-rise building (See Table 4.9).

Table 7: Witnessed Fire in High-Rise Building

Witnessed any fire in high-rise building?	Frequency	Percentage	Valid percentage	Cumulative percentage
Yes	114	50.67	50.7	50.7
No	111	49.33	49.3	100.0
Total	225	100		

The mean score of respondents with regards the level of damage as a result of the impact of fire occurrence revealed that, Injury ranked first, Destruction of Property ranked second, Structural Defect and Permanent Deformity both ranked third, Collapse of Structure ranked fifth and Death ranked seventh which also according to the frequency of occurrence.

Table 8: Extent of Damage in Fire Incidence in High-Rise Building

Rating of the extent of damage due to building fire experienced in high-rise building?	N	Sum	Mean	Rank
Injury	224	576	2.57	1st
Destruction of Property	224	450	2.01	2nd
Structural Defect	224	439	1.96	3rd
Permanent Deformity	224	439	1.96	3rd
Collapse of Structure	224	395	1.76	5th
Loss of Reputation	224	395	1.76	5th
Death	224	247	1.10	7th

Table 9 reveals that Fire Alarm, Portable Fire Extinguishers and Sprinkler System/Smoke Detectors ranked 1st, second and third respectively with regards availability of fire safety equipment in the high-rise buildings under study. Fire Hose Reel, First Aid Box, Fire Exists and Fire Safety Signs are ranked fifth, sixth and seventh respectively. This implies that fire safety equipment ranked first to seventh are the equipment mostly available in the high-rise buildings investigated. Emergency Lighting Detector, Halon Gas System and Fire Gas Mask are ranked eighth, ninth, tenth, eleventh, twelfth, fourteenth, fifteenth, sixteenth and nineteenth respectively. The implication of this is that fire safety equipment ranked eighth to nineteenth are the equipment mostly not available in the high-rise buildings investigated. Some of the fire safety devices available in the selected high-rise buildings.

Table 9: Availability of Active Fire Safety Equipment in High-Rise Building

Availability of active fire safety equipment in high-rise building?	N	Sum	Mean	Rank
Fire Alarm	225	659	2.93	1st
Portable Fire Extinguisher	225	654	2.91	2nd
Smoke Detector	225	643	2.86	3rd
Sprinkler System	224	632	2.82	4th
Fire Hose Reel	224	632	2.82	5th
First Aid Box	223	627	2.81	6th
Fire Exits	224	621	2.77	7th
Fire Safety Signs	223	595	2.67	8th
Emergency Lighting System	224	584	2.61	9th
Fire Hydrant	223	520	2.33	10th
Dry Riser	224	461	2.06	11th
Fire Blanket	221	391	1.77	12th
Wet Riser	224	396	1.77	12th
Foam Extinguisher	224	375	1.67	14th
Fire Bucket	223	359	1.61	15th
Fusible Link Door	223	354	1.59	16th
Heat Detector	223	354	1.59	16th
Flame Detector	223	354	1.59	16th
Halon Gas System	224	332	1.48	19th
Fire Gas Mask				

Majority of the respondents revealed that they have never attended fire safety trainings as shown in Table 10. This implies that majority of the respondents could not handle fire safety equipment and be able discern the required action to take in fire incidents, though 7.11% of the respondents frequently attend training 19.11% rarely attend training and 12.0% often attend trainings.

Table 10: Attendance of Fire Safety Training

Attendance of fire safety training?	Frequency	Percentage	Valid percentage	Cumulative percentage
Frequently	16	7.11	7.1	7.1
Often	27	12.00	12.0	19.1
Rarely	43	19.11	19.1	38.2
Never	134	59.56	59.6	97.8
Missing system	5	2.22	2.2	100
Total	225	100	100	

Table 11 reveals that majority of the respondents (56.89%), have never received trainings on evacuation procedures. While, 26.22% rarely receive training on evacuation procedure, 8.44% often receive trainings and 7.56% frequently receive training on evacuation procedure. This implies that, majority of the respondents could be of assistance in terms of evacuation, whenever the need arises to a certain degree.

Table 11: Frequency of Receiving Training on Evacuation Procedure

Training on evacuation procedure?	Frequency	Percentage	Valid percentage	Cumulative percentage
Frequently	17	7.56	7.6	7.6
Often	19	8.44	8.4	16.0
Rarely	59	26.22	26.2	42.2
Never	128	56.89	56.9	99.1
Missing system	2	0.89	0.9	100
Total	225	100	100	

From Table 12, it was discovered that majority of the respondents (92.9%) do not have the current fire emergency phone numbers. This implies that in the event of fire disaster, most of the occupants and users of the buildings would not be able to seek for assistance in combating the incident.

Table 12: Knowledge of Current Fire Emergency Phone Numbers

Current fire emergency phone numbers?	Frequency	Percentage	Valid percentage	Cumulative percentage
Yes	16	7.11	7.1	7.1
No	209	92.89	92.9	100
Total	225	100	100	

Table 13 shows that conducting inspection of electrical installations, taking renovation work precautions and inspections and implementing good housekeeping practices ranked first, second and third respectively. Provision of clear signage indicating exit routes and location of fire safety equipment and Education and training of high-rise building users in fire life safety; Conducting inspection, operation and maintenance of fire safety equipment; Implementing fire drills; Adhering to Standard Codes; Implementing pest control program and Provision of fire safety plan ranked fourth, sixth, seventh, eighth, ninth, and tenth respectively. The implication of the above is that conducting inspection of electrical installations, taking renovation work precautions and inspections and implementing good housekeeping practices are the fire safety strategies with the highest degree of acceptance based on the respondents. Also, provision of fire safety plan which

ranked tenth is an indication of the lack of awareness amongst respondents of the relevance of fire safety plans. The following strategies were suggested by respondents towards ensuring fire safety in high-rise: Provision and servicing of fire safety equipment, conducting inspection, operation and maintenance of fire safety equipment, Continuous training and education of users of high-rise buildings and the establishment of safety department manned by professional to ensure compliance with safety rules, regulations and procedures.

Table 13: Level of Acceptance of Fire Safety Strategies

How often are the following fire safety strategies observed?	**N**	**Sum**	**Mean**	**Rank**
Conducting inspection of electrical installations.	225	1039	4.62	1st
Taking renovation work precautions and inspections.	225	1034	4.60	2nd
Implementing good housekeeping practices.	225	1029	4.57	3rd
Provide clear signage indicating exit routes and location of fire safety equipment.	225	1023	4.55	4th
Education and training of high-rise building users in fire life safety.	225	1023	4.55	4th
Conducting inspection, operation and maintenance of fire safety equipment.	225	1018	4.52	6th
Implementing fire safety procedures and evacuation drills.	225	1002	4.45	7th
Adhering to Standard Codes.	225	959	4.26	8th
Implementing pest control program.	225	954	4.24	9th
Provision of fire safety plan.	225	938	4.17	10th

Amongst the factors listed that hinders the integration of fire safety equipment, Initial cost ranked first, fraudulent Practices ranked second and Maintenance Cost ranked third. The factor with the least influence was discovered to be Ignorance of Client and Carelessness of Design Team. The implication of the result is that the three most influential factors have to do with money.

Table 14: Degree of Influence of Factors that Hinder the Integration of Fire Safety Equipment in High-Rise Buildings

Degree of influence of the following factors in hindering the integration of fire safety equipment	N	Sum	Mean	Rank
Initial Cost	18	86	4.78	1st
Fraudulent Practices	18	84	4.67	2nd
Maintenance Cost	18	83	4.61	3rd
Limited Regulation of the Sector		69		4th
Limited Knowledge of Professionals	16	75	4.31	5th
Attitudes of End Users	18	74	4.17	6th
Government Policy	18	71	4.11	7th
Ignorance of Client	18	66	3.94	8th
Carelessness of Design Team	18	66	3.67	8th
	18		3.67	

Analysis of Physical Observation

The researcher was able to visit the six selected buildings in Abuja to ascertain available and functional fire safety equipment.

Table 15 indicates that Smoke Detector, Fire Alarm, Portable Fire Extinguishers, Sprinkler System, Fire Exists, Fire Hose Reel, Fire Hydrant, First Aid Box and Dry Riser are available in all the high-rise buildings investigated. Fusible Link Door and Halon Gas System are absent in all the buildings. Also, it revealed that Smoke Detector, Fire Alarm, Portable Fire Extinguishers, Fire Exists, Fire Hose Reel, First Aid Box and Dry Riser are functional in all the high-rise buildings investigated which could be attributed to the status of Abuja as a modern city. Sprinkler System, Fire Hydrant, Emergency Lighting System and Fire Safety Signs are functional in five of the six high-rise buildings under study. Also, in all these buildings there are inadequate signs, directions and information on fire safety equipment. The fire Exits available in all the buildings are securely locked which is an indication of lack of use, likewise the fire glass of the Alarm System are unbroken due to the fact that they have never been used. These securely locked fire exits could constitute the risk of been trapped in emergency situations despite their location on every floor.

Fire equipment	Availability (%)	Functionality (%)	Remark
Smoke Detector	100	100	Available and Functioning in all the Buildings
Heat Detector	16.7	16.7	Available and Functioning in a Single Building
Flame Detector	16.7	16.7	Available and Functioning in a Single Building
Fire Alarm	100	100	Available and Functioning in all the Buildings
Sprinkler System	100	83.3	Available and Functioning in five of the Buildings
Portable Fire Extinguishers	100	100	Available and Functioning in all the Buildings
Halon Gas System	0	0	Absent in all the Buildings
Possible Leak Detector	0	0	Absent in all the Buildings
Fire Drills	100	100	Available and functional in all the Buildings
Emergency Lighting System	83.3	83.3	Available and Functional in five of the Buildings
Fire Hose Reel	100	100	Available and Functional in all the Buildings
Dry Riser	100	100	Available and Functional in all the Buildings
Wet Riser	33.3	33.3	Available and Functional in two of the Buildings
Fire Hydrant	100	83.3	Available in all but Functional in five of the Buildings
Fire Safety Signs	83.3	83.3	Available and Functional in five of the Buildings
Fire Bucket	66.7	66.7	Available and Functional in four of the Buildings
Fire Gas Mask	16.7	16.7	Available and Functional in a Single Building
First Aid Box	100	100	Available and Functional in all the Buildings
Fire Blankets	33.3	33.3	Available and Functional in two of the Buildings

Discussion of Results

Thousands of fire incidents have occurred in Nigeria, which had resulted in many deaths, injuries, and loss of property running into billions of Naira as well as building damage

(Makanjuola, Aiyetan and Oke, 2009). Of these fire incidents, more than a half occur in residential buildings according to Ayeni (2002) who concluded that building occupants in residential buildings are ignorant of the use of common fire extinguisher, and do not even know what to do in case of fire outbreak. Accordingly, this study focuses on searching for the factors that affecting effective usage of fire safety measures in public buildings. These are defined as the buildings where people live and are engaged in activities, etc. It is very difficult to use well-defined variables or factors to quantify the losses in public building fires. However, various studies show that the possible factors that influence fire-related losses (life or financial losses) are multi-dimensional (Yuan-Shang and Ho-Shu, 2000a).

The study identified removal of unused plug and removal of unused electrical source as the greatest fire safety awareness among public building users and these are attributes in relation to occupants that include knowledge, habits of fire prevention and fire management within the buildings Federal Emergency Management Agency (1997;1999); attributes of building fire safety, for example building structure, location of escape routes, accessibility and potential situations of fire fighting and rescue and active as well as passive fire protection systems (Hausner, Walker and Swersey ,1974; Ramachandran, 1998) ; time and spatial attributes of fire occurrence, which include time of day, season, location of the fire within the building, [illegible] of building occupancy, presence of iron-barred windows and numbers of fire exits in the building, characteristics and severity of the fire development and evacuation difficulties (Ramachandran,1979/1980; John and Paul,1999; Yuan-Shang and Ho-shu, 2000b) fire brigade interventions such as travel distance, attendance time, control time, extinguishment time of fire and dispatched fire-fighting forces (fire services) (Ramachandran, 1998;Corman, Rider & Srevenson, 1976; Ignall, Rider and Urbach, 1978; Sardqvist & Holmstadt, 2000; Yuan-shang & Chien-Hua,2002). All the above-mentioned possible influencing factors that may or may not be inter-related are considered as the explanatory variables in this study. The findings indicated that in spite of the availability of fire fighting equipment majority of the respondents could not handle fire safety equipment. These findings align to report of Al-Homoud and Khan (2004) that most residents are ignorant of many safety aspects in their homes.

Conclusion

Periodical inspection of the functionality of fire safety equipment in these buildings are not carried out, trainings on operations of fire safety equipment and regular evacuation drills for occupants and building users are not in place. The different factors affecting the integration of fire safety equipment in high-rise buildings which are size of building, type of building, type of occupant, complexity of building, purpose of building, client's brief and financial capability of client, with size of building ranked as first. Also, the factors hindering the integration of fire safety equipment

identified are initial cost, fraudulent practices, cost of maintenance, and ignorance of client and carelessness of design team with initial cost ranked as first. Education and training of high-rise building users in fire life safety, taking renovation work precautions and inspections, conducting inspection of electrical installations, conducting inspection, operation and maintenance of fire safety equipment, implementing fire safety procedures and evacuation drills are the accepted fire safety strategies with education and training of high-rise building users in fire life safety ranked first. The need to improve fire safety management practices in high-rise buildings in Abuja is very important. Based on the findings of this study, the following recommendations are proffered which should be collectively considered by all stakeholders in the built environment:

- Actions and items that constitute risk of fire such as storage of highly flammable materials, smoking amongst others should be strictly discouraged and restricted in every high-rise building especially those used by a large number of people.

- Integration of basic fire safety equipment in every high-rise building should be enforced effectively, right from the stages of approval of design, construction and post-construction. The functionality of this basic fire safety equipment should be ensured. Also, regular maintenance of this equipment should be carried out to guarantee the safety of lives and properties in fire situations.

- Fire safety unit and personnel should be established in high-rise buildings. Occupants and users of these high-rise buildings should be educated and trained in fire life safety practices with regular evacuation drills conducted.

- Other fire safety strategies such as conducting inspection of electrical installations, taking renovation work precautions and inspections, implementation of pest control programme, implementation of good housekeeping practices, provision of clear signage indicating exit routes and location of fire safety equipment, conducting inspection, operation and provision of fire safety plan should also be practised.

- A preparedness plan should be designed for each building based on its unique features. This would help in curbing or minimizing the impact of fire disaster and getting occupants ready to face the situation when there is a fire incident.

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