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A Study on the Awareness of Fire Safety Measures for Users and Staff of Shopping Malls: The Case of Mlimani City and Quality Centre in Dar es Salaam

Geraldine J. Kikwasi

Department of Construction Management, School of Construction Economics and Management, Ardhi University, Dar es Salaam, Tanzania

Abstract: Shopping malls are accessed by people from all walks of life and, therefore, provision of adequate fire safety measures is equally important. In Dar es Salaam, Tanzania, at large construction, use of shopping malls is a relatively new experience, and risks associated with use of shopping malls, such as fire outbreak, are not evident to frequent users. The main purpose of the study is to assess awareness of fire safety measures for users and staff of two shopping malls located in Dar es Salaam. The research adopted a case study strategy, and 100 respondents were involved in the study. Both random and purposive sampling methods were used to select respondents for the study. Multiple sources of evidence were used in data collection, namely literature review, observations, questionnaires and interviews. Findings indicate that both shopping malls have in place fairly fire prevention measures with varying degrees. Majority of staff and users indicated that they know fire safety measures but their poor knowledge was reflected in assessing them on diferent equipment and installations, such as foam, hose reel, sprinklers and drenchers. The paper concludes that awarenes of fire safety measure of users and staff of the two shopping malls is relatively low. It is, therefore, recommended that provision of fire safety training and instructions, such as posters for users and seminars for staff of shopping malls, shall be a main focus of shopping malls owners and responsible authorities.

Key words: Fire safety measures, risks, shopping mall, users.

1. Introduction

Fire outbreak in a constructed facility presents risks to human and their properties. There have been many efforts to address fire risks in buildings. Oladuokun and Ishola [1] developed a risk analysis model for fire disasters in commercial complexes in Nigeria. Chow [2] identified fire safety provisions for super tall buildings. Beever [3] proposed "cabins" and "islands" as a fire protection strategy for an international airport terminal building. Sutula and Ryder [4] proposed the use of cone calorimeter to test relevant material properties and material performance data for green building construction. The *Fire and Rescue Act of 2007* [5] stipulated that every building which has a storey, the floor of which is more than 12 m above the level of the street or ground surface adjoining any part of the building or a building with 2,000-m^2 gross floor area, shall be provided with fire safety measures. However, the "Act" has no specific provision on fire safety measures in shopping malls.

A number of studies have assessed fire safety measures in buildings. Kachenje et al. [6] assessed urban fire risks in the central business district of Dar es Salaam. Similarly, Rubaratuka [7] investigated provisions of fire safety measures in buildings in Dar es Salaam. Makushita [8] revealed that essential fire safety measures were not provided in high-rise buildings of Anand City. Mydin et al. [9] found that the ancestral temples in Georgetown, Penang have not achieved a high level of fire protection awareness. Other studies have focused on implementation of fire

Corresponding author: Geraldine J. Kikwasi, Ph.D., senior lecturer, research field: risk management in construction. E-mail: gkikwasi@aru.ac.tz.

safety programmes. Flynn [10] lists standardized procedures for development and implementation of fire safety programmes for each individual premises. Msumari [11] disclosed procedures skipped in implementation of fire safety programmes.

Shopping malls are accessed by people from all walks of life and, therefore, provision of adequate fire safety measures is equally important. In Dar es Salaam construction, use of shopping malls is a relatively new experience, and risks associated with use of shopping malls including fire outbreak are not evident to frequent users. Hayward [12] lists fire safety measures in shopping centres. Tabassum et al. [13] investigated fire safety of air-conditioned shopping centres at Dhaka City. Furthermore, users and staff of shopping centres and other buildings should have the knowledge of safety measures presented in their workplace. More importantly, users and the public at large should be able to use fire fighting installations in case of fire occurrence. Rahim et al. [14] investigated fire safety awareness and management in a mall. Makushita [8] studied on awareness regarding fire safety measures among 20 residents living in high-rise buildings of Anand City. Kachenje et al. [6] disclosed the awareness and ability of using fire safety provisions in a building by users.

The purpose of this paper is to assess awareness of fire safety measures for users and staff of two shopping malls in Dar es Salaam as per details explained below.

1.1 Mlimani City Shopping Mall

Mlimani City shopping mall is a single storey building with approximately 30,000-m^2 gross floor area located along Mandela and University Roads. It accommodates: major banks in Tanzania, such as National Bank of Commerce Ltd., CRDB Bank Ltd. and National Microfinance Bank Ltd.; large retail shops, such as GAMES, NAKUMAT, Mr. PRICE; and other medium and small size shops that attract many people for shopping and other social and economic activities (Fig. 1).

1.2 Quality Centre Shopping Mall

Quality Plaza shopping mall is a two-storey building with approximately 28,000-m^2 gross floor area located along Nyerere Road. It accommodates one large retail shop called UCHUMI supermarket and other medium and small shops that attract many people for shopping and other social and economic activities (Fig. 2).

2. Review of Literature

2.1 Fire Prevention Measures in Buildings

Fire safety measures include fire extinguishing installations, fire detection and alarm systems, as well as integrated design features. Fire outbreak in a constructed facility presents risks to human and their properties. There have been many efforts directed to addressing fire risks in buildings. Oladuokun and

Fig. 1 Mlimani City shopping mall.

Fig. 2 Quality Centre shopping mall.

Ishola [1] developed a risk analysis model for predicting the proneness of a commercial complex to fire accident. Chow [2] advocated that all fire safety requirements can be translated to some critical design features, such as travel distance, fire resistance period or number of staircases. Beever [3] proposed "cabins" and "islands" and elaborated that "cabins" are areas of high fire load, such as shops that are limited in extent and well defined and "islands" are areas of combustible materials including seating which tend to be well separated with large circulation space in between. He further proposed that "cabins" be protected separately by sprinklers and provided with smoke extract on system and disclosed that, for "islands", fire spread is not a problem. Kobes et al. [15] proposed sprinkler system, fire safe elevators, especially designed extra staircases for fire fighters, and spoken and personal directives to prevent fatality in case of fire in high-rise buildings. Sutula and Ryder [4] proposed the use of cone calorimeter as a standard test method that would allow for relevant material properties and material performance data to be obtained on green materials. They further elaborated that, as buildings become more elaborate and move toward increasing sustainability through the use of green materials, the used materials may present an increased fire risk.

FIA (Fire Industry Association) [16] pointed out that there is a need of escape signs, such as exit, fire exit and emergency exit in large and more complex premises, directing people along escape routes. FIA [16] disclosed other protective measures to include: structural and passive fire protection; fire detection and warning signs; signs and notices; and recording, planning, informing, instructing and training.

The *Fire and Rescue Act of 2007* [5] stipulated that every building which has a storey, the floor of which is more than 12 m above the level of the street or ground surface adjoining any part of the building or a building with 2,000-m^2 gross floor area, shall be provided in every such storey with one of the following:

(1) adequate free and unobstructed means of escape from there leading to the roof of the building and to the street or ground surface adjoining the building;

(2) fire alarm and detection system;

(3) such other means of escape in the event of fire as the Commissioner-General may require.

The *Fire and Rescue Act of 2007* [5] also provides for automatic fire sprinklers for building which has a storey, the floor of which is more than 24 m above the level of the street or ground surface to be provided in every room, office and hall.

Fire safety measures in buildings are inadequately provided and, in cases where they are provided, are not well maintained. Rubaratuka [7] revealed that fire safety measures in investigated buildings are inadequately provided and that in case of fire serious damages are likely to occur. Kachenje et al. [6] found

that most of buildings have a limited number of facilities and means against fire hazards and some of them are either not easily accessible or not functioning at all. Makushita [8] found that majority of studied high-rise buildings did not have escape signs, fire hydrant, fire safety system, fire extinguishers or fire alarms. Mydin et al. [9] disclosed that the fire protection systems in ancestral temples in Georgetown were very limited, very simple and of basic level where only fire extinguishers were provided.

Flynn [10] listed standardized procedures for development and implementation of fire safety programmes for each individual premise to include:

(1) prevention of outbreak of fire through establishment of day to day fire prevention procedures;

(2) instruction, training and exercising of management and staff on all matters relating to fire safety;

(3) emergency procedure and fire evacuation drills;

(4) provision of fire safety instructions to the public/guests;

(5) maintenance of fire protection equipment;

(6) maintenance of buildings and its fittings and services;

(7) maintenance of escape routes;

(8) liaising with fire authority and assisting the fire brigade;

(9) keeping of fire safety records.

Msumari [11] reveals that fire safety programme in public university hostels is implemented by 50% and procedures skipped include: emergency procedures and fire evacuation drills; training and comprehensive instructions. On the other hand, Urio [17] pointed out that the main challenge facing implementation of fire safety in school buildings is occupants unaware of fire safety issue.

2.2 Fire Safety and the Shopping Mall

Shopping malls are accessed by people from all walks of life and, therefore, provision of adequate fire safety measures is equally important. Hayward [12] listed fire safety measures in shopping centres to include provision of sprinklers, smoke control and signage and alarms. Tabassum et al. [13] revealed almost all shopping centres which are well equipped with fire extinguisher and hydrant systems, smoke detectors and fire and safety signs and symbols, but means of escape and fire fighting equipment found in almost all buildings were not maintained properly. Hayward [12] cautioned that, once a shopping mall installs a sprinkler system, it is imperative to maintain and test it regularly for the system to work properly.

2.3 Training and Knowledge of Fire Safety Measures

Training through short course, seminars and workshops will equip visitors, users and occupants of building with knowledge to take action in case of fire out breaks. Tabassum et al. [13] recommend that all shopkeepers and security guards should be involved in regular fire drills at least once a year and they should be trained in the use of fire fighting appliances. Rahim et al. [14] revealed that involvement in related fire safety programmes was the most effective method of educating building occupants on fire safety. Kachenje et al. [6] disclosed that only 29% respondents of the surveyed buildings had received training within the past five years. Makushita [8] established that trainings for steps to be taken in case of fire, first aid, search and rescue trainings have never been organized for all residents living in studied high-rise buildings.

Awareness and ability to use available fire safety provisions in a building will protect people and their property from loss due to fire occurrence. Rahim et al. [14] pointed out that respondents' levels of awareness were rather low as most of assessed parameters indicated moderately effective. Kachenje et al. [6] disclosed that 60% of building users do not know how to operate the facilities and 41% are not aware of available escape means in case of fire outbreak. Hayward [12] disclosed that, in one study, respondents were presented with six different signs and everyone understood the "NO SMOKING"

sign and "EMERGENCY EXIT" with a man running sign but only 53% understood the sign for fire hose and concluded that only half of the population understands such signs. A study by Makushita [8] revealed that all residents living in high-rise buildings of Anand City are not aware about Emergency Operation Centre and majority are not aware whether their buildings are constructed according to the *National Building Code* and fire safety.

3. Methodology

The study adopted case study approach that studied in detail, while two out of four big shopping malls that are found in Dar es Salaam City. The population comprised of users and staff of shopping malls. A sample size of 100 respondents was envisaged. Purposive sampling was used to select staff of shopping malls while random sampling was used to select users of shopping malls. Multiple sources of evidence were used in data collection, namely literature review, observations, questionnaires and interviews.

4. Findings and Discussion

4.1 Responses to Interviews and Questionnaires

Sixty questionnaires were prepared and hand-delivered to 30 staff from each shopping mall, and 20 interviews were planned for each shopping mall. The results are summarized in Fig. 3.

All planned interviews were conducted, and 27 and 28 questionnaires were dully filled and returned from Mlimani City and Quality Centre, respectively. However, respondents from a group of shopping mall users were reluctant to participate in the study. This resulted into many requests for interviews than expected, and thus getting hold of 40 respondents was a challenging exercise. This implies that attention to fire safety measures of users of shopping malls and other public places is relatively low.

4.2 Availability of Fire Safety Measures in Shopping Malls

Shopping malls need to be equipped with fire extinguishing installation and equipment, as well as fire detection and alarm systems. An examination of available fire protection measures in the two shopping malls is shown in Table 1.

In addition, at Mlimani City where four fire assembly points and at Quality Centre, there is a room designated for fire precautions. The two malls have in common portable fire extinguishers (dry powder and carbon dioxide) and escape signs. While studies like that of Hayward [12], FIA [16], Beever [3] and Tabassum et al. [13] advocate the use of sprinklers, fire alarms and detectors, none of these were provided in the malls. Hayward [12] maintained that, in an enclosed area, such as a mall, smoke represents a major

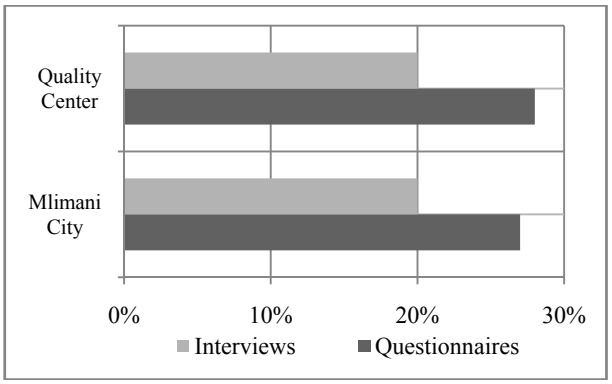

Fig. 3 Responses to interviews and questionnaires.

Table 1 Fire safety measures in shopping malls.

Serial number	Fire safety measures	Mlimani City	Quality Centre
1	Horse reel	√	×
2	Sprinklers	×	×
3	Drenchers	×	×
4	Dry/wet riser	×	×
5	Dry powder	√	√
6	Carbon dioxide	√	√
7	Heat detectors	×	×
8	Smoke detectors	×	×
9	Fire alarm system	×	×
10	Escape signs	√	√

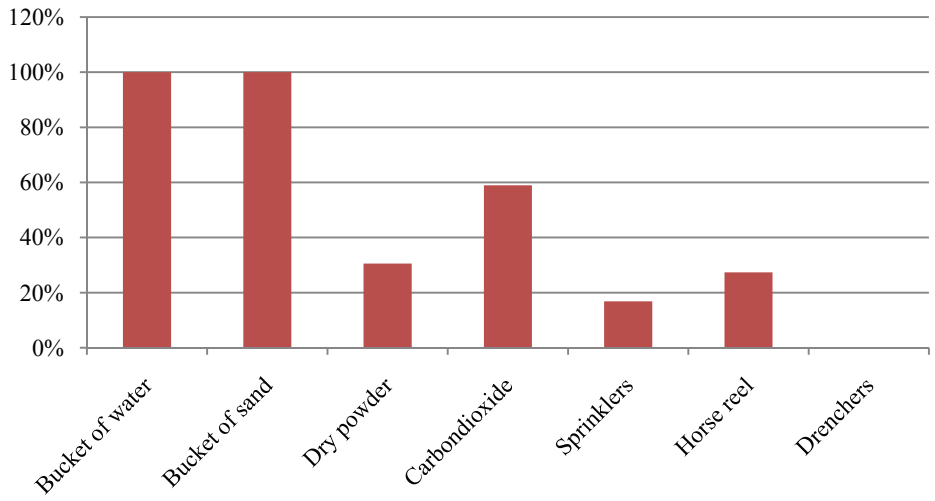

Fig. 4 Knowledge on different fire fighting equipment.

Table 2 Ability to use fire fighting equipment.

Response	Frequency	Percentage
Yes	29	29%
No	71	71%

Table 3 Training on fire safety measures.

Response	Frequency	Percentage
Yes	12	12%
No	88	88%

threat to human life, since smoke-related injuries and deaths outnumber fire-related fire related injuries and death four to one. This confirms the findings of Rubaratuka [7] and Kachenje et al. [6] that fire safety measures in buildings surveyed in Tanzania are inadequately provided.

4.3 Knowledge of Fire Fighting Equipment

Users, as well as staff of shopping malls, need to have knowledge of fire safety measures. Respondents' knowledge was sought, and it was revealed that 98% have heard of fire fighting equipment while 2% have not. However, through examining respondents on different fire fighting equipment, their knowledge seems to be on average, as summarized in Fig. 4.

Basing on the above results, it seems that respondents have relatively low knowledge on drenchers, sprinklers, horse reel and dry powder. Surprisingly, only 27% of respondents know horse reel which is commonly used in many buildings. Although this study focused on fire fighting equipment, in a way, it is in consistent with the findings of Urio [17], Kachenje et al. [6] and Rahim et al. [14] that users/occupants and the public at large have relatively low knowledge of fire safety measures in public buildings.

4.4 Ability to Use Fire Fighting Equipment

Installation of fire fighting equipment in shopping malls or any other building is incomplete if occupants can not use them at the time of fire outbreak. Respondents' ability to use fire fighting equipment was assessed and results are summarized in Table 2.

Results indicate that majority of respondents (71%) can not use fire fighting equipment. This suggests that fire fighting equipment are installed in shopping malls for complying with fire safety regulations rather than protecting people and their properties.

4.5 Training in Fire Fighting Equipment

Ability to use fire fighting equipment is a result of training that is extended to staff and users of any building. Respondents training on fire safety measures were examined and results are shown in Table 3.

It is evident that majority of respondents (88%) have never received any training on fire safety measures.

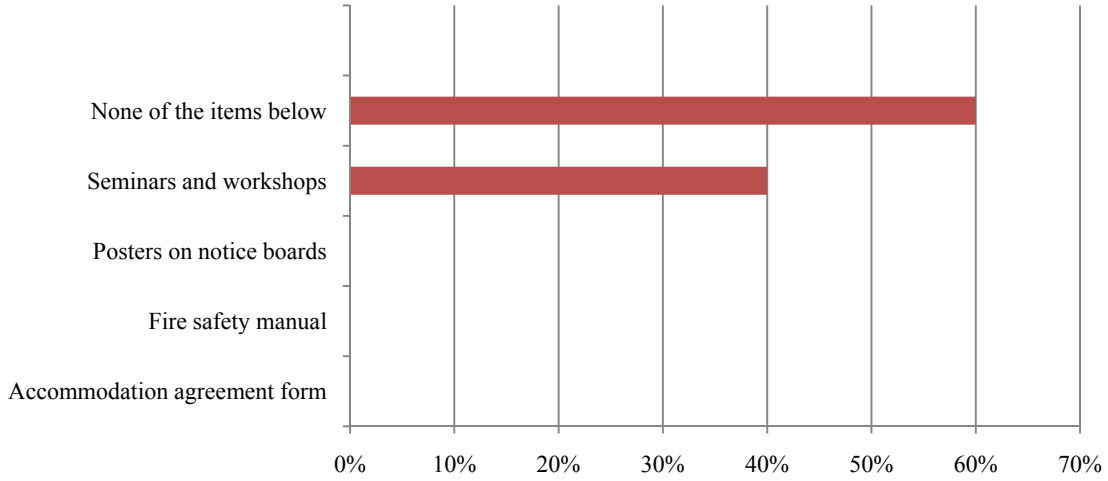

Fig. 5 Staff and users training in fire safety measures.

This finding is in consistent with the findings of Makushita [8] and Kachenje et al. [6] and partly to that of Hayward [12]. This implies that fire fighting equipment is installed in buildings but most users, staff or occupants are not trained on how to use them in case of fire outbreak.

4.6 Means of Fire Safety Instructions

Training of users, staff or occupants on fire safety measures can take many forms. Respondents were requested to indicate means of instructions that are used in shopping malls. The results are shown in Fig. 5.

Results reveal that more than half (60%) do not know any means of fire safety instruction used in shopping mall. This is expected for users of shopping malls as it is not easy for them to know when such seminars are conducted. This also indicates that shopping malls do not make use of notice boards for fire safety matters.

5. Conclusions and Recommendations

Shopping malls construction and use in Dar es Salaam, Tanzania at large are a relatively new experience. As a result, provision of fire safety measures, awareness and training on how to use provided safety measures in shopping malls remain a challenge to owners, staff and users. The study, therefore, concludes that:

(1) Mlimani City and Quality Centre shopping malls have in place fairly fire prevention measures with varying degrees, however, means of fire safety instructions were almost non existence;

(2) Awareness of safety measures presented in shopping malls is relatively low;

(3) Most shopping malls users and staff do not know how to use fire safety equipment.

The paper recommends that owners should provide adequate fire prevention measures in shopping malls. Furthermore, fire safety training should be provided to staff and fire safety instructions, such as posters made available for users, as well as staff of shopping malls.

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