Building Design for Bangladeshi RMG Industry with Built in Fire Safety System

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Abstract

This paper shows a building design especially for the RMG industry of Bangladesh with built in fire safety system. Due to heavy traffic jam in the road, it takes a long time for fire service and civil defense to reach in the accidental area. This built in fire safety system can helps to extinguish fire and helps to reduce the loss of asset due to fire accident until the arrival of fire service in the accidental area. Data is collected from literature review, case studies and informative interviews from key person of fire service and civil defense authority for understanding the background of this research. Finally an AutoCAD drawing is shown for the proposed building design with necessary equipment's. This design consists a large tank with automatic watering system for water storage at the roof top of the building. Water is supplied from water tank to each floor through the water pipe when the chain is dragged by someone such as security guard or other employee. An emergency chain dragging system is available in the management room which will be operated in urgent situation such as governmental holidays or at night. An extra motor facility will be added in this system which ensure watering system in the tank and this power line is taken directly from governmental line because there will be no electricity connection in the factory when fire accident occurs. For the sustainability issue, rain water storage facilities were available in this system. Fire extinguisher ball will be kept in each floor nearest to the various electronic equipment which helps to extinguish fire when fire accident is caused by E type fire. This building design for RMG industry has not need huge amount of cost. On the other hand, this system will be added to the existing building without hampering the productivity.

Keywords: *Building design, RMG industry, Fire safety, AutoCAD drawing, Water tank, Water pipe, Fire ball.*

1. Introduction

Ready Made Garments (RMG) sector is the largest economic as well as financial sector of Bangladesh. This biggest strategic sector earns almost 81% of total foreign earnings of Bangladesh (Hossain, Sajib et al. 2017). It is the biggest industrial sector of Bangladesh where more than 4 million of workers are engaged(Paul and Quadir 2013, Chakrobarty 2017). This sector also plays a significant role in women empowerment. Approximately 80% of total workforces are female doing work on an average 11 hours per day (Paul and Quadir 2013, Rahman, Siddiqui et al. 2015). This sector is not only for native people because many foreign workforces are engaged in this sector. But this sector face challenges to ensure workplace safety for the millions of workers (Ansary and Barua 2015). Due to the poor safety records it has been facing challenges regarding the compliance with the international standard as well as national labor act to ensure safety in the workplace and a better working environment for the worker. Recently this sector is going back for some reasons as like poor infrastructures, transportation problem, lacking of technical person, industrial hazards, labor unrest, political hazards etc. Workers of this sector are less secured not only as monetary remunerations but also as many

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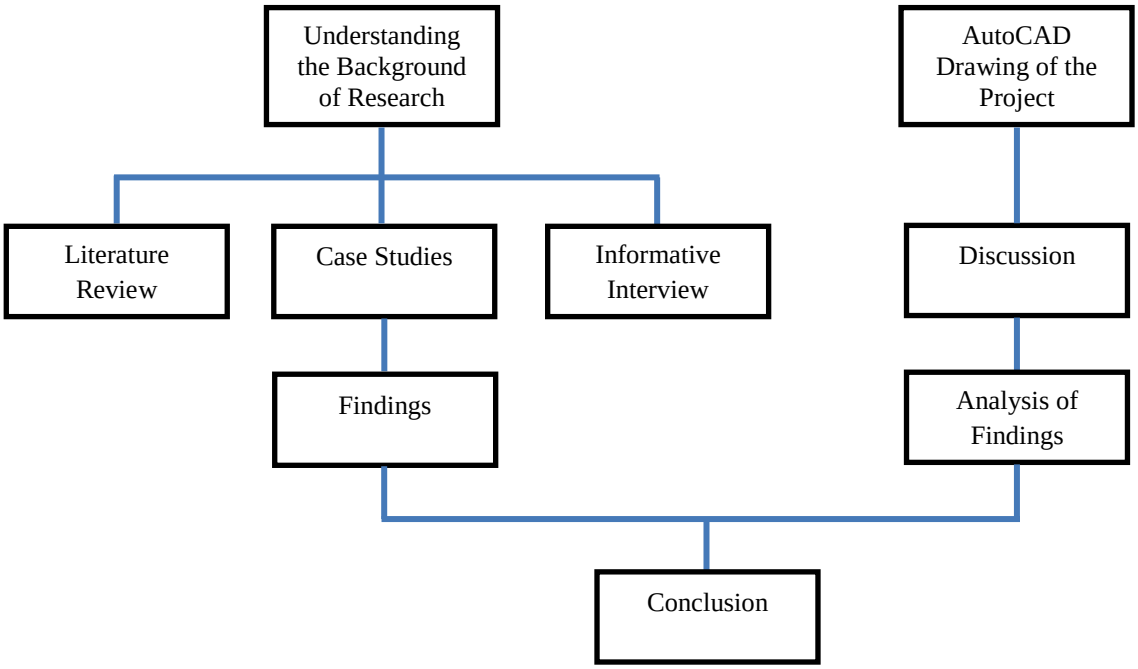
accidental problem caused in the industry. Workers are less safe in the workplace as anytime accidents can cause them disability or loss of lives (Shumi 2008). Most of the cases workers lives are endangered by risk of fire due to lack of proper safety system. Till now approximately 90 big fire accidents have occurred in this RMG sector leading to at least about 200 deaths and 1000 injuries (Ansary and Barua 2015). One of the most deadly fire accidents is Tazreen Fashions fire on November 24, 2012 which resulted in death of 112 workers with many injured (Akhteruzzaman, Hasan et al. 2015). Fire accidents occurred in RMG industry resulted not only in death and injured of workers but also loss of huge amount of capital. According to the report of fire service and civil defense almost 2500 small and large scale of fire occurrences have been occurred from last 19 years which loss is determined almost 9 billion taka (Mizanuzzaman and Research 2016). The causes of fire accidents are determined as electrical short circuit, boiler explosion, storage of flammable materials, transformer explosion, overheating etc. (Hasan, Mahmud et al. 2017). The loss of huge capital and life is occurred due to poor type of fire equipment, fire safety device, lack of proper training etc. On the other hand, due to huge traffic jam in the road fire brigade were failed to reach in proper time which causes huge loss of capital. Due to pressure of buyer and compliance issues about worker safety many garments industry are now having different safety measures such as hose pipe, fire ball, carbon di oxide, flame retardant powder etc. (Hamja 2019). The benefit got is not as expected due to proper management system and lack of training to worker. Sometimes fire safety devices are inadequate than need in some industries due to high cost and availability. This problem can be solved by a permanent built in fire safety system which has low cost and no need to technical knowledge as well to operate. The proposed study shows a semi-automatic fire safety system which have both automatic and manual mode by use of water. The main purpose of this study is to propose a suitable fire safety system by use of water with low cost that can minimize the loss of life and capital as well.

2. Research Methodology



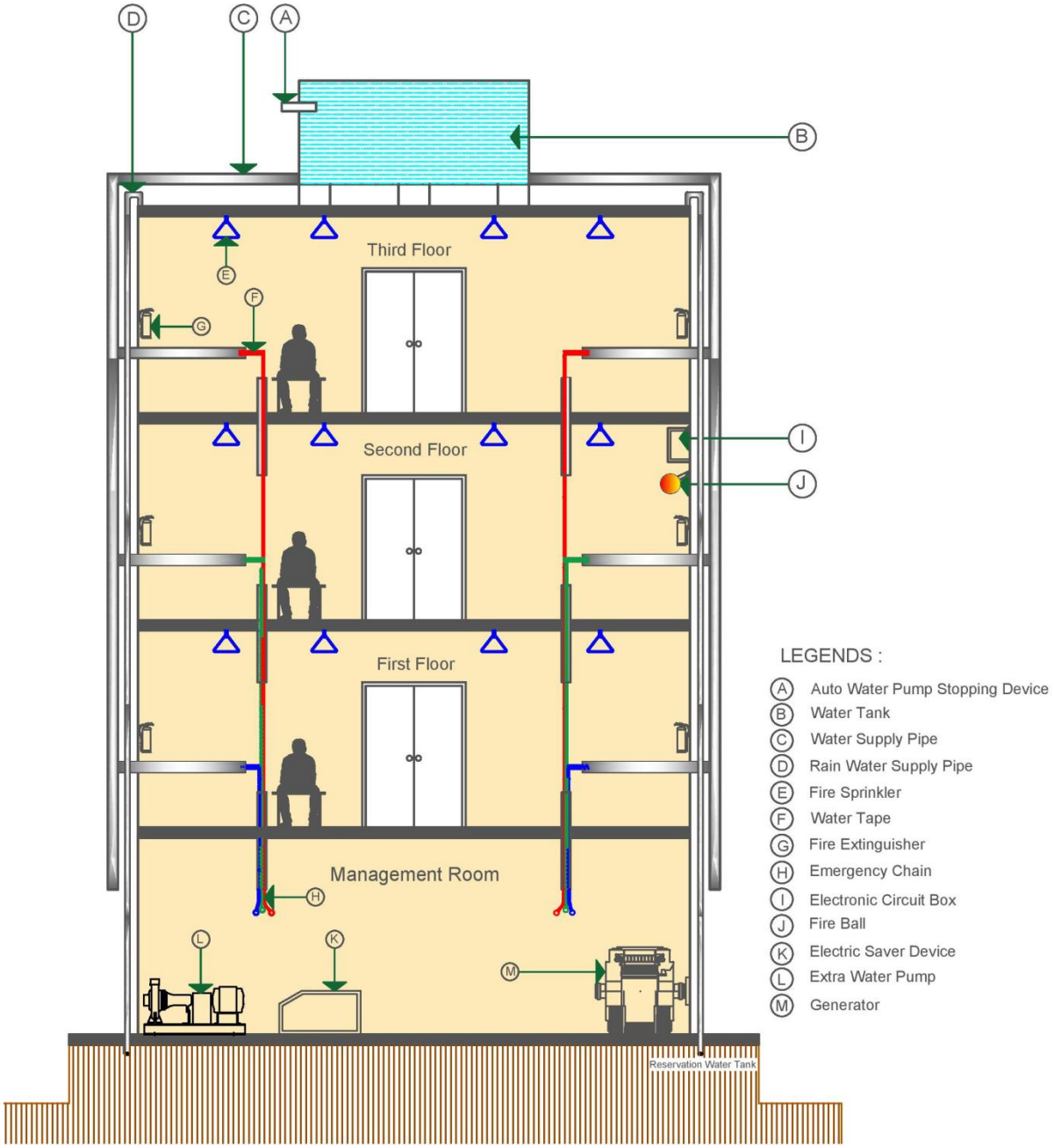
The methodology of the research given in the above illustration can be divided into two major parts. First part consists of understanding the background of the study. Research problem can be identified from the literature review, case studies and informative interviews where interviews have taken from key informative persons of fire brigades. Main barriers of the existing fire safety system of the RMG industry can also be finding from the background study. Potential scope will be found once identified the problem of the existing fire safety system. After that potential building design for fire safety will be proposed by AutoCAD drawing of the building. Procedure of the proposed building for fire safety will be discussed which will then analyze as findings. Findings come from the background and proposed design of the building will conclude the result for this research.

3. Discussion

Fire accident in a garments industry generally caused by class A and class B type fire which source is solid materials and flammable liquids respectively. Class E type fire accident caused by electrical apparatus is suddenly occurred in the garments industry where intensity of fire is primarily low. Water works as a best fire extinguisher when fire accident caused by class A or class B type fire. Water cannot be used as an extinguisher when fire accident caused by class E type fire due to electrical conductivity of water. In that case, dry ice or fire extinguisher ball can be used to minimize the loss caused by the fire accident. From those, fire extinguisher ball is more popular due to its automatic operability. In this report, a new form of building design, is which reduces the loss of capitals and asset due to fire accidents caused from different sources is shown.

This building design contains a large water tank at the top of the floor and some important equipment such as hose pipe, splinter, steel pipe, water motor, government power connection and steel chains. The regular small water tank used for water supply of employee and worker will be replaced by this large water tank hence no extra water tank is required for this building design. Water line is connected to every floor by the help of equipment from the water tank. Water tank will be operated by automatic watering system by which automatic motor will be started when water level crosses a certain level. Additionally rain water storage facility can be added to the water tank by which rain water can be stored in the time of rainy season. This additional facility minimizes the electricity cost with saving the power consumption. The water tank used in this process will not require any additional maintenance cost because regular water tankhas been used for water storage. To different power line facility will be added one of which is the main power line and another separate one is directly from government power connection that is used in urgent situation. When fire accident occurs, main line power connection will be stopped to minimize the risk and in this case power will be supplied from the separate another line to active watering system in the tank. In accidental time, water pumping system from the water tank to different floor will be operated by a manual chain system. This chain will be attached to each pipe handle and the entire chain will move from the top floor to the bottom floor through a pipe. The chain is dragged when fire accident takes place suddenly and water call will be introduced. It is possible to control the intensity of fire as well as thermal heat generated by fire by this water call. The entire whole system will be controlled by a management room located in the ground floor. Everyone is running randomly in the working floor with searching an emergency exit point when fire accident occurs. Although carbon dry ice available as a fire extinguisher in every floor, it will not be helpful due to shortage and complexity of operation sometimes. In this complexity

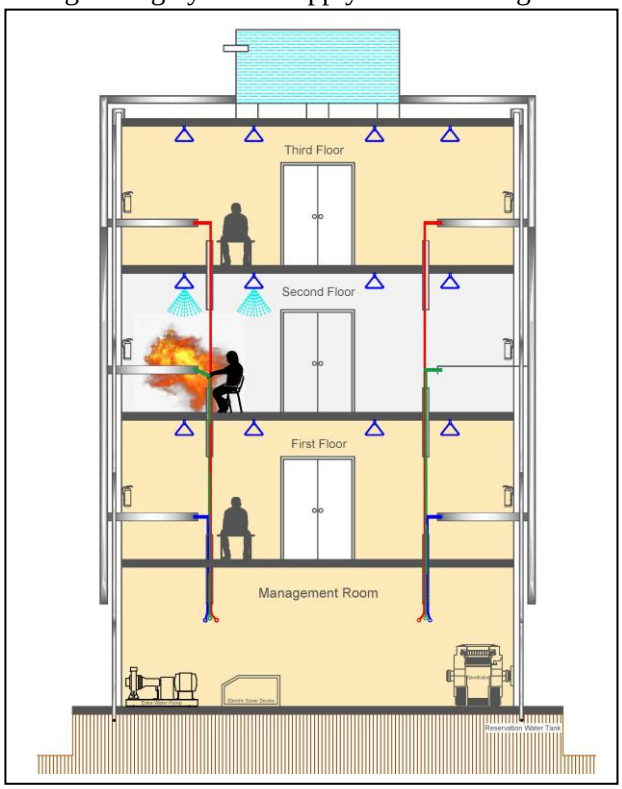
period the above mentioned water pumping system helps to control the fire by turning the chain just to make a tap.

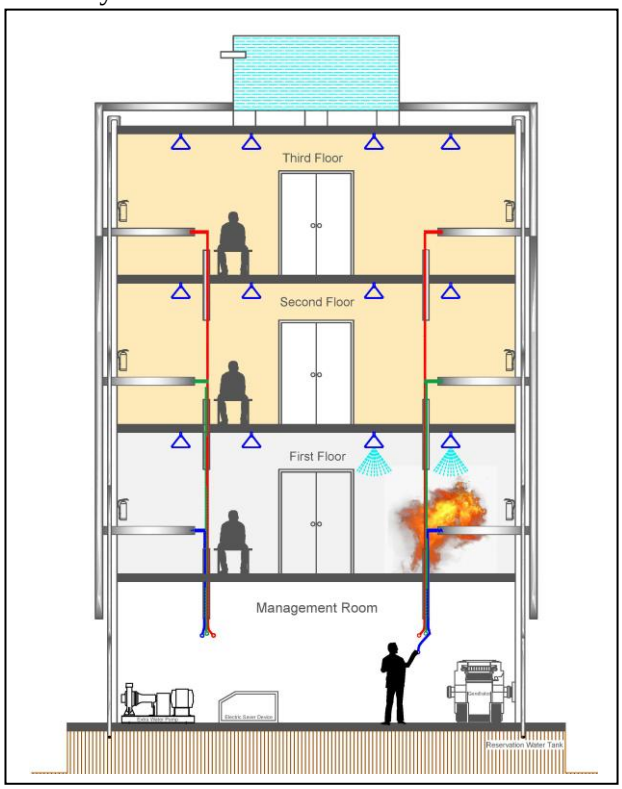


Water will be supplied to each floor from top safety tank with the help of pipe. There will be two water tapes on each side of the main gate of each floor by which it is possible to open and close the water connection. There will be two systems to operate the water tape by turning the chain. One system is to operate the water tape from main gate of the each floor which will be turned by the security guard. Another system will be operated in case of any emergency especially at night

or in holidays when there is no security guard and worker or employee present. This system will be operated from the management room by turning the chain with the help of any person or employee. An extra water motor will operate on need basis for collecting water in emergency case which will be driven by government controlled official power line. This is because when fire accident occurs factory electricity connection will be disconnected but the electricity connection of the road side that means government official line remains connected. When level of water is reduced, the motor will be turned on automatically with the help of this government controlled official power line. This will ensure the water supply without any obstacle.

Fire extinguisher ball will be used for C type fire when fire accident caused by short circuit or any electrical equipment. Some fire extinguisher ball will be kept beside the electrical equipment's. When fire accident occurs caused by these electrical equipment's, temperature around its area will be increased and that time fire extinguisher ball worked. However, fire extinguisher ball also worked when fire accident caused by A or B type fire. In that case, fire extinguishing by water supply and fire ball give double facility to reduce the hazards.





The above mentioned process will continue until the arrival of fire services and civil defense. It takes some times to arrival of fire services due to get prepared and heavy traffic in the road. It is possible to decrease the intensity of fire during this period with the help of this process. The above mentioned process will help to control the intensity of fire during this period which reduces the loss of asset greatly. This process will be stopped whenever fire services arrive and started their operation.

4. Conclusion

Population density is very high in the industrial area of Bangladesh especially in Dhaka, Gazipur and Narayanganj. Due to high population the average traffic speed is very lower in the industrial area. Most of the readymade garments factories are located in these industrial areas.Due to heavy traffic and absence of any emergency line; it is not possible to earliest arrival of fire service & civil defense unit in the accidental area many times. For this reason, loss of assets occurs greatly due to fire accidents in the RMG industry of Bangladesh. So, the RMG industries need a temporary fire safety system which can reduce the intensity of fire as well as reduce the loss of capitals due to the occurrence of fire accidents. The above discussed building design with fire safety system can work in any types of situations without any obstacles. No need huge amount of cost for this building design. Beside this, old building can be converted to this proposed design very easily without hampering the productivity. No need any special training for the employee to operate this system smoothly. Two systems of operating the water tape such as operating from management room and main gate of each floor ensures the water supply to the accidental floor or room very smoothly. An extra motor ensure to fulfill the water tank in emergency case which will be driven by the electricity connection of government line. This building design with water supply system supplied water continuously until the arrival of fire services and civil defense. This process will minimize the loss of asset caused by the fire accident.

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