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# A Study on Fire & Safety Systems in Commercial & Residential Building

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***Abstract:*** ***Fire and safety in residential and commercial building is a very central aspect of architecture and maintenance. Fire stoppage is the unremarkable action that eliminates risks and makes people and things to respond correctly. Fire prevention starts with the construction of the building. This section considers aspects of fire prevention as it relates to materials that are resistant to combustion or burning and materials that are highly combustible and need superior care if they are to be used in the building. The study of fire safety system in residential and commercial building is carried out and analyzed in terms of cost and effectiveness of provided system. We designed fire safety system for a commercial building and also additional idea of fire ball is introduced and used in building.***

***Keywords: Fire ball , fire safety***

## I. INTRODUCTION

The emergencies on construction sites due to fire are capable of causing disturbing penalties on the buildings and workers employed there, Alternative plans offer for several movements, such as evacuation ways and assembly points by moving through escape routes. various safety management techniques for building construction sectors like concepts of organizational culture, safety culture, summaries of safety culture definitions and research, models and measurements of safety culture within construction safety plays very important role. Fire safety is the set of performs proposed to decrease the destruction caused by fire. Fire safety measures comprise those that are intended to avoid ignition of an uncontrolled fire, and those that are used to bound the growth and effects of a fire after it starts. Fire safety measures include those that are prearranged during the construction of a building or executed in structures that are previously standing, and those that are taught to occupants of the building. To save loss of life, material and money it is today's need to provide fire safety in a building.

## II. OBJECTIVE OF PROJECT

*A.* To study fire and safety management in the commercial & residential building.
*B.* To find out the main factors causes of fire in commercial & residential building.
*C.* To identify the fire safety protection measures in commercial & residential building.
*D.* To develop the fire safety index in building.
*E.* To provide some additional ideas to control the fire in building.

## III. SCOPE OF PROJECT

*A.* This part covers the requirement for the prevention, life safety in relation to fire and fire protection of building. The code specifies construction, occupancy and protection features that are necessary to minimize danger to life and property from fire.
*B.* The intent of this manual is to reduce the risk of and losses from construction site fires. The manual provides Canadian builders with practical tools and information based on best practice, legislation, regulation and standards from Canada, the United States and Europe. Regulation related to buildings under construction varies across the country, and the information in this guide may not reflect the local, provincial and national regulation in all areas.
*C.* It is important to research, understand and comply with all area-specific fire safety regulations before construction and throughout the project. (See the Legislation, Regulation and Other Guidelines section for more information.) While the focus of this manual is on the design, planning and construction phases for new buildings, the information may also be relevant to projects involving demolition, alteration, renovation, repair and maintenance of existing buildings.

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## IV. ACTUAL PROVISION OF FIRE AND SAFETY SYSTEM IN COMMERCIAL BUILDING

### *A. Design Of Safety System*

#### *1) Fire Hose Reel System*

FHR Flow Rate =50 Gpm
(GPM – Gallon Per Meter)
Max No of FHR In Operation At Any Time =2no's
Duration of Operation =90min.
Fire Hose Reel Tank Storage Capacity = 50 X 2 X90
Total Storage Volume Required =9000 Gallons
1 Gallons =3.785 Liters
Total Storage Volume Required=9000 X3.785=34065 Liters

#### *2) Sprinkler System*

Total Storage Tank Volume
Pump Flow Rate Required =2 X 50 Gpm =100 Gpm
Sprinkler Spacing Will Be 1.5 Mtr.
Design Density Will Be 0.15 Gpm/Ft = 1500ft2 (Be Assumed As Fire Zone )
=1500 X 0.15
=225 Gpm.
Total Capacity Will Be =225 Gpm.
Sprinkler Water Storage Capacity =225 Gpm X 1 X 90 = 20250
=20250 X3.785
=76645.25 Liters
Total Discharge (Q) = 100 gpm + 225 gpm =325gpm
In This Case we Apply 350 gpm Discharge

#### *3) Calculation For Pump In Horse Power*

Q=350 Gpm
Height = 47.40 Ft
Hp = Q X H /3960
=350 X 47.40 /3960
=4.18
70% =70/100=0.7
Hp =4.18/0.7 =5.97
5HP Pump Is Required.

### *B. Calculation & Estimation of Fire Safety System*

Using Below Equipment's :-

TABLE NO. 1 ESTIMATION OF FIRE SAFETY SYSTEM

| Sr.No | Description | Number | Rate (Rs.) | Quantity(Rs.) |
|---|---|---|---|---|
| 1. | Fire Sprinkler | 58 | 720/- | 41,760/- |
| 2. | Smoke Detector | 4 | 1100/- | 4,400/- |
| 3. | Hose Reel | 5 | 7000/- | 35,000/- |
| 4. | Hose Box | 5 | 1499/- | 7495/- |
| 5. | Heat Detector | 4 | 1100/- | 4400/- |
| 6. | Fire Extinguisher (6 kg ) | 12 | 3200/- | 38,400/- |
| | | | Total Amount | Rs.01,31,455/- |

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## V. ADDITIONAL IDEAS

### *A. Fire Ball*

Fireball Extinguisher is define as the material which is used for Extinguisher of combined elements(i.e. heat,oxygen,fuel&chemical chain). Fireball Extinguisher is light weight and easy to use. It should be easy to handle. Fireball Extinguisher also environment friendly. It should be self activating(working as auto system). It will be working in 3 to 5 seconds. Fireball Extinguisher is in the hard form. It should be covered 5 sq.mt area.

Calculation & Estimation of Fire Safety System of Fire Ball :-

Table NO. 2 Estimation of Fire Ball System

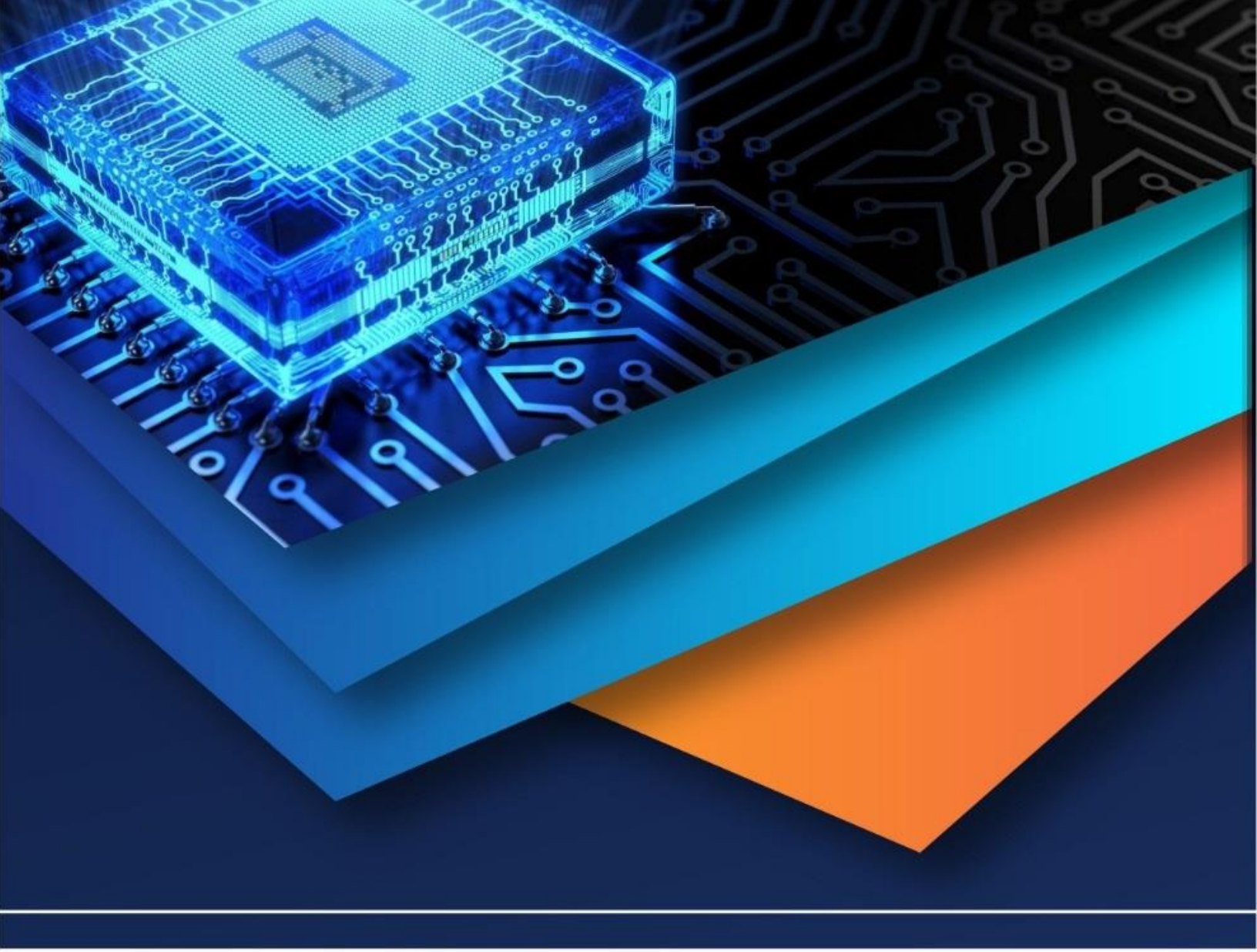
| Sr.No | Description | Number | Rate (Rs.) | Quantity(Rs.) |
|---|---|---|---|---|
| 1. | Fire Sprinkler | 24 | 720/- | 17,280/- |
| 2. | Smoke Detector | 12 | 1100/- | 13,200/- |
| 3. | Hose Reel | 5 | 7000/- | 35,000/- |
| 4. | Hose Box | 5 | 1499/- | 7,495/- |
| 5. | Heat Detector | 4 | 1100/- | 4,400/- |
| 6. | Fire Ball | 14 | 1120/- | 15,680/- |
| | | | Total Amount | Rs. 93,055/- |

## VI. CONCLUSION

*A.* This project deals with the study of fire safety systems and its components.
*B.* The fire safety systems helps to detect and control the fire at its initial stage and there by preventing the losses due to fire.
*C.* Therefore by adopting these fire safety systems in buildings we can avoid the fire accidents and the losses caused due to it.
*D.* Wireless sensor network are increasingly applied in the field of fire safety.
*E.* Fireball is one of the easiest and low cost method .

## REFERENCE

[1] National Building Code (NBC) of India.
   a. Part 4 Fire and safety
[2] Kofi Agyekumoshua Ayarkwa2 d De-Graft Joe Opoku, “Fire Safety Awareness and Management in Multi-Storey Students’ Hostels”, Department of Building Technology Kwame Nkrumah University of Science and Technology (Kumasi, Ghana) ,2, April 2016
[3] Chirag Gautami, Dr. Mayuri Prajapati, Ronak Khurana, “Analysis Of Factors Affecting Fire Safety Management Of Residential Building: A Case Study”,International Research Journal Of Engineering And Technology, May 2020
[4] Geraldine J. Kikwasi ,”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 esSalaam”,Department of Construction Management, School of Construction Economics and Management, Ardhi University, Dar es Salaam, Tanzania.
[5] Elsevier Ltd. Open access under CC BY-NC-ND license,” Fire Safety Management Strategy of Complex Developments”, Fire Department of Beijing City Public Security Burea,2014.
[6] Elsevier Ltd. Open access under CC BY-NC-ND license, “Fire risk analysis of residential buildings based on scenario clusters and its application in fire risk management”,Academy of Disaster Reduction and Emergency Management, Beijing Normal University, Beijing 100029, PR China Department of fire command, Chinese People's ArmedPoliceForceAcademy,Langfang065000,PRChina,Sept. 2014.



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