

# Fire Prevention and Safety in Buildings

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**Abstract-** Constant attention is required to minimize adverse impact due to fire. Fire safety system is the essential part of any building although it's not been taken into consideration by the building developers and planners, thus it is necessary to take initiatives for development of fire safety system. Electrical fault is one of the main causes of fire in all types of buildings i.e. residential, industrial, commercial buildings and its potential hazard is increasing as more electrical appliances are used nowadays. Wiring has a higher possibility to be ignited. There were even cases reported due to short-circuit in electric box set caught fire. The present fire safety system of Surat city is good but have some lacking as it is not developed as per the municipal corporation norms, so more cases of fire bursting out has been arose due to improper fire safety system and also due to less maintenance. Thus at the time of fire the building structure gets heavily damaged and there are chances of losses of life and property. In this project the residential & commercial buildings suffered by the fire problems would be surveyed and lacking in the safety system will be shown and its upgradation will also be given so as to provide a better and safer fire safety system. Thus properly designed, installed, and maintained, these upgraded systems can overcome deficiencies in risk management, building construction, and emergency response. These may also provide enhanced flexibility of building design and increase the overall level of fire safety.

**Index Terms-** Fire Safety, Fire Causes, Fire Classes, Automatic door lock, Fire Blanket, Fire Hose Reels, Smoke Vent System, Automatic Sprinkler System, Smoke Alarms, Elide Fire Ball

## I. INTRODUCTION

Fire protection engineering impacts every aspect of building design. Civil Fire protection engineering impacts every aspect of building design. Civil engineers, structural engineers, architects, mechanical engineers and electrical engineers all need to know how the principles of fire protection engineering will affect their involvement in the design of buildings and related infrastructure. This project will provide

an introduction to fire protection engineering for the building design team. It will facilitate the building design process and result in safer and more cost-effective buildings and infrastructure for public agencies and companies. Fire engineers, like their counterparts in other engineering and scientific disciplines, undertake a formal course of education and continuing professional development to acquire and maintain their competence. This education typically includes foundation studies in mathematics, physics, chemistry, and technical writing. Professional engineering studies focus students on acquiring proficiency in material science, statics, dynamics, thermodynamics, fluid dynamics, heat transfer, engineering economics, ethics, Systems in engineering, reliability, and environmental psychology. Studies in combustion, probabilistic risk assessment or risk management, the design of fire suppression systems, the application and interpretation of model building codes, and the measurement and simulation of fire phenomena complete most curricula.

The present fire safety system of surat is good, but has some of its lacking. Thus more cases of fire busting is been arising daily. This problems are due to improper fire safety system and due to less maintenance. Currently the fire cases are increasing in surat city as recently some of the commercial buildings like Landmark building, empire state building, world trade centre (WTC), etc. were struck by fire heavily. Due to lack of fire safety systems these commercial buildings had suffered serious damages of goods and property.

Thus appropriate measures should be taken to protect the buildings and life of people from the fire accidents so as to cause minimum damage of life and property for a better and smooth working of the business and so to protect any building from fire following five fundamentals should be taken into considerations:

1) Building material and design

- 2) Water supply
- 3) Fire extinguisher
- 4) Fire alarm system
- 5) Special occupancies and hazards

What is fire?

Fire is the rapid oxidation of a material in the exothermic chemical process of combustion, releasing heat, light, and various reaction products. The flame is the visible portion of the fire. If hot enough, the gases may become ionized to produce plasma. Depending on the substances alight, and any impurities outside, the color of the flame and the fire's intensity will be different.

Fire needs three elements to ignite. These three elements are:

Oxygen:

When Oxygen in the air combines with flammable vapours given off by Fuels they create a form of heat at a molecular level. Then, a source of ignition (a match or spark, say) can cause it to combust. Without enough Oxygen, ignition cannot happen. In the opposite way, if there is too much Oxygen then the vapours won't be concentrated enough to ignite. The ratio of vapour to Oxygen is known as the 'explosive' or 'flammable' limit and is different for each gas or vapour.

Heat:

Combustion occurs when flammable vapour mix with air (Oxygen) and are ignited by a spark or flame. Solids give off flammable vapours by being heated. Certain solids such as paper or flour appear to ignite almost instantly. This is because they give off vapours and reach a flammable temperature almost immediately. In fact, fine dusts dispersed in the air can explode because they give off vapours and ignite so quickly it appear to happen instantly. Other solids like timber take longer to ignite because they are more dense and so don't give off flammable vapour so easily. Liquids are a bit different to solids. They are a lot more runny for a start. But, where solids need to be heated to give off flammable vapours, some liquids give off vapours even in cold weather.

Fuel:

Fuels can take almost any form: Solids like wood, fabric, rubber and plastic. Liquids such as petrol, oil,

cooking oil or even nail varnish remover. Gases like propane, butane and 'natural' gas. Different fuels burn at different rates and with different intensities. The above mentioned

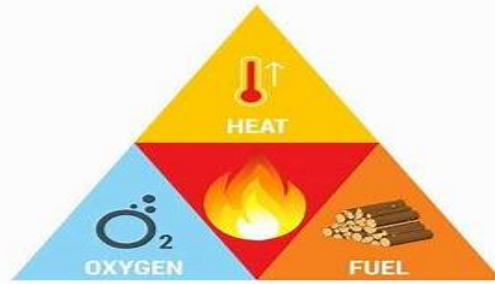


Figure-1

elements create the "fire triangle". Fire triangle in reality is a simple model for understanding the necessary ingredients for most fires. The Fire Triangle Theory has been accepted for many years

Today, this theory is modified to explain combustion or fire as a 4-sided figure, called a tetrahedron. A tetrahedron resembles a pyramid and offers a new element when considering combustion. The base of the pyramid represents the chemical chain reaction that occurs when the three other elements heat, fuel and oxygen are present in appropriate proportions. Vapors gases are released during the burning process and are carried into the flame. The heat from the flames drives the chemical reaction. Heat, fuel and oxygen are the three standing sides of the figure and all four elements must be present in order to support combustion.



## II.SCOPE OF THE WORK

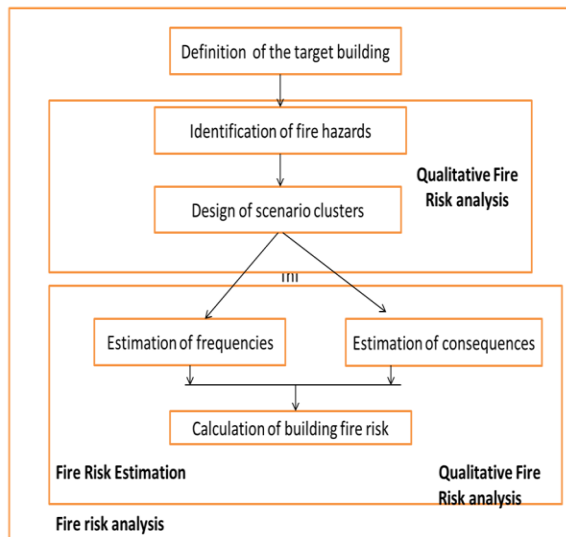
The aim of this research project is to study current fire safety system in all types of buildings. Also this project will give safety improvement strategies and also upgrading as per the foreign fire safety techniques will be given so as to give a dependent fire safety to all types of buildings.

Different scope of wok are as follows :-

- To identify the problems facing by the buildings. It is essential to identify the problems related with safety in any building. Without identifying and analysing the problems it is very difficult to adopt or suggest an appropriate safety practices.
- It is necessary to collect all the data regarding the plans of building such as ventilation, staircase, lift, open to space (OTS) and free space nearby the building
- To analyze the collected data and compute the data based on the fire code book (Final Comprehensive General Development Control Regulation-2017 )
- To give proper solution based on the analyzed data.

### III.METHODOLOGY

## Flowchart



As our project is related to the different types building in which fire safety is not installed. Thus, here our plan of the work will be to visit the to those building which do not have fire safety plan and it me face problem during fire hazard. Suitable remedies should be taken to reduce the effect of the fire if it may occur

The main site we had visited to the building are as follow

Gulsan park(Commercial and Residential building)

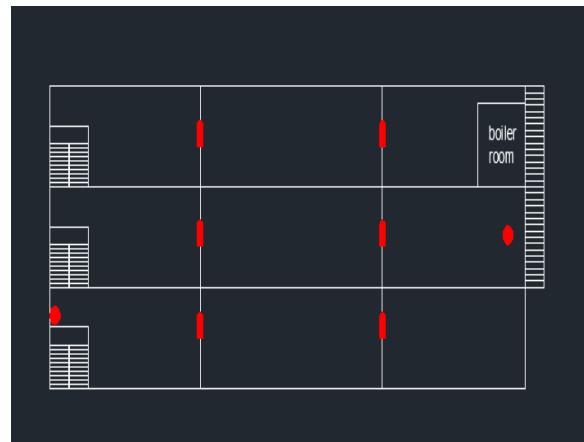
Apsara apartment(Residential building)

➤ Industrial building

❖ Industrial Building at Pandol, Katargam

• Name : Industrial Building

- Address – Pandol, Katargam
- Height=11m
- Gross Area=6204.18
- Staircase=280sq ft
- ❖ Requirement of tools according the FCGDCR
- Fire protection
- Chief fire official
- Fire man
- Corridor and passage
- Staircase
- Additional Staircase
- Ventilation
- Portable fire extinguisher
- Fire alarm system
- Smoke and fire ventilation
- Boiler and Boiler rooms



Section view of industrial building

Circle Shape is symbol for Elide ball

Cylindrical shape is symbol for fire extinguisher

Extra ladder is provided on right side of the building

➤ Commercial and residential

❖ Data of building

• Name of building-: MAnnant Apartment

• Address-: Mannant Near varyiali bazaar

• Height=16m

• Gross area=9600sq ft

• Lift area=23' \*3= 69sq ft

• Staircase=95\*3= 285 sq ft

• Open to space (ots)= 439.65sq ft

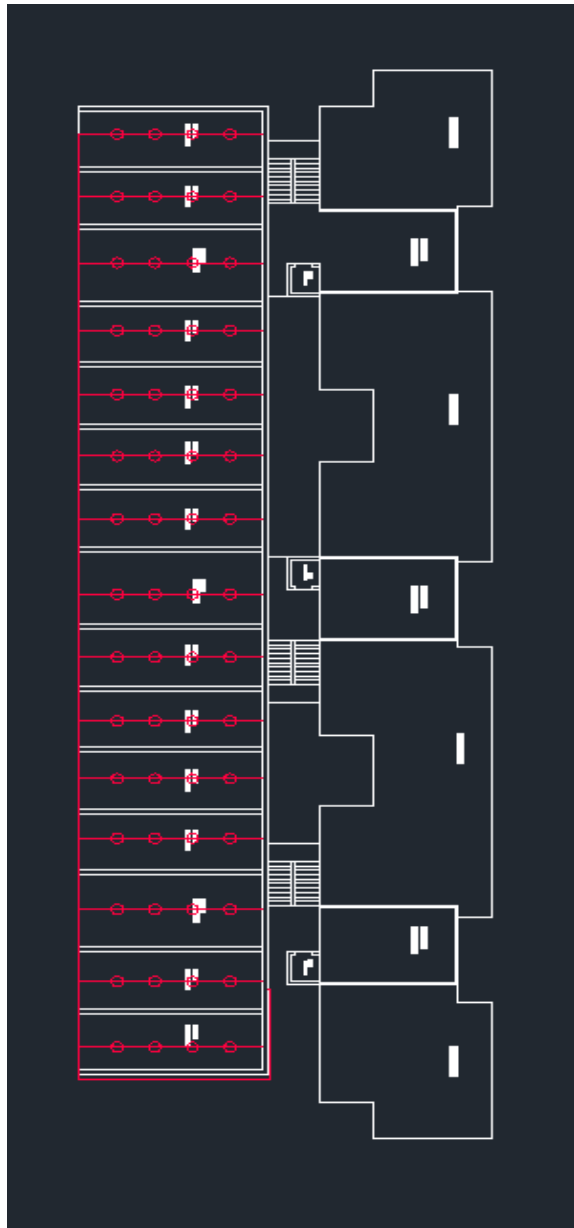
❖ Requirement of tools according the FCGDCR

• Fire protection consultants

• Chief fire officers

• Fire man

- Marginal space
- Corridor
- Exit requirement1
- Doorways 1
- Staircase
- Additional Staircase
- Electric service( cable size)
- Ventilation
- Portable fire extinguisher
- Fire exits signs
- Automatic Fire sprinkle



#### IV. CONCLUSION

A representative sample of relevant literature concerning fire incidents in buildings was reviewed to identify the main causes of fire spread in existing buildings. As older residential buildings constitute a considerable portion of existing residential building stock, and normally such buildings are more fire-safety deficient compared to newer buildings that have been constructed following more recent building codes, it is clear that a large number of such buildings need to be retrofitted to upgrade for an adequate fire safety system to satisfy the new fire codes. Review of the traditional and new retrofitting methods for fire safety of buildings in this paper provides an overview of the technologies available. Information gathered from multiple sources and a variety of old and recent high-tech fire protection and retrofitting systems presented offer a state-of-the-art review of viable approaches that can be adopted for fire retrofit projects, including some of the advantages and disadvantages of fire protection devices and strategies. Comparison of various features and attributes of different fire safety systems shows that each option has some strength and also some drawbacks . from the above study we came to a point that building code for fire safety provide only safety regarding to the height and area of the buildings, but as new structure is fully cover and buildings code of fire safety do not provide any provision according to the structure which is the main causes of fire in new construction of building.

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