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To Study Factors Affecting Fire Safety in High-Rise Buildings and Their Implementation Attributes

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Abstract - *Fire is one of the frequently occurring hazard during and post constructions. Its vulnerability increases for mainly post construction projects as occupancy is at full. There are various institutions which have provided the guidelines to overcome such hazard, but it becomes necessary to identify what are the minimum factors which needs to be implemented at site keeping in view of such norms. This article contains study of such factors which affects fire safety aspects in high rise residential buildings and identifying their implementation in actual conditions.*

***Key Words*: Fire, Fire Hazards, Fire Safety, Post Construction Project, Tabulation Method, Highrise Building**

1. INTRODUCTION

The most important of these hazards which deserves the highest consideration is the life hazard, as everybody concern is to save and protect lives from fire. Fire safety in construction is about preventing fires from starting and ensuring people's safety if they do. Buildings face the greatest risk from fire during the post construction phase. Here we discuss about the post constructed site or else already having a building or at some places no any kind of fire protection held. In the recent years, the fire safety system must be held in all kind of buildings for the safety of workers, things which is in the buildings, and for the building long age. Fire safety is more important were talk about the human being. So, that here we choose the fire safety, live safety and building safety purpose. In this research we considered about the fire safety measures, like, no objection certificates, inspection carried out, then after fire safety guidelines like, National building code (NBC), Gujrat comprehensive development control regulation (GDCR), fire hazards, its prevention, its rules and regulations, fire safety elements, and public awareness, etc. Study the factors affecting fire safety, its equipment, its role, its causes, and sources. The main point to study the fire safety is related to the residential and commercial high-rise buildings. Because the recent year we have many kinds of accidents held to the less of fire safety. In recent year, there have been several examples like, major the fire broke out at the Ganesh Genesis building located in the Gota locality of Ahmedabad , commercial complex in sarthana jagatnaka area of surat held the fire accident because of electric short circuit, Blast in the boiler of chemical factory in dahej, Gujarat, in march 2019, oil and natural gas corporation in Gujarat, broke out the fire, etc. The fire is spread by the conduction, convection and radiation so that the materials which used in building, inflammable and non-combustible. So, the safety purpose of the building its necessary to take a step against fire hazards.

1.1 RESEARCH CONCEPT

A main purpose of research is to inform fire safety rules and regulations, and to prove guidelines, and contribute to developing knowledge in a field of post construction buildings. This research will highlight the significance with the following points like, a tool for building knowledge and for facilities learning, means to understand various fire safety issues and increase public awareness, and a way to prove lies and support truths. The aim is, to study the factors with affect the fire safety in building after construction. To study in detail about fire hazards in different types of buildings. To study fire safety guideline as per national building code and Gujarat comprehensive development control regulation. To identify factor affecting fire safety in building after construction. To collect the primary data of survey and carry out data analysis method. To study the fire hazards and fire safety guideline with the use of national building code and Gujarat comprehensive development control regulation, to identify the factors affecting the fire safety in building after construction.

2. RESEARCH METHODOLOGY

This research presents the concept of fire safety and its rules and regulations study. The sequence of research methodology is given in the below flow chart, for overview of project. is, introduction, research methodology, literature review, fire safety rules and regulations according to NBC & GDCR, and the last on is data collection, data analysis and recommendations. In the introduction chapter, the concepts of fire, types of fire, its definition, fire hazards, causes of fire in the residential buildings, causes of fire in the commercial buildings, causes of fire in the industrial buildings, damage hazards in the buildings, and research need are discussed. Then the next chapter discuss the research methodology. Which is gives us to overview of the research method. And this chapter clear about the aim of study, objective and scope

of the study. After that study the literature review, which is gives us to different example of the research methodology, and give the base of the study, with the use of different literatures. In the next chapter study the guideline of the national building code and Gujarat Comprehensive Development Control Regulation fire safety rules and regulations. which is gives us the factors using the fire safety in the buildings. Then after discussing about the factors affecting fire safety in the building after construction. Then study the guideline of the fire safety equipments. It is must important for all kind of building protection. Data collection is held by the questionnaire, distribute the questionnaire by google form. Google form is distributed with the responsible person, who can understand the questionnaire. At that time the covid- 19 pandemic across the all over the world so that we cannot go for that location and collect the result. And in the last data analysis by the tabulation method. Give the graph for each result of factors. Then give the recommendations about the fire safety in post construction buildings. The flow chart of the research methodology is given below:

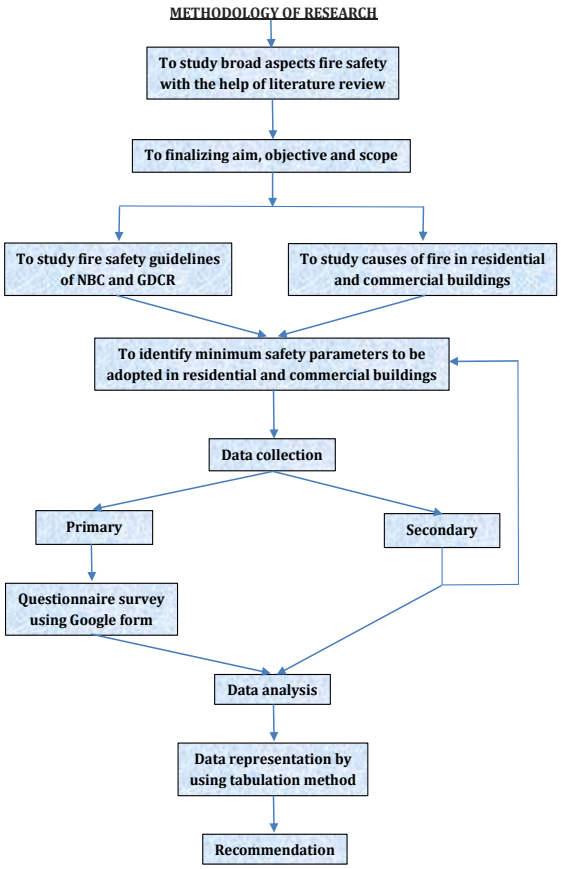

Fig- 1 Overview of research methodology

3. LITERATURE REVIEW

It is a summary, classification, analysis and evaluation of published papers or sources on a topic related. The aim of literature review is to show your guider that you have read, the main published work concerning a particular topic. 1.Research paper was based on the large commercial complex has appeared in china. In this commercial complex have a very heavy fire loads like, merchandises like clothes, shoes, hats and combustible decorations, electricity, smoke, etc. therefore the fire occurred in commercial complex. Once there is a fire occurred, the heavy smoke with CO, CO2, NOx, HCN, not only affects the safe and quick evacuation of the people, but also put them in danger. This analysis having difficulties in fire protection design so that current national standard has covered such points: distribution of business operations inside the complex, indoor walking street, how to determine the fire load of the complex, safe evacuation area, occupancy density, firefighting equipment, smoke control pattern as well as other important design parameters. "Code for fire protection design of tall buildings" GB 50045-95(2005 edition) requires that if the building area of an underground shopping mall is larger than 20000m2, fire wall shall be used to separate it and there shall be no openings in the fire wall. 2. Another research paper gives the information about CU risk is comprised a system model and sixteen sub-models. The system model deals with the system methodology and the basic structure of the assessment approach, organizes basic functions of each sub-model, relationship of all the sub models, as well as data input and output of the whole model. There are two parameters, first one is expected risk of life and second one is annual fire loss is based on the cost. In this one case study of six storey building describe the using CUrisk and design the equipment use and its probability to must keep it in each floor and in the end fire Spread, Building Cost, Occupant Response and Evacuation sub-models, CUrisk can evaluate the fire performance of buildings, not only in terms of performance of fire protection measures, but also in terms of the expected life risk and fire losses during the building design life. This research paper gives the different 8 kind of fire protection option like, No active systems, only alarms, only fire department, Alarms and fire department, only sprinklers, Sprinklers and alarms, Sprinklers and fire department, Fire department, sprinklers and alarms.

4. FACTORS AFFECTING THE FIRE SAFETY

The questionnaire survey is depending upon these factors. For the comparison of NBC and GDCR, finalize the factors, which affect the fire safety for the building. Factors are affects the fire safety are like, NOC, Firefighting device installed by, Fire extinguisher, Inspection, Direction signage for fire safety exit, Smoke alarm system, Inflammable material used in staircase, Fire sprinkler system, Emergency lighting, Ventilation, Hose reel, Non-combustible material in interior and exterior, Underground firefighting water storage tank, Fire lift, Regular maintenance of fire safety equipment, Expired date of firefighting equipment, MCB and ELCB. Here we discuss about some factor which are more important. In the fire safety for high rise building, the inspection is most valuable part, because the firefighting

equipment is worked properly or not, the use of the equipment, the availability of the equipment, and the all kind of necessary like, firefighting water tank, if it is there are, so the water is in the water tank, no any kind of interior and exterior flammable material in the building, the terms and conditions of the government law is full filled or not, that kind of inspection carried out is normally in six months or else every one year. Expired date of equipments is also the affects in the building and life safety of the people. Sometimes the expired dated equipment is not fully works at the emergency time. In this variable the fire sprinkler is used for the fire occurrence area, it is very useful equipment of the fire safety, at sometimes the fire brigade was not rich in proper time, at that condition this tool is useful. All high-rise building having a staircase, but in these staircases no any kind of flammable material used is must sure, because the wooden staircase, aluminum staircase is flam attracts and so that the people stay in that building is suffering from the time of fire, so this variable is very useful to noticed. The smoke alarm system is used for the fire occurrence or any kind of smoke are there, this variable used for the alertness of the people, which was stay in this building and the accident can be destroyed.

5. DATA COLLECTION

The data are collected by the questionnaire survey. The questionnaire survey data collected by the google form. With the results of questionnaire survey, these results put into coding and then survey should have held by the tabulation method with their rules and principles. Tabulation passes on the meticulous arrangement of the information in to rows and columns. Rows are the horizontal arrangement. The tabulation is an arrangement of records/ facts/ statistics in rectangular structure with suitable heading to make clear to special rows and columns. The main purpose of the table is to make simpler the figures/ numbers and to facilitate comparisons. Each column and row must be given title. Title of column called caption and title of row is called stub. The questionnaires are helpful for the survey of fire safety in high rise buildings. The common things, which we can use daily basis is prefer the below questions. It's also called the checklist of the fire safety in high rise buildings. This questionnaire is depending upon the different factors of fire safety, like building NOC, building year of construction, building type, number of floors, plot area, firefighting device installed by consultant, any authority or others, this is the basic things of each building. Therefor the building has fire equipments, like, fire extinguisher, its visibility, hose reel, sprinkler system, its having a water tank or not, then the direction signage, smoke alarm system, inflammable material in staircases, emergency lighting, combustible material in interior or exterior surface of the building, inspection carried out in last five years, then the proper maintenance, expired date of equipments, fire lift available or not, and electrical service like MCB (Miniature circuit breaker) and ELCB (Earth leakage circuit breaker) available or not.

This kind of factors affect the different things in the building and so the fire accident held. So, for the safety purpose of human being and for the building life these factors are totally depends on fire safety.

6. DATA ANALYSIS

Data analysis by the data tabulation method. Tabulation passes on the meticulous arrangement of the information in to rows and columns. Rows are the horizontal arrangement. The tabulation is an arrangement of records/ facts/ statistics in rectangular structure with suitable heading to make clear to special rows and columns. The main purpose of the table is to make simpler the figures/ numbers and to facilitate comparisons.

According to this process, first collected data with the data collection are put into tabulation or table form. Then, give the data of weightage, and unnecessary data are remove in this table, then export the data in the excel sheet and then give the proper principles of the table, and give some attractive look.

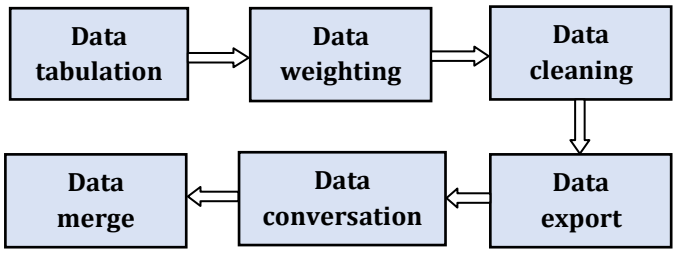

Fig- 2 Process of data tabulation and analysis

Data analysis are based from the collected data results of the questionnaire. For the questionnaire, we have received the forty-two results by the distribution of goggle form. The google form is distributed only in Ahmedabad region and it is only for the high rise residential and commercial building. First, after tabulation, given a coding of each responses. Then after the coding have done, calculating the positive and negative response of the tabulated data and give the all the factors which is describe in the questionnaire survey having a graphically described for the data tabulation method.

7. CONCLUSION

With the help of the study carried out, for the minimum safety parameters, to the implemented in residential and commercial high-rise building we have collected several data existing residential and commercial buildings and the findings, identify that some factors like NOC, fire extinguishers, and MCB & ELCB those are totally adopted in

the buildings. The below graph shows the positive results of the analysis.

Fig: 3 Positive results of data tabulation

The below graph state that, residential and commercial high-rise buildings not having a proper result of, smoke alarm system, inspection, inflammable material in staircase, fire sprinkler system, fire lift, expired date of equipments, maintenance of equipments, hose reel, direction signage of exit, non-combustible material in interior and exterior.

Fig- 4 Negative result of data tabulation

So, here the performance of this criteria can be developed by the people, and people should save their own life due to fire hazards.

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