



## INVESTIGATING THE FACTORS CAUSING ACCIDENT ON CONSTRUCTION SITES

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**Abstract:** Accidents in construction projects, particularly in building activities, are common. These accidents can result in fatalities, major injuries, or near misses for the personnel involved, as well as additional effects such as lost work days and a negative image for the industry. Thus, accident prevention is essential through continuously improving construction health and safety. As a result, determining the elements that contribute to accidents is critical. The purpose of this study is to identify the elements that contribute to construction accidents, rank the various causes, and offer workplace safety solutions. A questionnaire was created in order to perform a survey of various workers in the construction industry, from unskilled labour to tradesmen. There were around 50 responders. The questionnaire includes the factors that contribute to construction accidents. The RII approach is used for factor analysis. The study revealed that unsafe working circumstances, caught between tools, equipment, and scaffolding failure are the most important reasons causing accidents, and that providing proper safety measures for workers on site will improve performance and also increase the productivity of the building industry.

**Key Words:** construction, high rise building, accident, hazard, workers, injuries.

### I. INTRODUCTION

Construction industry in India is indeed one of the significant contributors to the country's economy and employment sector. The Indian economy is dynamic, and various factors can influence the ranking of industries in terms of employment. India's construction sector has been a major employer due to the country's rapid urbanization, infrastructure development, and the construction of residential and commercial properties. The demand for construction workers, skilled and unskilled, has been substantial, providing jobs to millions of people across the country. (S. R. Meena)

#### 1.1 Indian Construction Employment

The Indian construction labour force accounts for 7.5% of the worldwide labour force and accounts for 16.4% of fatal global occupational accidents (Kulkarni, 2007). A mortality is five times more likely in the construction business than in the manufacturing industry, and the chance of a catastrophic injury is two and a half times higher. According to a recent report by the International Labour Organization (ILO) that referenced one survey by a local relief organization, India has the world's highest accident rate among construction workers, with 165 out of every 1,000 workers injured on the job. (Vishnuvarthan, 2014)

As a result of the increased risks involved with working at elevated heights, worker accidents on high-rise structures are a major concern in the construction business. High-rise construction duties include erecting steel structures, pouring concrete, installing facades, and running heavy gear. These activities can result in accidents if sufficient safety precautions are not taken.

The construction industry, particularly the civil engineering sector, is known to be one of the most hazardous industries globally. Workers in this sector face a variety of risks and potential dangers, leading to a higher number of accidents compared to many other industries. Falls from height and through openings are indeed significant contributors to fatal accidents at construction sites (SS.Torgal, 2014). Because safety mishaps and personnel injuries are common in the construction business, it is regarded as a high-risk industry. (Chan, Jan 20)

#### 1.2 Accidents on Construction Sites

The construction sector is widely regarded as one of the most hazardous and deadly vocations in the world. Construction work in India, as in many other nations, entails a variety of risks and potential hazards, making it critical to establish sufficient safety measures to protect workers.

Because of their knowledge and familiarity with construction procedures, experienced workers are often better suited to handle potentially hazardous circumstances. However, regardless of experience, safety precautions should be prioritized in order to protect all personnel. The fact that around 70% of construction workers in India come from areas such as Bengal and Assam emphasize the significance of giving safety training and awareness to individuals who may be new to the construction business or working in unfamiliar surroundings. (Kavya.K, Dec 19)

## Hazards In Workplace

### a Health Hazards (Orji Solomon E., 2016)

1. Chemical substances (asbestos, solvents, chlorine)
2. Infectious diseases (tuberculosis, HIV, hepatitis)
3. Physical (noise, temperature, radiation, vibration)
4. Ergonomics or Repetitive Strain Injuries (carpal tunnel syndrome, back pain)
5. Psychiatric

### b Safety Hazards

1. Trips, falls, and slips
2. Stuck in machinery and trenches
3. Explosions and fires
- 4 Accidents involving transportation and vehicles

Here are some of the reasons why construction sites pose a high risk:

- 1. Working at heights:** Many construction activities entail working at heights, such as on rooftops, scaffolding, or ladders. Workers are at risk of falling if sufficient safety precautions and equipment are not in place, which can result in serious injuries or fatalities.
- 2. Openings and unprotected edges:** Construction sites frequently contain openings or edges that do not have proper guardrails or safety. This poses a risk to workers who may fall through these apertures or off exposed edges.
- 3. Heavy machinery and equipment:** Cranes, excavators, and forklifts are among the heavy machinery and equipment used on construction sites. This machinery requires ability and training to operate, and accidents can occur if not properly managed.
- 4. Unstable structures:** Structures may not be totally stable during construction, increasing the danger of collapse or accidents owing to unstable ground or materials.
- 5. Electrical hazards:** Electrical work on construction sites can be dangerous if not managed properly. Another danger on construction sites is electrocution.
- 6. Limited space and congestion:** Construction sites are frequently packed with personnel, equipment, and supplies, causing congestion and increasing the likelihood of accidents.

### 1.3 Workers Health Hazard

Worker safety is indeed a fundamental and crucial aspect of any industry, including the construction sector statistic shows; Daily fatalities: The figure of around 950 people dying every day due to occupational accidents on construction sites is staggering and emphasizes the urgent need for improved safety measures. Daily injuries: With over 720,000 workers getting injured daily on construction sites, it illustrates the high risk and potential danger that workers face while performing their duties. Annual fatalities in India: The annual toll of over 48,000 workers dying due to occupational accidents in India alone underscores the severity of the situation in the country. Frequency of occupational accidents: The nearly 37 million occupational accidents that result in at least 4 days' absence from work reveal the widespread impact of such incidents on workers' health and productivity. These statistics highlight the urgent need for the construction industry to prioritize safety and take proactive measures to protect the well-being of its workers. Improving safety standards, enforcing compliance with regulations, providing proper training, and fostering a strong safety culture are essential steps to address the issue. Additionally, investing in technology and innovative solutions that can reduce the risk of accidents, such as automation, robotics, and remote monitoring systems, can also play a role in enhancing worker safety. Ultimately, every worker has the right to a safe and healthy work environment, and it is the responsibility of employers, governments, and industry stakeholders to work together in implementing measures that prevent accidents and protect the lives and well-being of workers. (P.Hamalainen, 2010)

## II. LITERATURE REVIEW

### Accident due to fall

The researcher examined accidents caused by worker falls on construction sites and discovered that the majority of fall accidents occurred at elevations less than 9.15 m, primarily on new construction projects of commercial buildings and residential projects with relatively low construction costs. (Hinze, 2003)

### Safety Standard and Working Conditions

This paper investigated the root cause of poor safety standards and working conditions on construction sites. The criteria covered in this study are

- 1.safety programs and policy,
- 2.safety program execution,
- 3.safety program evaluation.
- 4.The use of personal protective equipment,
- 5.hazards and their protection,
- 6.emergency response. (Sathish Kumar.P.S, 2012)

### Unsafe work methods

According to research, the principal causes of accidents are related to the industry's distinctive nature, human behavior, challenging work site conditions, and poor safety management, all of which result in unsafe work practices, equipment, and procedures. Training and the implementation of comprehensive safety programs must be prioritized in both developing and developed countries. (Mouleeswaran.K, 2014)

### Accidents On Construction Sites

The construction sector is the most dangerous and hazardous career. Experienced workers are required to tackle these hazardous conditions. Around 70% of construction workers in India come from Bengal, Assam, and other states. Proper safety precautions,

such as Harnesses and guardrails, as well as other alternatives like fastening ladders, wearing safety belts and helmets, and inspecting scaffolding, can help to reduce the risk of occupational injuries in the construction sector. (Oladiran, 2009)

**Effects of accident on work**

The development industry, by definition, is risky. It is widely regarded as having a high accident rate, which results in absenteeism, loss of profitability, permanent incapacity, and even fatalities. Aside from creating personal tragedies, construction accidents also delay project progress, raise costs, and hurt the developer's reputation. Accident rates in development remain a common source of concern. This concern is justified because development has the highest failure rates in many countries. The purpose of this article is to identify and systematize the most important aspects and direct causes that influence the occurrence of accidents in the development industry. (Mthlane D, 2012)

**Factors of accident**

There are various and numerous causes of accidents that occur on site; it is the site manager's or supervisor's responsibility to discover these causes and strategies to eliminate them. According to the researcher, acts of God or disasters in the construction industry are events or activities that cause catastrophic damage to building products, processes, and stakeholders. Rain, flooding, wind, earthquakes, landslides, and other natural disasters all-cause mortality on construction sites. (Ranasinghe, 2015)

**Work hazards**

Whether working on a modest project or a large commercial complex, construction workers face some of the most hazardous working circumstances of any profession on a regular basis. Even for the most experienced worker, a construction site is dangerous by nature. Accidents continue to occur and will undoubtedly continue to occur owing to the nature of the work itself as well as the multitude of hazards faced by construction workers. (V. H. P. Vitharana, 2015)

**3. PROBLEM STATEMENT**

Accidents in the construction business have long been a major concern around the world. Despite advancements in safety rules and practices, construction sites continue to be hazardous work environments, resulting in a variety of incidents and injuries. Worker accidents on construction sites continue to be a major source of concern and a depressing reality in the construction sector. Several causes contribute to these accidents, which result in injuries and, in extreme cases, fatalities.

**4. AIM**

Aim is to investigate and analyze the factors leading to accidents on construction sites.

**4.1 Methodology**

The technique is intended to reflect the various features of building sites as well as the overall project objectives. As a preliminary step, a thorough questionnaire is prepared to measure the criteria influencing site safety with weightage based on importance. The following criteria were evaluated for the survey.

The questionnaire is distributed, and completed questionnaires are collected from respondents using Google forms. A total of 50 interviews were done across 6 locations with a variety of managers, site engineers, safety personnel, and laborers. The number of interviews is shown in Table 1. Finally, information from the questionnaire and interviews were used to analyze the causes of accident on site.

In these forms, they tick for ranking the factors 1 to 5.

1 means min severity 5 means maximum severity

**Table -1: RII Scaling**

1	2	3	4	5
n1	n2	n3	n4	n5

After the collecting data, Relative Importance Index (RII) technique is used for the analysis of the survey data. RII is calculated by given formula

$$R.I.I. = 5(n5) + 4(n4) + 3(n3) + 2(n2) + 1(n1) / 5(n1 + n2 + n3 + n4 + n5)$$

Here, n1 = total persons who ticked for 1 for each factor

n2 = total persons who ticked for 2 for each factor

n3 = total persons who ticked for 3 for each factor

n4 = total persons who ticked for 4 for each factor

n5 = total persons who ticked for 5 for each factor

**5. DATA COLLECTION AND ANALYSIS**

**Table -1: Factors of Accident value, Ranking**

NO	FACTORS	RII VALUE	RANK
1	Fall from ladder	0.75	7
2	Fall from scaffolding	0.811	3
3	Faulty equipment's	0.732	9

4	No PPE Provision	0.891	1
5	Lack of training	0.812	2
6	Noise hazards (Deafness)	0.785	4
7	Reckless action of workers	0.761	5
8	Poor equipment management	0.655	18
9	Poor information flow	0.736	8
10	Lack of safety education	0.721	11
11	No safety signages on site	0.712	13
12	Failure of safety net	0.643	19
13	No maintenance of equipment	0.675	15
14	Hot and rainy weather	0.603	23
15	Dusty and noisy condition	0.713	12
16	Fire hazard	0.632	20
17	Chemical burns (No Gloves)	0.668	17
18	Fall of material	0.673	16
19	No Knowledge of work	0.755	6
20	Addictions of workers	0.601	24
21	Fear and anxiety of worker	0.622	21
22	High work load on worker	0.613	22
23	Lack of understanding	0.689	14
24	Unskilled equipment operator	0.732	9
25	Ignorance of workers	0.564	25

## 6. RESULTS AND DISCUSSION

The characteristics are ranked based on the causes and effects of construction accidents. The RII values produced from the analysis are used to rank the candidates. It clearly indicates that incorrect design may result in building collapse, worker drowsiness may result in scaffolding accidents, and a lack of awareness of personal protective equipment may result in a fall from height mishap.

## 7. CONCLUSIONS

It is acknowledged that project managers should pay more attention to the significant variables identified in the research in order to reduce the occurrence of accidents. According to this study, the most serious incidents in the construction business are falls from great heights, falls from scaffoldings, and building collapse. These are identified using previous works of literature. Statistics from OSHA guidelines These mishaps are primarily caused by technological causes, organizational causes, human causes, and environmental causes. It is mentioned that God's manifestations are unavoidable, yet under very poor or antagonistic weather circumstances, laborer's can be excused from work, particularly during a powerful storm. To prevent construction mishaps, numerous safety measures such as personal protective equipment (PPE), toolbox meetings, and worker safety training are implemented. OSHA recommendations should be recorded and reported when they are broken. Workers should be supervised by safety personnel on the job locations. To prevent construction accidents, workers must be aware of the hazards and safety programs.

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