

**SAFETY PERFORMANCE ANALYSIS FOR ONGOING CONSTRUCTION  
PROJECTS: A CASE STUDY FOR SURAT CITY**Mr. Jatin Kumar Patel <sup>1</sup>, Asst.Prof. Neetu Yadav<sup>2</sup> and Prof.Neeraj Sharma<sup>3</sup>ME Second year Student,Civil Dept. S.N.P.I.T & RC,Umarakh, Bardoli, Gujarat <sup>1</sup>Asst. Pro.,Civil Dept. S.N.P.I.T & RC,Umarakh, Bardoli, Gujarat <sup>2</sup>Head of Civil Dept. S.N.P.I.T & RC,Umarakh, Bardoli, Gujarat <sup>3</sup>

**Abstract:** This study is focus on construction safety performance. Safety performance is defined as quality of safety related work. Safety here is not occupational safety but within the worker safety, public safety, environment safety, property safety and construction site safety. In this paper, safety performance measurement of various construction site of Surat based on an investigated site survey has been done. The study conducted on construction site through the method of questionnaires survey and Safety performance factor analysis, safety performance category analysis, safety performance index and statistical analysis method. Survey has been conducted on thirty sites. Finding of study show that the most safety nonperformance issue belongs to management catogery.it was observed that site management seemed not interested in their work. Overall, most of sites lie between unsafe to moderately unsafe range. This shows that the overall safety performance level of site construction site needs drastical improvement.

**Key words:** safety performance; construction safety; safety performance index; construction site

**I. INTRODUCTION**

In the developed as well as developing part of the world, construction industry is considered to be one of the most significant industries in terms of contributing to GDP and also in terms of its impact on health and safety of the working population. Construction industry is both economically and socially important. However, the construction industry, at the same time, is also recognized to be the most hazardous.

Although dramatic improvements have taken place in recent decades, the safety record in the construction industry continues to be one of the poorest. Research shows that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures. Emphasis in both developing and developed countries needs to be placed on training and the utilization of comprehensive safety programs.

Coupled with the circumstances in which the construction phase usually has a lag time for months or even years in the planning phase. This raises the issue of separation and isolation breakdown of communication between professionals in the development of construction techniques that result in a delay in project completion time and the swelling costs, not to mention the claim and issue addenda and extra-work. Where the project from start to finish takes a team of experts in the field of construction safety so that in each construction process has been considered in terms of construction safety .Safety was instrumental in the construction of workers due to the work of this project includes a high degree of hazard. Safety project property must also be kept as equipment projects, while building the project (site layout), building projects, and property of other parties involved in the project. Forests that surround the project are protected forest where the government protects the forest and the animals that exist. Because it is in the implementation of the project should pay attention to the actions taken so as not to interfere with the safety of the environment, especially the safety of the ecosystem.

**II. OBJECTIVE**

In this study evaluate construction site safety performance for Surat city.

**III. RESEARCH METHODOLOGY**

The research methodology consisted of the following steps

1. Literature review and pilot study to collect base knowledge.
2. Conducting site observation surveys at selected work sites.
3. Identify the factor affecting on during construction and prepare the questionnaire.
4. Use safety performance index method to check level of safety.
5. Research analysis i.e. Assessment of the survey findings to diagnose the safety performance and conclusions.

#### IV. DATA ANALYSIS APPROACH

##### 1. Safety Performance Factor Analysis

Safety performance factors were observed during the site investigation. Based on the level of safety non-performance, the Factor Non-Performance Index (FNPI) and the Factor Performance index (FPI) were calculated using the following formulae.

$$\text{Factor Non-performance Index (FNPI)} = \frac{\sum (\text{Factor score} \times \text{No. of sites at a particular score})}{\text{Total number of responses} \times 5}$$

where “5” in denominator indicates the score at the maximum level of safety non- performance.

$$\text{Factor Performance Index (FPI)} = 1 - \text{FNPI}$$

##### 2. Safety Performance Category Analysis

Based on the factors non-performance and factors performance indices, the category Non- Performance and category performance indices of the four categories have been calculated with the following formulae.

$$\text{Category Non Performance Index (CNPI)} = \frac{\sum \text{FNPI (of the factors in the category)}}{\text{No. of Factors in the category}}$$

$$\text{Category Performance Index (CNPI)} = \frac{\sum \text{FPI (of the factors in the category)}}{\text{No. of Factors in the category}}$$

##### 3. Safety Performance Index

Safety non-performance score of each site has been calculated by summing up the scores of safety non-performance of all the factors for a site. Then the safety non-performance index has been calculated using the following formula.

$$\text{Safety non-performance Index} = \frac{\sum (\text{Score of Safety non-performance of all factors for a site})}{\text{Maximum score at particular site}}$$

Where, Maximum Score for a particular site = No. of factors investigated x 5

Further, the Safety Performance Index (SPI) has been calculated using following formula: Safety Performance Index (SPI) = 1 – Safety Non-Performance Index

#### V. DATA ANALYSIS

On the basis of Factor Non-Performance Indices the top ten safety non-performance practices found on sites are as follows.

Table1: Top 10 safety nonperformance factor

1	Safety engineer at site
2	Training program for worker
3	Safety regulation, policy, training, meeting, inspection at site
4	Safety plan at site
5	Worker use safety tools during work
6	Worker normally wear face mask at dusty condition
7	Housing facility for worker
8	Scaffolding, ladder and safety tool provide at site as per IS
9	Provide warehouse for storage of material
10	Worker normally wear gloves

Table 2: safety performance category analysis

No	FACTOR	CPI	CNPI
1	Management	0.170	0.830
2	Worker safety	0.184	0.816
3	Construction site condition	0.192	0.808
4	Property safety	0.208	0.792
5	Environment safety	0.230	0.770
6	Public safety	0.232	0.768

Most of the safety non-performance practices belong to management category. Management category has got the highest non-performance index (i.e. 0.83) that again supplements Weakness identified in the management safety practices.

Table 3: Safety performance level

% SPI	0-25%	25-50%	50-75%	75-100%
Safety performance level	Extremely safe (ES)	Safe (US)	Un Safe (US)	Extremely Unsafe (EUS)

After checking safety performance level of all 30 sites we say that:

Results indicate that most of the sites lie in the range extremely unsafe to safe (about 67%) and the rest are in the safer range (33%). This shows that the overall level of the construction industry as regard to site safety needs drastic improvement.

## VI. STATISTICAL ANALYSIS OF SPI

The mean value of SPI of 0.52 indicates that the overall safety performance of construction Organizations on work sites is only average. One important highlight from the statistical analysis is that the skewness has come out to be a negative value (i.e. -0.12). A major conclusion from this statistical inference is the lack of presence of standard system with regards to safety management in the construction industry.

## VII. CONCLUSION

After checking safety performance level of all thirty sites we say that;

- Analysis says that three site are extremely safe and seven sites are safe so they have lies in range of 33%.
- But there are seventeen sites which is unsafe condition and three site which have extremely un safe condition so they are lies in range of 67%.
- This shows that the overall level of the industry as regard to site safety needs drastic improvement. Safety seems to be on the less priority on the agenda even during the execution phase which is not a healthy trend.

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