

Safe climate assessment for infrastructure projects: A Case study of Surat

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Abstract- The construction industry is one of the most hazardous industries worldwide due to its unique nature. Safety is the condition of being protected from or unlikely to cause danger, risk, or injury. Unsafe conditions exist on work sites and labourers are exposed to numerous hazards and extreme weather conditions. Large construction companies are following the safety regulations and implementing their safety management systems but their accidents rate is still increasing. The environment of the construction industry is risky which make it very essential to pay more attention to improve the construction safe climate and health at work place. The aim of the study is to consider the safety and health of workers at construction site. This investigation has been carried out with help of case study based approach. Three infrastructure construction site which covers (Sardar Bridge, Cable stay Bridge, Puna Junction) we have found safety performance index and health of workers from this case studies. After caring out this research work we can say that safety at infrastructure project is consider a prime requirement as increase rate of accident will directly affect of project. So to reduce overrun safe climate construction project is maintain.

Keywords- Health, safety, accident minimization, employer's safety, construction

I. INTRODUCTION

Health and safety is relevant to all branches of industry, it is particularly important for the Construction industry. It has always been a major issue as it is considered the most exposed sectors when it comes to occupational accidents. Safety is the condition of being protected from or unlikely to cause danger, risk, or injury. Health is the state of being free from illness or injury. Health and Safety are regulations and procedures intended to prevent accident or injury in workplaces or public environments. The issue of the construction worker's health and safety has become a well-recognized problem and represents a concern that is shared worldwide. The major causes of accidents in the construction industry are related to the unique nature of the industry, human behaviour, difficult work-site conditions, and poor safety management which result in unsafe work methods and procedures. Due to the fact that accident rates in construction are high when compared to other industries, the construction and project managers need to be fully prepared to deal with accidents when they occur, undertaking proper investigations and reporting procedures afterwards.

II. OBJECTIVE OF STUDY

- To evaluate current construction safety practices and assesses the safe Climate at project sites.
- To evaluate health of workers at construction workplaces.

III. SCOPE OF THE STUDY

- This study will be evaluated with the help of case study for Surat City Only.

IV. LITERATURE

- Hafiz Zahoor et al. (2015) ^[1] has discussed relationship between safety climate and safety performance in the construction of multi-storey buildings. They have concluded that the construction of multi-storey buildings is at increase in the major cities. There are major causes of accident by unsafe behaviours of workers, many types of accidents include; fall from height, followed by lifting activity and electrocution. It also presents a research framework to identify the safety climate factors which can remarkably enhance the safety performance in the construction of multi-storey buildings. One major solution to reduce the accident rate with safety climate measurement model to measure, monitor improve the safety performance of construction in developing countries.
- Abid Hasan et al. (2012) have focus made on safety incentive and penalty provision in Indian construction projects and also impact on safety performance of construction projects. Research based on questionnaire survey to evaluate training, special attention to risky situations, role of safety committee and sub- contractors, specialized workers and safety equipments, and right form of incentive and penalty(I/P).They have adopted RII method to collected data from ongoing

building and factory construction projects of a leading Indian contractor. Using the RII method the rank orders of different attributes were obtained for all responses, and those of clients, consultants and contractors separately of responses to success attributes affecting safe completion of I/P projects.

- James R. Wilkins (2011) has discussed the construction workers' perceptions of health and safety training programmes. James identifying workers' conceptions of the training they receive is critical to the design and deployment of effective workplace education programmes. Strong health and safety training programmes improve employee retention as well as compliance with health and safety requirements. In this paper many potential participants indicated that they were not comfortable using a computer and did not feel comfortable with completing an electronic questionnaire via a personal computer. Given limitations, it concentrates on issues: The online questionnaire was accessed and begun 214 times, but only 140 questionnaires were marked as complete, marking the rate of abandonment at 34.6%.
- Sulastre Mat Zin et al. (2012) summarized factors of employers' behavior as the main significant cause to encourage employees' behavior towards safety compliance to occupational, safety and health improvement in the construction industry. This study is identified as an approach providing law-making framework to execute human behavior towards safety compliance by practicing high standards of safety and health at work. This study is done in the context of the construction industry on behavioral safety compliance factors particularly to management level role towards OSHA development. They have adopted two technique used to obtain and analyzed the data. First technique was using making from which the purpose is to obtain the factor contributes of each interviewee. The second technique is Average Index Method. In this study OSHA improvement hence protect employees from occupational accident, injuries and illness.

V. RESEARCH METHODOLOGY

Research methodology of this study contains two main steps. First step includes literature Survey. The literature review was conducted through research papers, journals, internet, etc. Second step includes case study of Bridge Construction site for Surat city. Third step is to find out the safety and health of workers at Bridge site.

VI. CASE STUDY

Check list				
Sr. No.	Description	Case study 1	Case study 2	Case study 3
Site				
1	Safety representative	Yes	Yes	Yes
2	Is there an employee with First Aid Training and a First Aid Kit available onsite?	Yes	Yes	Yes
3	Are materials, scrap, or debris, piled and stored as to not create a hazard?	Yes	Yes	Yes
4	Are Toilets provided at jobsite adequate and maintained in a sanitary condition?	Yes	Yes	Yes
5	Is there an adequate supply of potable water available at the jobsite?	Yes	Yes	Yes
6	Emergency phone numbers posted	Yes	Yes	Yes
7	Fire Extinguisher	Yes	Yes	Yes
Scaffolding				
8	Are scaffolds inspected by a competent person at the beginning of the shift?	Yes	Yes	Yes
9	Are scaffolds more than 10' in height protected by guardrails on the back and both ends?	Yes	Yes	Yes
10	Workers training	Yes	Yes	Yes
11	Are scaffolding set on sound footing?	Yes	Yes	Yes
12	Are scaffolding fully planked?	Yes	Yes	Yes
13	Are scaffolding erected or moved within 10 feet of power lines?	No	No	No
14	Are extra material allowed building up on scaffold platforms?	No	No	No
15	Are scaffolds loaded with more weight than they were designed to support?	No	Yes	Yes
Facility Security and Public Safety				
16	Traffic management	Yes	Yes	Yes
17	Safe crossings	Yes	Yes	Yes
18	Site security	Yes	Yes	Yes
19	Warning signs (hard hats, no trespassing, etc.)	Yes	Yes	Yes
20	Adequate lighting for site and public	Yes	Yes	Yes

PPE				
21	Hard hats	Yes	Yes	Yes
22	Safety glasses (goggles for liquids)	Yes	Yes	Yes
23	Hand protection	Yes	Yes	Yes
24	Foot protection	Yes	Yes	Yes
25	Traffic vests / traffic paddles	Yes	Yes	Yes
Electrical Protection				
26	Earthing of electrical installations	Yes	Yes	Yes
27	Location of underground and overhead power cables	Yes	Yes	Yes
28	Protection of lead/ cables	Yes	Yes	Yes
29	Number and location of power points	Yes	Yes	Yes
Fire Protection				
30	Fire extinguishers (adequate number, type & maintained)	Yes	Yes	Yes
31	Gas cylinders (storage/ proper separation & use)	Yes	Yes	Yes
32	Fire hydrants /standpipes (accessible to fire dept)	Yes	Yes	No
33	Necessary permits obtained from fire department	Yes	Yes	No
Workers health and safety				
34	Safety policy	Yes	Yes	Yes
35	Safety plan	Yes	Yes	Yes
36	Workers health insurance	Yes	Yes	Yes
37	Separate training area	Yes	Yes	Yes
38	Safety training	Yes	Yes	Yes
39	Minimum labour wages are provided to labour or not?	Yes	Yes	Yes

1) CASE STUDY OF SARDAR BRIDGE

The foundation stone for widening of Sardar Bridge from the existing four lanes to eight lanes was laid on September 6, 2015. Widening work will cost Rs 80.75 crore to the municipal corporation's exchequer. Presently, the main bridge is 650 metre in length and has flanks of 250 metres at its both sides. The new design will increase the main bridge portion to 700 metre, but reduce the flank portion to 120 metre on both sides. The widening portion of Sardar Bridge from Adajan to Athwalines will be dedicated to the citizens on February 2018. The widening of the bridge's portion from Athwalines to Adajan will be completed by June 2018. Estimate cost of Sardar bridge work is 96.46 crore.

Table 1: Case Study of Sardar Bridge

Criteria	Followed	Not Followed
Site	7	0
Scaffolding	5	3
Facility Security and Public Safety	5	0
PPE	5	0
Electrical Protection	4	0
Fire Protection	4	0
Workers Health and Safety	6	0

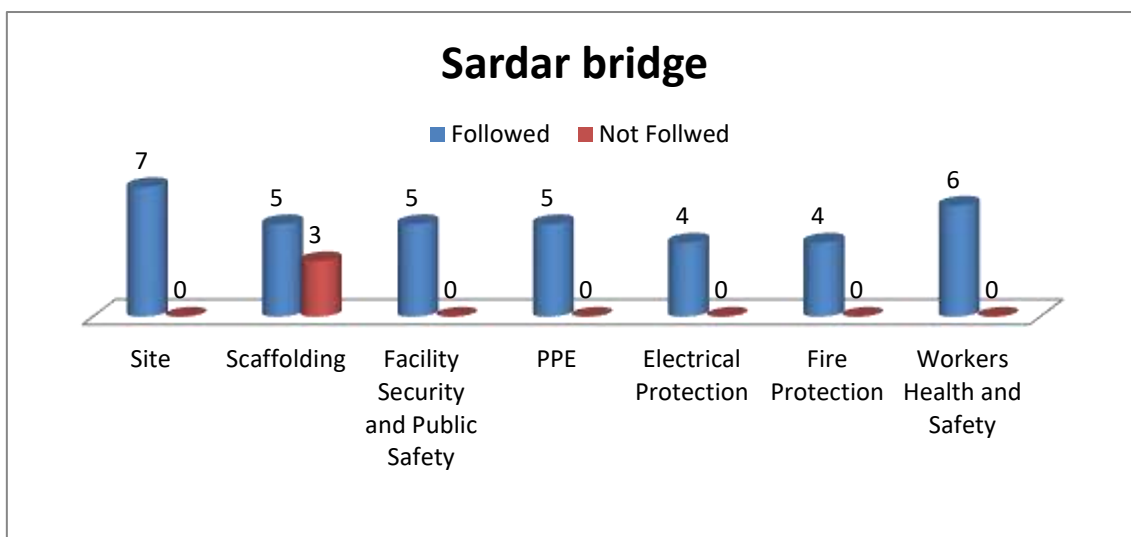


Chart 1: Case Study of Sardar Bridge

2) CASE STUDY OF CABLE STAY BRIDGE

- Out of 20 cables, 15 are erected in under construction Surat cable stayed bridge over river Tapi. Construction of cable bridge in Surat is going on for last 8 years. With erection of 5 more cables, construction of this bridge will be over, most possibly by middle of this year.
- Contact for construction of cable stayed bridge was given to Gammon India in year 2010. As the company failed to complete the work, the contract was given to Unique Construction.
- At present the bridge is 80% complete.
- Estimate cost of cable stayed bridge is 42.93 crore.

Table 2: Case Study of Cable Stay Bridge

Criteria	Followed	Not Followed
Site	7	0
Scaffolding	6	2
Facility Security and Public Safety	5	0
PPE	5	0
Electrical Protection	4	0
Fire Protection	4	0
Workers Health and Safety	6	0

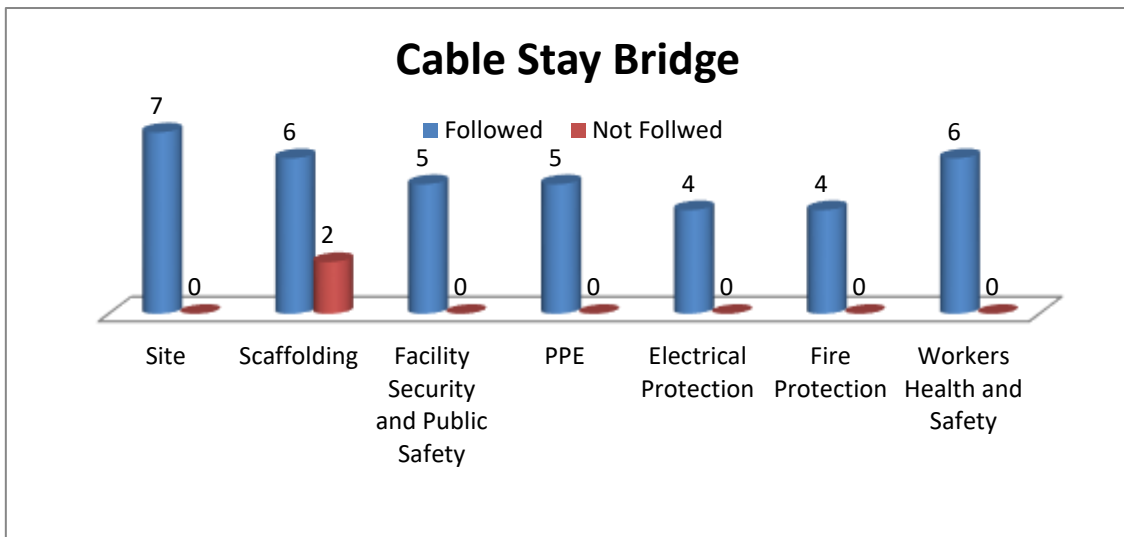


Chart 2: Case Study of Cable Stay Bridge

3) CASE STUDY OF PUNA JUNCTION

Table 3: Case Study of Puna Junction

Criteria	Followed	Not Followed
Site	7	0
Scaffolding	6	2
Facility Security and Public Safety	5	0
PPE	5	0
Electrical Protection	4	0
Fire Protection	2	2
Workers Health and Safety	6	0

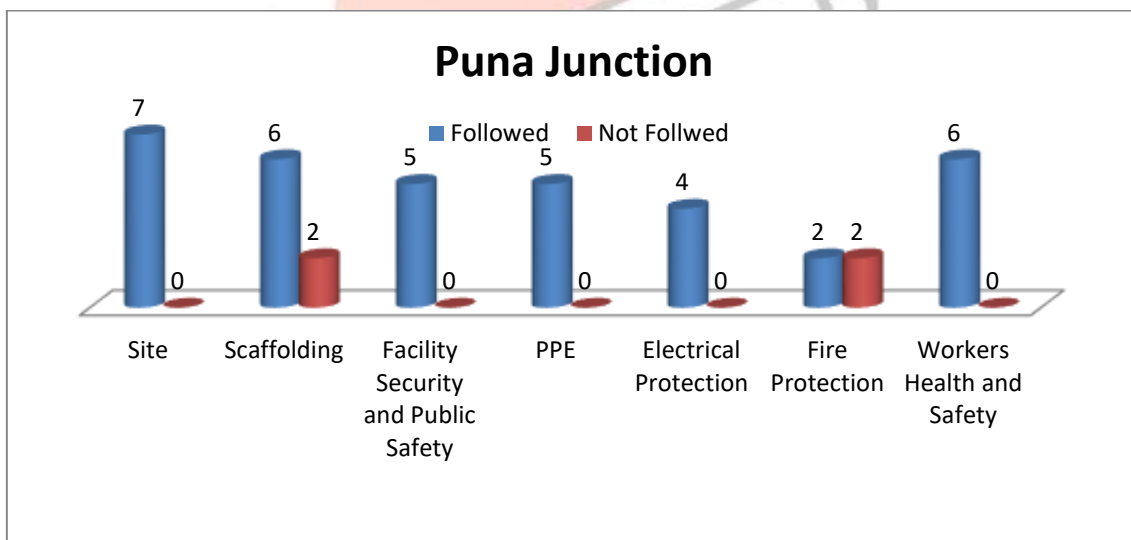


Chart 3: Case study of Puna Junction

4) COMBINED CASE STUDY

Table 4: Combined Case study

Criteria	Followed	Not Followed
Site	21	0
Scaffolding	17	7
Facility Security and Public Safety	15	0
PPE	15	0
Electrical Protection	12	0
Fire Protection	10	2
Workers Health and Safety	18	0

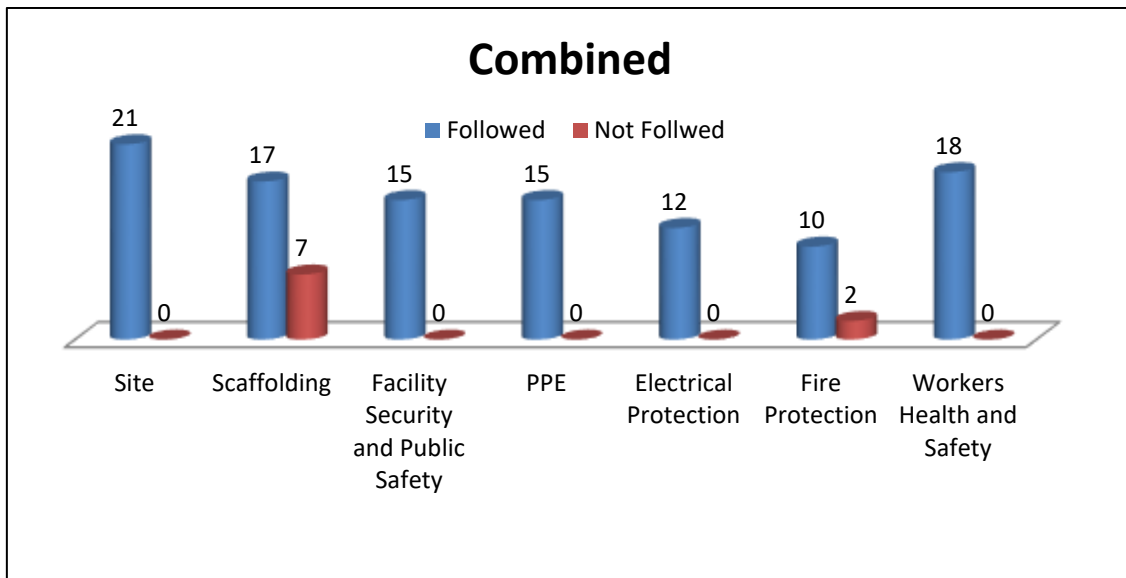


Chart 4: Combined Case Study

VIII. CONCLUSION

From this study we are able to conclude that safety at work place play a very important role for successfully completion of any construction project and reduce project overruns. This study showing some very common but important causation which needs to be taken care during the origination of any construction project. Three infrastructure construction site in the Suart city area we have found safety performance index and health of workers from these case studies. From these case studies we are able to say that on infrastructure construction project accident rate at construction site directly affect to the project so to reduce accident rate at construction site and maintain safe climate at construction project.

IX. ACKNOWLEDGMENT

Special mention goes to my wholehearted mentors, Ms. Neetu B Yadav. My Master in Engineering has been an amazing knowledge and I thank wholeheartedly, not only for her wonderful academic support, but also for giving me so many wonderful opportunities. I would also like to thank Dr. Neeraj D Sharma, Principal & H.O.D of Civil Engineering Department, Asst. Prof. Rushabh Shah, Asst. Prof. Hiren A Rathod and Asst. Prof. Bhavin K Kashiyani of Civil Department, S.N.P.I.T & R.C., Umrah for helping me during the this work.

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