International Journal of Modern Developments in Engineering and Science
Volume 2, Issue 4, April 2023
https://www.ijmdes.com | ISSN (Online): 2583-3138

Hazard Identification and Risk Assessment to Eliminate/Reduce Risk Levels in Mivan Type Construction Unit

Dinesh Navin Sekar[1*], S. Sivalingam[2]
[1]M.E. Student, Department of Mechanical Engineering, SRM Valliammai Engineering College, Chennai, India
[2]Assistant Professor, Department of Mechanical Engineering, SRM Valliammai Engineering College, Chennai, India

***Abstract*: The foremost aim of the project is to prevent the occurrence of any Incident/Accident in Mivan Shuttering construction site by completely understanding the Nature of Work and its perspectives through the detailed process of Hazard Identification and Risk Assessment (HIRA) and thereby providing Control Measures accordingly to reduce the high-risk levels prevailing in the area.**

***Keywords*: Construction safety, HIRA, Risk matrix, Mivan construction.**

1. Introduction

Accidents are very common on construction sites in developing industries and are often taken into consideration. Injury related issues are common to Indian construction destinations, mainly in the areas of falls from height, broken formwork and damage from electrical equipment. Occupational safety and hazard assessment research and its responsibilities are essential for all professionals. However, it turns out that professionals who tend to do so rely more on their own experience and information regarding dynamic risk assessment. This is due to the lack of a logical methodology and the lack of opportunities to actually check the consistency of decision making. Taking into account the extensive literature, a layout study is ready to assess the hazards and their risks in exercises (such as formwork) that account for the maximum level of failure. This format is used to investigate and study the systematic and successful risk assessment of formwork and other exercises in construction projects. This system is useful to many associations and helps reduce accident rates whenever it is adopted to further develop safety by incorporating these control estimates into safety plans. The importance of risk assessment cannot be overemphasized. Helps identify potential hazards and reduce the likelihood and impact of accidents, injuries, and other adverse effects. By implementing an effective risk management strategy, an organization can protect its people, assets and reputation and ensure business success.

2. Hazard Identification and Risk Assessment (HIRA)

Hazard Identification and Risk Assessment (HIRA) is performed to identify undesired events that may result in a hazard, analyse the danger of this undesirable event that may occur, and usually estimate the extent, magnitude, and chance of serious repercussions. It is well known in industry that various risk assessment approaches contribute significantly to advances in the safety of complex operations and equipment. The goal of this hazard and risk analysis work is to identify and assess hazards, event sequences that lead to hazards, and the risk associated with hazardous events. There are numerous ways available to assist detect and analyse dangers, ranging from simple qualitative procedures to advanced quantitative methods.

A. Process

1) Identify hazards

Examine the workplace to identify what processes or actions could be harmful to the workers. Incorporate all areas of employment, such as remote workers and non-routine tasks like repair and maintenance. Should also review accident / incident reports to determine what hazards have already harmed the Organization.

2) Evaluate the risks

To assess the risk of a hazard, analyse how, where, how much, and how long people are typically exposed to a possible hazard. Using a risk matrix, assign a risk rating to your hazards. A risk matrix can assist quantify the amount of risk per hazard by incorporating elements like the probability of occurrence and the severity of potential injuries.

3) Frame control measures

After assigning a risk assessment to a hazard, it's time to devise appropriate measures to protect workers, property, people, and the environment. Prioritize control implementation by following the control hierarchy.

4) Document/record your findings

It is critical to maintain a proper record of risk assessments. This might assist your company in keeping track of hazards, risks, and management methods. Documentation may include a full description of the risk assessment process, a summary of evaluations, and descriptions of how findings were obtained.

*Corresponding author: dinavinsekar@gmail.com

Table 1
Risk assessment sheet (Observed Hazard)

Hazardous Action/Condition	Hazardous Action/Condition	What are you already doing?	What further controls/actions are required?	Timescales for further actions to be completed	Responsible person's job title
Working at Height Centering worker climbing through braces and frames in a scaffold.	Centering workers are the person who might be harmed. Risk of workers falling from scaffold which causes major head injury and multiple fractures or even death based on the impact of the fall.	PPE like helmets, safety harness, safety shoes for the workers are provided. First aid kit for workers in the site are well equipped and are in adequate number. The workspace in the catwalk part of the scaffold are provided well. The bracings of the scaffold are strong enough to withstand the worker's load.	The fixed ladder must be installed in the scaffold as a compulsory part. Lifting of worker using harness, ropes and pulley under any emergency situations must be present. The ladder must be fixed at even or flat surfaces to avoid any varied load distribution. Training for painters involved in climbing of scaffold should be provided based on facing the ladder during ascending and descending, keeping three points of contact, and positioning to centre of ladder. Supervisor must be deployed mandatorily to inspect and fill the checklist and to govern the workers whether the workers perform their task without any breach of the safety and work policies. Sign boards displaying "Falling Objects" and "Men Working Overhead" must be hanged in the workplace.	12 days 10 days 12 days 16 days 10 days 3 days	Construction manager Construction manager Construction manager Site engineer Construction manager Construction manager

5) Review control measures

Check in with your assessments to check if the controls that proposed have been implemented. If the conditions on which the risk assessment was established considerably change, use your best assessment to decide whether a new risk assessment is required.

B. Risk Assessment Sheet

The table present below depicts the actual or observed hazard and its associated risk level in the construction site, where this project was performed.

C. Hierarchy of Control

Limiting worker exposure to dangers in the workplace is critical to worker safety. The control hierarchy is a way to evaluate which activities will best control exposures in reducing Risk level prevailing in the site.

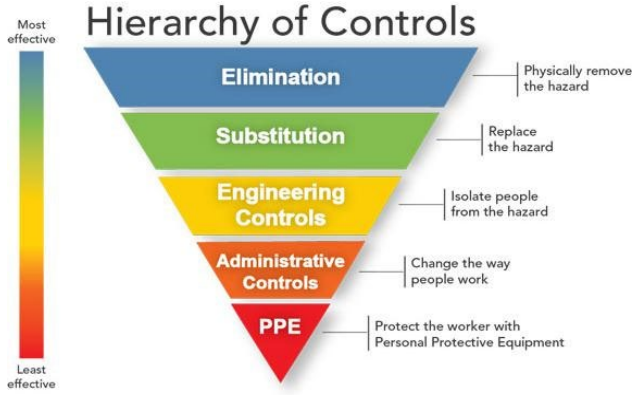

Fig. 1. Hierarchy of control

From the hierarchy of controls, the important control measure chosen for the observed hazard in the construction site is the "engineering solution" where the risk level of the hazard can be reduced considerably to low levels if implemented in the workplace.

D. Risk Matrix

The risk matrix visual tool helps in identification of the risk level that the construction site encounters, as well as their overall likelihood and severity of the Observed Hazard.

Risk Factor (RF) = Likelihood (L) X Severity (S)

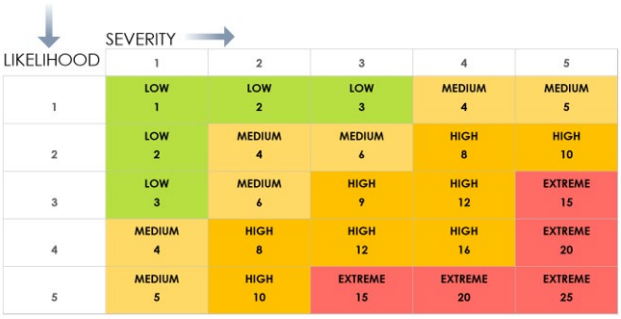

Fig. 2. Risk factor chart

3. Results and Discussion

- Numerous hazards were Identified with their associated Risk levels and Control Measures are Obtained accordingly, to Reduce the Impact of the Hazard if occurred in the workplace.

- From the all Hazard observed from the workplace, WORKING AT HEIGHT - Centering worker climbing through braces and frames in a scaffold, is found to be most critical one as the injury would even result in the Fatality or Head Injury to the workers.

Therefore,

Likelihood (L): 4 (as it occurs most of the time in a day)
Severity (S): 5 (as injury may even result in Fatality)
Risk Factor (RF): (L=4) X (S=5)
Risk Factor (RF) = 20.

LIKELIHOOD \ SEVERITY	1	2	3	4	5
1	LOW 1	LOW 2	LOW 3	MEDIUM 4	MEDIUM 5
2	LOW 2	MEDIUM 4	MEDIUM 6	HIGH 8	HIGH 10
3	LOW 3	MEDIUM 6	HIGH 9	HIGH 12	EXTREME 15
4	MEDIUM 4	HIGH 8	HIGH 12	HIGH 16	EXTREME 20
5	MEDIUM 5	HIGH 10	EXTREME 15	EXTREME 20	EXTREME 25

Fig. 3. Risk matrix chart for the observed hazard

For the Risk Factor (RF) Value = 20, which is considered to be the Extreme threat posing Hazard, Immediate and suitable Control Actions must be taken against to Reduce the Risk levels.

Hence, the engineering control of installing a fixed ladder above the catwalk (platform) of scaffold is provided as a major control measure along with other minor control measures to nullify the risk posed by the hazard.

4. Conclusion

And now that the assessment process is completed, implementation of the control measures framed in order to eliminate/reduce severity and likelihood of hazards prevailing in the work place is to be followed. And recording of every event to help in accident occurrence number reduction by analyzing the past accident and using it as a tool for the study in future. As this is a construction site, the need for Risk Assessment to be followed is considerably high because there is constant development in structure and the zone is prone to creation of new Hazards on regular basis. Hence the Assessment to be reviewed and conducted upon new installment or change in work progress.

And thus, the high-risk possessing hazards in the site are controlled by implementing the measures taken to reduce or eliminate the risk factor, thereby making the workplace a hazard free environment and saving the organization through moral, financial and legal ways.

References

[1] Ale, B.J.M., Bellamy, L.J., Baksteen, H., Damen, M., Goossens, L.H.J., Hale, A.R., Mud, M., Oh, J., Papazoglou, I.A., Whiston, J.Y., 2008. Accidents in the construction industry in the Netherlands: An analysis of accident reports using Storybuilder. Reliability Engineering and System Safety 93 (2008), 1523–1533.

[2] A book by Clifton A. Ericson, II, Hazard Analysis Techniques for System Safety, Hazard Analysis Types and Techniques, A John Wiley & Sons, Inc. Publication.

[3] Abhishek Sharma, Abhaynath Kumar, and Veerendra Suryawanshi, "Hazard Identification and Evaluation in Construction Industry," April 2015.

[4] Kambale, Shivam Hawaldar, Sawan Patil, Amol Sonawane, Anjali Patole, Manoj Patil, "Study Paper on MIVAN Technology."

[5] A review of risk management in construction: opportunities for improvement, Rogério Cabral de Azevedo, Leonardo Ensslin, Antônio Edésio Jungles, Modern Economy 5(04), 367, 2014.

[6] Li Yin Shen, George WC Wu, Catherine S. K., "Risk assessment for construction joint ventures in China," Journal of construction engineering and management 127(1), 76-81, 2001.

[7] Krantikumar Mhetre, B. A. Konnur, Amarsinh B. Landage, "Risk management in construction industry," International Journal of Engineering Research 5 (1), 153-155, 2016.

[8] Mohamed Nabawy, Laila M. Khodeir, "A systematic review of quantitative risk analysis in construction of mega projects," Ain Shams Engineering Journal, 11(4), 1403-1410, 2020.

[9] Osama Ahmed Jannadi, Salman Almishari, "Risk assessment in construction," Journal of construction engineering and management, 129(5), 492-500, 2003.

[10] A. S. Ligade and S. B. Thalange, "Occupational health and safety management system (OHSMS) model for construction industry," International journal of research in engineering and technology, 1(2), 395-399, 2013.

[11] Marina Macedo Abreu, Gabriela Alves Tenório Morais, Alberto Casado Lordsleem Jr, Béda Barkokébas Jr., "Hazards in Occupational Safety in the Aluminum Formwork System," Joint CIB W099 and TG59 International Safety, Health, and People in Construction Conference, 103.

[12] http://www.hse.gov.uk/pubs/

[13] https://www.ccohs.ca/oshanswers/hsprograms/hazard

[14] https://app.croneri.co.uk/topics/risk-assessment-construction/indepth

[15] NEBOSH IGC Textbook.