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Risk Assessment and Hazard Identification in Prefabricated Structures and its Industries

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***Abstract*: This project aims to analyze the risks faced when the concept of prefabrication is introduced in the construction of a structure. The purpose of the paper is to focus on how to prevent the inconvenience caused and the preventive measures taken to overcome the risk faced by the prefabrication industries as well the workers. This paper also focuses on the ideas of how to implement innovative methodologies in the prefabrication sectors.**

***Keywords*: Risk, risk assessment, prefabrication industries, preventive measures, innovative methodologies.**

1. Introduction

The prefab industry is the backbone for the development of new ideas in construction business of any country.

Factory buildings, residential buildings and the industrial township are needed practically by all the sectors, either to support the manufacturing or services of any industry

At present precast concrete building are the advanced Construction techniques available over worldwide. Being its wide applicability, the total precast concrete buildings systems are becoming a popular choice for many constructions. Precast concretes are available in many shapes, sizes, including structural elements and unreinforced pieces.

This paper aims to determine the sustainability of prefabricated buildings by studying the economic, environmental and social impact of the methods of prefabrication used in their construction. The method of prefabrication involves heavy vibrators for curing/treating the voids formed inside the concrete. This causes nervous disorder for the laborers and is also time consuming. Hence, we are introducing the concept of self-healing concrete in prefabrication to avoid Risks.

The self-healing concrete has the capacity to heal and lowers the requirement to locate and repair internal damage without the need of other external intervention and concrete deterioration as well as lowering costs and increase durability.

2. Risk Assessment

Risk assessment is a part of the risk management process and is included in the management of health and safety at work Regulation. Risk assessment is the process of identifying what hazards currently exist or may appear in the work place. The risk defines which work place hazards are likely to cause harm to employee and visitors. There is no set way of doing Risk Assessment, so employers may choose the approach they wish. But the approach needs to be systematic, thorough and completed.

A. Hazard Identification

A hazard is something which may cause harm to you and other people and identifying potential hazard is the employer's first step in risk assessment. The harm may occur and the time of doing the work or may happen at a later date, possibly even years later.

B. Assess the Hazard Risks

There are numerous ways of assessing the level of risks. They all involve making an estimate which should be informed by the evidence and other sources of information, and require judging what level is acceptable. There is no one correct way of doing this and a particular method that works in one circumstance may not be appropriate in other situations.

However, the method used by the Employer must be Suitable and sufficient.

3. Analysis

Risk assessment are live documents that should be reviewed regularly and at least when there has been any change in circumstances or risk factors. Once the findings have been recorded, a schedule for implementation should be drawn up.

The table 1 shows the analysis of risks faced when a Prefabricated structure is being transported and fixed on the site. Measure to be taken care of is also mentioned.

4. Risk Matrix

During risk assessment, a risk matrix is used to figure out the level of risk by balancing the categories of chance or likelihood and consequence severity. This is a quick way to make potential risks obvious and assist management. The risk matrix is represented in figure 1.

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

This is how the risk factor is calculated.

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Table 1

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
Handling Heavy Weights Heavy Prefabricated slabs are lifted using Belts or Ropes.	Labourers/Workers might be harmed. Ropes that are damaged and less/inappropriate in tensile strength are used to lift heavy materials which lead to breakage/loosening of Ropes which causes unexpected damages. Sometimes even death due to fall of objects.	Personal protective equipment's like helmets, safety harness, safety shoes for the workers are provided. Walkie-Talkies and other wireless communication equipment's are provided for proper communication. First aid kit for workers in the site is well equipped and is in adequate number. Ambulance and fire engines are always ready for any emergency cases.	Only Skilled Labours should be allowed to work in High- Risk areas. Ropes that are in proper condition with proper working load must be used. Make sure that Supervisors are mandatorily present to inspect and to make sure that all the safety measures and policies are followed. Safety Sign boards indicating the work in the sites and its nearby areas should be encouraged.	5 days 10 days 5 days 3 days	Construction manager Construction manager Construction manager Site engineer

Fig. 1.

5. Observation and Results

Various risks were found out after the observation and analysis done in the Pre-Fabrication industries. With the data collected, the risk factor is calculated by the RF formula. The results are collected in table format and the necessary measures are followed to overcome the same.

Following are the observed results:

A. Calculation-1

Likelihood (L) = 3 (occurs most of the time in a day)
Severity (S) = 4 (Severe injury or even fatality)
Risk Factor (RF) = L (X) S
RF = 3 X 4 = 12
Therefore, Risk Factor (RF) = 12

When referred with the Risk Matrix (Fig. 1), the calculated value of Risk Factor is 12, which is an extreme condition.

Immediate and suitable actions must be taken to reduce risk levels.

6. Future Works and Benefits

- The prefabricated structures used for construction has its own risks and the way to solve the same.
- Considering all the facts, we are in the need to implement frequent on –site visits to the industries where these structures.
- Eg.: Prefabricated walls, windows, pillars etc…are being manufactured.
- These site visits will be documented as reports based on the risk assessment and the way to overcome them.
- The report will be submitted for evaluation and as a reference after the inspection is done.

7. Conclusion

- Prefabrication is more efficient than conventional on-site construction since manufacturing through a production line is more controlled.
- Some of the benefits of utilizing prefabricated buildings are faster on-site construction, reduced effects of uncontrolled factors, higher quality and consistency, cost efficiency, reusability, less raw material wastage, and reduced safety hazards.
- Prefabricated buildings can be classified according to the degree of construction. The different types of constructions are component, panel, module, hybrid, and complete buildings.
- It is possible to identify a number of issues that need to be resolved before prefabrication may become a standard by looking at the positive and negative aspects of the current prefabrication industry. For prefabricated manufacturing, higher production volumes can be utilized to offset the initial expenditures.
- Finally, it would be necessary to coordinate and execute safety standards and monitor on a worldwide basis.
- Prefabrication is a booming industry, but it still has some major hurdles to overcome. There are only a few alternatives to getting around them, according to the research that comes after. However, it can be found that these challenges are

surmountable with enough effort. Future prefabrication problems will be addressed by a great number of new technology developments.

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