Risk Analysis in Precast Industry

[1]Ankita Surve, Student, MIT World Peace University, Pune, surveankita12@gmail.com

[2]Prof. Arjita Biswas, Assistant Professor, Department of Civil Engineering, MIT World Peace University, Pune, arjita.biswas@mitpune.edu.in

Abstract **India is growing fast with the rapid growth in infrastructure, smart city projects and other commercial and housing projects to satisfy the population. This all things cannot be managed by old time consuming conventional construction methods. The conventional construction is too lengthy and risky for man and money. It also hinders the quality and cost of project. The new developing era of construction is finding the fastest and smartest solutions for everything. Precast construction is one of the solutions. The precast industry gives fast, accurate and quality construction. Precast also gives safe and healthy environment. People choose precast because it is risk free. But people are not aware that this smart solution also has some risk involved. This paper focuses on the risk involved in precast construction, its level and impact. The some basic mitigation is also given in this paper. The paper also gives the process of precast industry. The paper also discusses risk analysis process.**

Keywords: Risk, Precast Construction, time, cost, effect, mitigation

I. INTRODUCTION

The precast element-by-element construction method is a massive team work output. Various departments such as design, production, quality, transportation, erection and all interconnected by planning and coordinating department are involved in completion of a precast project.

The process of Precast Construction:

1. Design
2. Planning
3. Production
4. Quality
5. Transportation
6. Erection

All these activities are associated with n number of risks which affect the project cost and time sometimes leading to termination of project before completion. this risks mainly arise due to inefficiency of machinery, human negligence, constitutional amendments, weather and climatic change, natural calamities, poor management etc.

Risk is a probability or threat of quantifiable damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through pre-emptive action. Risk analysis is the process of identifying and analyzing potential issues that could negatively impact key business initiatives or critical projects in order to help organizations avoid or mitigate those risks.

There are some steps of risk analysis.

DETERMINE GOAL
IDENTIFY RISK
PRIORATISE RISK
IDENTIFY CONTROL MEASURES

II. LITERATURE REVIEW

1. P. Karthigai Priya Author has studied the current situation of construction in India. Most of the construction activities in India take place by conventional cast in situ method of construction. But still there is a huge demand for housing in India. So the construction activity has to take place in a much faster way. This cannot be achieved by conventional method of construction. It can be done possible with precast concrete of construction. Moreover there are more advantages of precast concrete when compared with conventional one. So various are studied and a review of those all has been given in this paper. Also the advantages and disadvantages of precast construction are also discussed here.

2. Goran Cirovic, The author studied the risks in construction industry. Construction industry is a highly risky process mostly because of its long life duration and unique product as a result of construction, and also many different professions are involved in one project. Generally, risks in construction industry should be controlled and reduced during design, procurement and construction phase, and the most important activities are define risk management plan from the very beginning and to assign risks to different project members and to manage their execution. In this paper risks on a project in initial phase will be presented, cost and duration risks and complete contingency for the previously defined budget will be

 DOI : 10.35291/2454-9150.2019.0146

described. Statistical data for one project in design phase will be analyzed and general comments and recommendations will be proposed. Also, general method for calculating risks will be presented.

III. PROBLEM STATEMENT

Increasing precast sector giving smart alternatives or conventional methods and reducing the risk involved. But still is there any risk in Precast Industry? If yes, then at which level and how?

IV. FINDINGS

1. Different types of Risks

1) Technological Risk

i. Break down of machinery

This is very common and usually happens. Mainly these are human errors. The machinery using for production, shifting, erection are always at high risk if not maintained properly. The sudden breakdown of machine can harm persons or Breaks elements. This can results in delay of project. Sometimes it stops the work for days or a week.

ii. Loop holes in design and drawing

A structure engineer and designer are mostly responsible for such type of risks. If the design is improper are not able to take load or sometimes fails while lifting. Sometimes detailer forget to record dimensions or record wrong dimensions, creates problems in patent connection while erection.

iii. Production problems

Production is a heart of precast. This includes mold preparation, reinforcement, and casting, remolding, curing, and shifting. If any one of it is not done properly can make huge problems for element. It can create quality issue. Clients can reject such elements or company has to repair it or sometimes recast the same. Recasting anything wastes money, time and manpower.

Iv. Quality Compromise in material

Sometimes the quality of raw material is not as per standard. The steel or concrete material also doesn't match the requirements. In such case, clients reject the material or if it used then creates problems in quality of overall element.

v. Software Errors

The company requires its own software for such planning and communication. If there is any error occurs, it paralyzes the whole system of company.

2) Transportation Risk

i. Delay in arrival of vehicle

The precast industry is based on transportation. 80%work in done in plant and only 20% work is cast in situ. If the driver takes time, or there is any problem on road, causes delay for installation. Such delay increases the time of journey and ends with increase in money.

ii. Accidents

The accidents while shifting the elements from plant to site is one of the major risks involved in this sector. Mostly the trailers are allowed on road at night only. In case any accident occurs it creates the problem on road because the elements are too heavy to manage as they require special cranes. The accidents also damage the element which company has to repair or recast. These raise the cost of project and also delay it by some time.

iii. Damage to element due to rash driving or other reason.

This is very minor level risk. If the road is in very poor condition, or driver drives roughly damages the element.

iv. Penalty by RTO

The Indian RTO has given some rules and standards regarding to size, height and shape of the material on heavy moving vehicles. There are some special regulations for crossing the boundary of state. The companies are supposed to follow the rules. If there is any illegal shipment, RTO will file a complaint or company has to pay fine.

3) Risks associated with human:

i. Accidents causing injuries to any human being

This thing mostly happens in phase of erection. Worker's carelessness or crane operator's mistake causes such type of problems usually. Effect of this depends on the level of injury.

ii. Accidents causing death of any human being

This is serious problem occurring on site or plant. It stops work for almost 2 to 3 days. Even there is problem for reputation of company.

iii. Extreme weather conditions

Indian weather is very extreme in all weathers. Continuous work in such extreme condition creates illness or health problems for workers.

4) Economical Risk

i. Increase in material price

Due sudden hike in cost of any material required, creates rise in overall budget of project. If a project is lump sum type, then company has to suffer a huge loss.

ii. Poor overhead allocation

The company has to manage different things along with production. The finance officer has to be very responsible about such things. Overhead includes office expenses, salary etc.

iii. Change in tax policy

The tax policy changes as per Govt regulations. Ex. All taxes get converted into GST last year.

5) Legal Risk

i. Change in law

 DOI : 10.35291/2454-9150.2019.0146

The business contracts, tenders are bound to be as per Law of India. The aspects and things includes in contract must be legal. If there is any change, the company has to adopt the new regulations.

ii. Land disputes

If the company has its own land doesn't have to face this problem. If land is on lease then company has to pay bulky rent. If any disputes occurs between land owner and leaser can create huge problem. Company has to either accept the owner's demand or shift the entire plant.

iii. Contract misinterpretation

As discussed above, all activities of project are bound by law. While submitting tender, company quote for something, but changes afterword or replace without permission, the party or client may take this on legal ground.

iv. Resistance from neighborhoods

This is very common problem. The political pressure increases such thing with help of local people. Sometimes the local people don't allow starting factory in their area as it may harmful for their health. The company has to give job opportunity to locals.

v. War like situation

This is national level problem and affects each and every part of India. This is unavoidable.

2. Risk Analysis

1) Technological Risk

Sr. No	Risk	Responsible Person	Cost	Time
1	Loop Holes in Design & Drawing	Design Engineer	50k- 3 lacs	10 days
2	Production Problems	Production & RMC Engineer	2- 5 lac	7 days
3	Breakdown of machinery	Foreman or Crane supervisor	20 k to 3 lac	3 to 15 days
4	Software Error	Software company		1 day
5	Quality Issue	Planning Assistant	10k- 5 lac	2 - 15 days

2) Risks associated with human:

Sr. No	Risk	Responsible Person	Cost	Time
1	Injury to anyone working	Safety Engineer	0-10 k	not much
2	Accident causing death	safety Engineer	2 lac	1 day
3	Extreme weather condition			1-2 day

2) Transportation Risk

Sr. No	Risk	Responsible Person	Cost	Time
1	Accident	Driver	50 k-10 lacs	7 to 20 days
2	Damage while shifting	Driver	0- 10 k	max.2 days
3	Penalties by Rto	Loading Dept. and Trailer Head	0-10 k	
4	Delay in arrival of vehicle	External environment		1 day

4) Economical Risk

Sr. No	Risk	Responsible Person	Cost	Time
1	Increase in material price	Govt. or external affairs	1- 2 lac	
2	Change in tax policy	Govt. or external affairs	50k- 2 lac	2 days
3	Poor Overhead Allocation	Billing Head	1- 2 lac	

5) Legal Risk

Sr. No	Risk	Responsible Person	Cost	Time
1	Increase in material price	Govt. or external affairs	1- 2 lac	
2	Change in tax policy	Govt. or external affairs	50k- 2 lac	2 days
3	Poor Overhead Allocation	Billing Head	1- 2 lac	

3. Mitigation

1. There is a "Contractors All Risks Insurance" in market for construction project. It covers 95% of total project cost and remaining 5% is considered as depreciation. It covers the project from design stage till its handover.
2. The precast sector has transportation risks. For transport the company has "Marine Insurance". This insurance covers every shipment of element from factory to site.
3. There is one more insurance which is especially for erection stage which is call as "Erection All Risks".

 DOI : 10.35291/2454-9150.2019.0146

V. CONCLUSION

The study shows that the precast sector is also having so many internal risks. Even the company has to face so many external matters. There must be good organizational structure to avoid such primary level problems. The weekly safety induction or such type of movement can reduce the human risks. The quality parameter will also help company from business risks. Over all, some small potential at every stage can reduce these risks.

REFERENCES

[1] Zhan Zhang, Kai Li, and Lei Zhang (2016)

[2] Vaishali Turai1 & Ashish Waghmare (2016) "A Study of Cost Comparison of Precast Concrete Vs Cast-In-Place Concrete" in International Journal of Advanced Engineering Research and Applications (IJA-ERA)

[3] VPS Nihar Nanyam, Riddha Basu, Anil Sawhney, Harsh Vikram , Gourav Lodha (2017) "Implementation of Precast Technology in IndiaÙ Opportunities and Challenges" in Creative Construction Conference 2017, CCC 2017, 19-22 June 2017, Primosten, Croatia

[4] Prof. Vjeran Mlinarić, Zvonko Sigmund "PROBLEMS IN LARGE SCALE PRECAST CONSTRUCTION PROJECT" (2017) 5. Sayali A. More1, Aishwarya V. Patil (2017) "Time, Cost , Productivity and Quality Analysis of Precast Buildings" in International Research Journal of Engineering and Technology (IRJET)

[5] P. Karthigai Priya1, M. Neamitha (2018) "A REVIEW ON PRECAST CONCRETE" in International Research Journal of Engineering and Technology (IRJET)

[6] Goran Cirovic, Simo Sudjic "RISK ASSESSMENT IN CONSTRUCTION INDUSTRY"

 DOI : 10.35291/2454-9150.2019.0146