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Study on Different Types of Risk Involved With Respect to Seismic Zone III for Construction Project in India

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Abstract: ***The construction projects are one of the most important one which plays a vital role in development of the country. It is estimated that the High-rise buildings are the most important part of the construction for the greater development. The major part of the construction leads to high-rise buildings. Hence the risk involved in this part also rates higher in the construction industry. Risks in construction projects are considered one of the most common problems causing a multitude of negative effects on the construction projects. Construction risks can be minimized only when their cause are identified. The objective of this study was to study the risk assessment in the construction of high rise buildings in Lucknow which situated in seismic zone III. This study was carried out based on literature review and questionnaire survey high-rise buildings in Lucknow. The data for this study will be gathering through a detailed questionnaire survey. The questionnaire consists of two sections and first section consists of general questions, the second section carries the list of major risks and their seismic risks. The two sections consist of thirty five risk factors. The questionnaire form is forwarded to various construction industries through email and in personal. The objectives of the study were successfully achieved. Totally for ten companies the questionnaires were given, out of which three had an effective reply thus the response rate is 70% which is considered a good response in this type of survey. This research seeks to identify and assess the risks in high-rise buildings and improve the risks that occur during the construction of high-rise building.***

Keywords: Construction, Risk assessment, Types of risk, mean.

I. INTRODUCTION

The construction industry is the second largest industry of the country after agriculture. It makes a significant contribution to the national economy and provides employment to large number of people. The use of various new technologies and deployment of project management strategies has made it possible to undertake projects of mega scale. In its path of advancement, the industry has to overcome a number of challenges and risks. However, the industry is still faced with some major challenges, including housing, disaster resistant, water management and mass transportation. Recent experiences of several new mega-projects are clear indicators that the industry is poised for a bright future. Risk management is the art and science of anticipating and planning for future uncertain events. It is concerned with identifying and analyzing a range of possible outcomes, then control and mitigate their negative impacts. The objective is to understand, and control risks. Construction projects are always unique and risks raises from a number of different sources. Risk is defined as any action or occurrence which will affect the achievement of project objectives .Risk management is a technique which is used in many other industries from, IT related to business, automobile, pharmaceutical industry, to the construction sector. Risks and uncertainties inherent in the construction industry are more than any other industries. Many industries have become more proactive about using risk management techniques in project. However, with respect to the construction industry, the same is not used commonly. Risk is an integral component of any project. Risk is present in all projects irrespective of their size or sector. No project is totally free from risks. If risks are not properly analyzed and strategies are not trained to deal with them, the project is likely to lead to failures. In practice, these new rates would often be valued after the work was executed based on the actual costs. Clearly, under this approach the employer carried the major risks of the change. Many new conditions of contract, for both building and civil engineering works, have now introduced a new methodology for valuing variations requiring the contractor to submit a quotation for the work before the instruction to proceed is given. This approach shifts the risk to the contractor who has to include in the quotation for all forecasted costs including delay, disruption and risk. Variations are inevitable on building and civil engineering projects and may range from small changes having little consequential effects to major revisions, which result in considerable delay (or) disruption to the project. There are a number of reasons for the introduction of changes on construction works including:

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A. Inconsistent and late instructions from the client
B. Incomplete design
C. Lack of meticulous planning at the design stage
D. Inadequate briefing from the client
E. Lack of co-ordination of specialist design work
F. Late clarification of complex details

Additionally on civil engineering works there are many cases where changes and new rates are necessary because of the nature of the ground. Furthermore changes may occur due to the client's desire to incorporate the latest technology into the project which will led to deviations of time and cost of the project which indicate the risk in the project.

II. RISK

Risk is defined as an exposure to the consequences of uncertainty. Risk is usually considered as an unwanted event that can be identified and quantified through its impact and probability of occurrence. The classical definition of risk states that
Risk = Probability x Impact

A. A probability of occurrence of that event.
B. Impact of the event occurring.

Traditional methods of coping with project risks and uncertainties mainly consist of establishing a contingency budget which is estimated as a percentage of the various project components. This method of calculating contingencies for risk has a low level of confidence and reliability. Probabilistic risk assessment techniques can provide an analytical basis for establishing contingency budgets by modeling the impact of risk factors using data ranges. The goal of risk assessment and risk management is to minimize cost overruns and scheduling problems. It has been shown that cost overruns are positively related to project size, engineering uncertainty, inflation, project scope increase, the length of time between planning and completion of a project, delays, and the inexperience of administrative personnel. Many systems exist for categorizing risks into different categories but the one presented here is fairly simple. In this system each risk item is qualified on two scales likelihood and impact. Each scale is divided into two categories of "low" (or) "high" and risks are rated according to each scale. Risks and other uncertainties can cause losses, which lead to increased costs and time delays, during the currency of projects and at their end. The need to prevent failures in the construction process and other losses relating to projects has been highlighted many times over the years and figures strongly in a recent major report.

C. Risk Management In High-Rise Buildings

Risk management is the art and science of anticipating and planning for future uncertain events. It is concerned with identifying and analyzing a range of possible outcomes, then control and mitigate their negative impacts. The objective is to understand, and control risks. Understanding the risks inherent with each potential project alternative is important to controlling cost and developing estimates that reflect the cost of accepted risks. To assist project management in understanding and controlling contingency as the project progresses through its development which is a dynamic and continuous process throughout project development. Construction professionals need to know how to balance the contingencies of risk with their specific contractual, financial, operational and organizational requirements. In order to achieve this balance, proper risk identification and risk analysis is required. Many construction professionals look at risks individually and do not realize the potential impact that other associated risks may have on their business operations. Using a holistic risk management approach will enable a firm to identify all of the organization's business risks. This will increase the probability of risk mitigation with the ultimate goal of total risk elimination. Since project risk management is the culture, processes and structures adopted by an organization directed towards the effective management of risk in projects. The goal of risk management is to ensure informed decisions are made at the right time and that there is visibility of sources of uncertainty that may impact on the success of a project. They reduce negative impacts and maximize opportunities and positive outcomes in the interests of projects and stakeholders. It is a systematic approach that allows risks to be embraced, avoided, and reduced through a logical, comprehensive and documented strategy. Serves as a kind of tools and techniques, that will help the project manager maximize the probability and results of positive events and minimize the probability and consequences of adverse events as indicated and appropriate within the context of risk to the overall project objectives of cost, time, scope and quality. Risk

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management should be at the earliest stages of project development, it will be helpful in developing an understanding of project uncertainty and in developing an appropriate project contingency. As the project progresses, the monitoring and control processes assist in managing cost escalation resulting from scope growth or the realization of uncertain event.

III. OBJECTIVE OF STUDY

A. The Objectives of The Study Are As Follows

1) Identifying key risk factors that could stand in front of construction processes by
2) Reviewing the literature and through the additions that could be made by the industry practitioners
3) To study the risk assessment in construction of high-rise buildings.

IV. RISKS IDENTIFIED

Based on the past experience (implant training) ,expert opinion (literature review) and consulting the experts, risk identification techniques the risk factors identified are as follows

A. Technical Risks
B. Construction Risks
C. Financial risk
D. Socio-political risk
E. Environmental risk
F. Management risks

V. RISK IDENTIFICATION TECHNIQUES

The general methodology of this study relies largely on the survey questionnaire which will be collected from the local building contractors of different sizes by mail or by personnel meeting. A thorough literature review was initially conducted to identify the risk factors that affect the construction of high-rise buildings. Also some interviews with industrial practitioners were conducted to produce to check effectiveness of questionnaires.

Risk Identification can be done by the following methods:

A. Brain storming

This is one of the most popular techniques. Generally, it is used for idea generation; it is also very useful for risk identification. All relevant persons associated with project gather at one place. There is one facilitator who is briefing about various aspects with the participants and then after note down the factors. Before closing it the facilitator review the factors eliminate the unnecessary ones.

B. Delphi Technique

This technique is similar to brainstorming but the participants in this do not know each other and they are not at the same place. They will identify the factors without consulting other participants. The facilitator like in brain storming sums up the identified factors.

C. Interview /Expert Opinion

Experts or personnel with sufficient experience in a project can be a great help in avoiding/solving similar problems over and over again. All the participants or the relevant persons in the project can be interviewed for the identification of factors affecting risk.

D. Past Experience

Past experience from the same kind of project, the analogy can be formed for identification of the factors. When comparing the characteristics of projects will provide insight about the common factors.

E. Check Lists

these are simple but very useful predetermined lists of factors that are possible for the project. the check list which contains a list of the risks identified in projects undertaken in the past and the responses to those risks provides a head start in risk identification.

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VI. METHODOLOGY

The general methodology of this study relies largely on the survey questionnaire which will be collected from the local building contractors of different sizes by mail or by personnel meeting . A thorough literature review was initially conducted to identify the risk factors that affect the performance of construction industry as a whole. This study has adopted the more general and broad definition of risk as presented by Shen et al (2001) on China's construction joint ventures and more risk factors from other literature. Also some interviews with industrial practitioners were conducted to produce to check effectiveness of questionnaires. After receiving the responses a model is used to evaluate the risk. The final step is to create a module for risk assessment.

VII. QUESTIONNAIRE SURVEY

Questionnaire is a set of printed or online questions with a choice of answers, devised for the purposes of a survey or statistical study. The questionnaire was tested with a pilot survey for clarity, ease of use, and value of the information that could be gathered. The questionnaire survey is divided into two parts. The first part consists of general information like name of the respondent, type of company, experience, designation value of their project and the second part consists of the construction risk factors for evaluation of the risk assessment.38 risk factors are given based upon the pilot study. The questionnaire was prepared for the pilot survey was formulated by seeing the relevant literatures in the area of construction risk. The interviewer was free to ask additional questions that focused on issues arising during the course of the interview. A Likert scale of 1-5 was used in the questionnaire. A Likert scale is a type of psychometric response scale often used in questionnaires, and is the most widely used scale in survey research.

VIII. FACTORS INFLUENCING RISK

A. Construction Risk

1) Disputes between labors
2) Changing sequences in construction activity
3) Non availability of resources
4) Revision of design
5) Availability of camp for labors
6) Change in quantities of work
7) In Time work permissions for executing work
8) Safety of workers
9) Stoppage of work due to Medical outbreak

B. Design Risk

1) Late changes of design from client side
2) Will the level of details of design delivered by the owner affect over all construction time?
3) Improper specifications
4) Inadequate and incomplete design

C. Environmental Risk

1) Impact of weather condition on completion of project
2) Pollution by construction waste
3) Procedure to facilitate construction waste cleanup or disposal

D. Financial Risk

1) Delay from clients
2) Increment for staff benefits
3) Unprecedented price in raw materials
4) Fluctuations in Estimated finance than expected

E. Management Risk

1) Documents and process directed as per agreement for mitigation of risk
2) Project team discussions on risk

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3) Use of WBS and project milestones to help identify project risks
4) Time for planning
5) Loosing of critical staff at crucial point of construction
6) Documented process for identifying project risks

F. Political Risk
1) Pressure from any political party
2) Local bodies (political/rowdies) compelling to use their resources
3) Union Issue

G. Procurement Risk
1) Temporary demand of increase in price of materials
2) Specialized labor for fixation/Installation
3) Is there a chance of procurement team to know the sales chart of client?

H. Sub-Contractors Risk
1) Chances of sub-contractor walk out
2) Delay in work execution of sub-contracto
3) Revision of price

I. Technology Risk
1) Knowledge on equipment's
2) Service for damaged equipment's
3) Loss of data or software/hardware of computer

IX.RESULTS AND DISCUSSIONS

The table 1 below has the consolidated factors of risk 20 out of 38 has been shortlisted due to its occurrence. Most of the risk comes under management problems and construction

Table 1: finalized risk rating after survey

FACTORS	Min	Max	Mean
Project team discussions on risk	2	5	3.88
Revision of price	2	5	3.81
Time for planning	2	5	3.42
Disputes between labors	2	5	3.26
Safety of workers	1.00	5	3.88
Use of WBS and project milestones to help identify project risks	1.00	5	3.86
Knowledge on Equipments.	1.00	5	3.86
Service for damaged equipments.	2.00	5	3.30
Specialized labor for fixation/Installation	1.00	5	3.44
Impact of weather condition on completion of project.	1.00	5	3.40
In Time work permissions for executing work	1.00	5	3.14
Unprecedented price in raw materials	1.00	5	3.14
Availability of camp for labors	1.00	5	3.12
Fluctuations in Estimated finance than expected	2.00	5	3.26
Loss of data or software/hardware of computer.	1.00	5	3.09
Temporary demand of increase in price of materials	1.00	5	3.05
Delay from clients	1.00	5	3.05
Non Availability of Resources	1.00	5	2.88
Will the level of details of design delivered by the owner affect over all construction time?	1.00	5	2.88
Pressure from any political party	1.00	5	2.77

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X. CONCLUSION

The construction companies need to include risk as an integral part of their project management. Decision making such as risk assessment in construction projects is very important in the construction management. The identification and assessment of project risk are the critical procedures for projecting success. This study determines the key factors of risk in construction industry. A total of 38 factors influencing risks in construction are analyzed through pilot survey which include experts of academic (Professors), governmental sectors and construction industry were interviewed, and 20 evaluation criteria were obtained as the key factor by interviewed experts. This approach provides a more effective, accurate and organized decision support tool.

As far as the engineers concerned Lack of knowledge of arbitration has the maximum risk rating and other risks are material shortage, shortage in supply of electricity, poor quality of procured materials, loss due to fluctuation of interest rate, accident in site sub-contractor related problems, error in drawings, improper verification of contract documents, and competition from other companies. The least risk rating given by project engineer is environmental risk, relation with government departments, local protectionism and industrial disputes.

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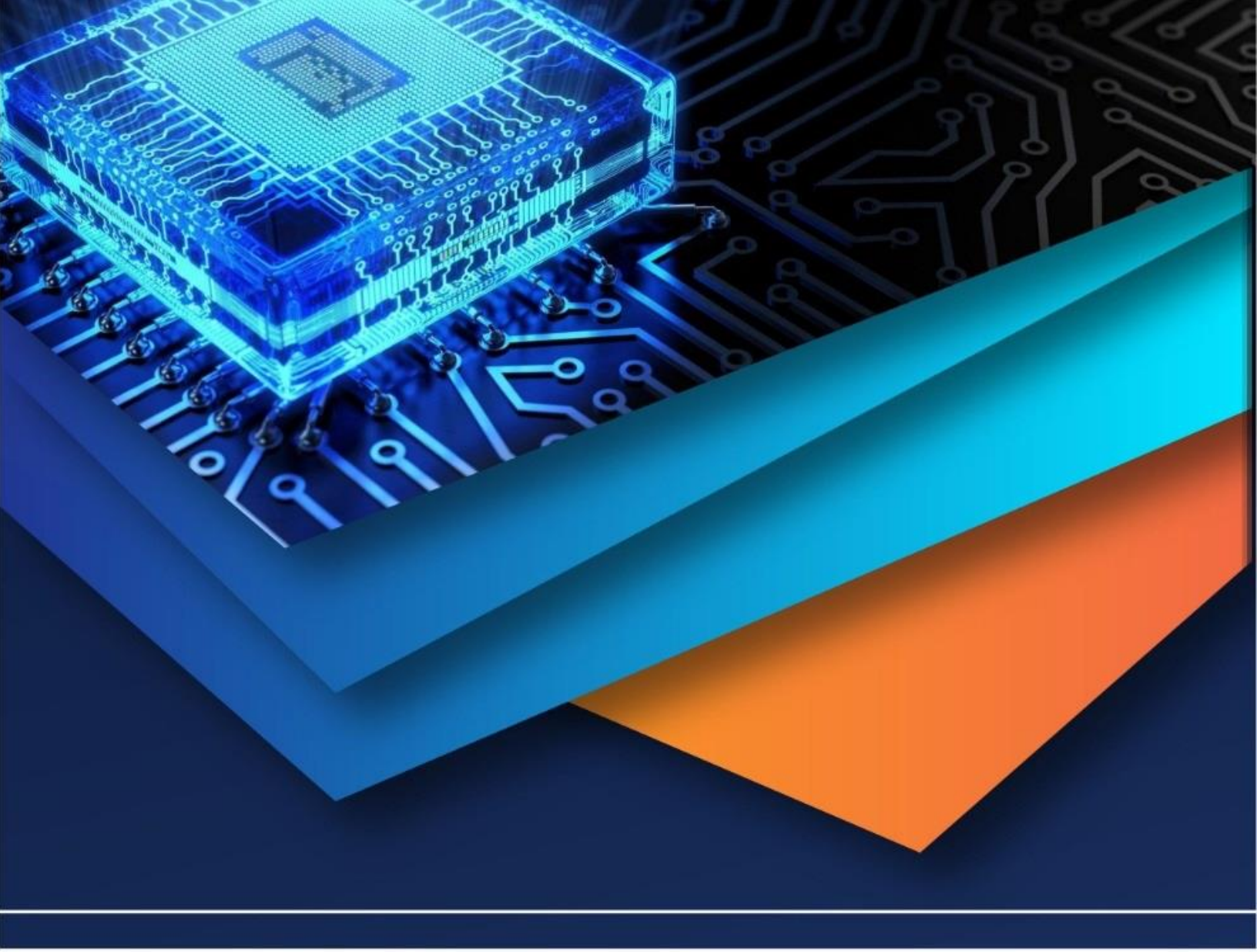

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