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An Analysis Of Causes and Effects Of Change Orders On Construction Projects In Pune

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Abstract— - In the last decade there has been extent amount work in construction industry. Due to this large scale of development going on across the country. Large construction projects are facing problem of delays and extra costs. In all types of construction projects cost and time is an important role. The changes at every stage or on regularly basis on construction project disturb the schedule of project as well as extra work has to be done. The purpose of this paper to focus on various change order and cause, effects and control measures for construction projects in Pune. The study limited for the Pune city .For this goal we prepare questionnaire from the previous literature and research. The questions based on the client, contractors, consultants and other factors causing change orders. This questionnaire survey done manually from the construction projects in Pune.The respondent are engineering professionals having minimum 5 years of experience in construction industry for handling projects.
The purpose of this paper to know cause, effects and control measures for change orders in construction projects in Pune. From the data collected by the questionnaire survey we first take Cronbach's Alpha test for internal consistency test by using SPSS statistics software. After analyzing and find out conclusion we used relative importance index method.

Keywords:- Change Management, Construction Project, Cronbach's Alpha, Causes, Change Order, Effects, Relative Importance Index.

. introduction

Construction projects are long process having more complicated small tasks involved in it.For completion of large construction projects we have to complete small construction tasks in regular manner. For that lot of efforts are taken. But sometimes quite unfortunate conditions cause the flow of construction activity. The change order are one of them unfortunate reason to disturb the flow of construction process simultaneously delay the construction project. The management of these changes is skill; in what manner we manage that change without affecting our goal. Managing change is the greatest importance to the success of construction project.

The Change Orders are significant effects on the construction projects performance. The quality of the work decreases, workmanship decreases. The change orders created when change occur from any reason it may owner, contractor, etc. A change is the work for addition or rework. Many of the time change causing the demolition and rework. These causes decrease the labour productivity. Change orders are easy to manage at the initial phases of construction which reduce the rework and extra effects for particular stage. The rework due to change order causes the dispute among owners and contractor and owner has to pay extra money for extra work. Change orders have many causes they are changes project to project as per scope of the projects, location.
So the change orders are from any reason they collective effect on construction project which resulted in delay or cost overheads.

II. RESEARCH REVIWES:

Change order usually issued to cover variation in scope of project, design mistakes, material quantities, and shortages.
Researches Reviews:

Ali S. Alnuaimi, Ramzi A. Taha, Mohammed Al Mohsin, Ali S. Al-Harthi.(2010)

The research done by these authors in Oman for causes, effects and remedies on public construction projects. That study found that Client additional work and modification to design change is the most important cause for change order. Beside of that nonavaibility of construction manual and reference of similar projects in that area is on of the cause. The study found measure effect on time schedule, disputes and costoveruns. Contractor was found the most benefited among all this. The remedies suggest to prefer standard manual at the design stage.

Patrick Keane, Begum Sertyesilisik, Andrew David Ross(2010)

A variation is any type of deviation from an agreed upon, well defined scope or schedule of works. A change order is the formal document that is used to modify the agreed contractual agreement
and becomes part of the projects documents.
The conclusion of these authors study shows that conflicts between contract documents, lack of involvement in design stage, always differ the project objectives is one of the strong reason causing change orders. The change orders minimized using good communication during contract preparation, good project execution planning of upcoming activities. The maintain good relationship among all parties. The

owner should take all the advantages of consultancy appointed to the projects.

Murali Sambasivan, Yau Wen Soon (2006)

The main approach towards specific area to clear for issuing change orders. The study only for change orders which will cause the delay or time overrun. They found the main reasons are contractor improper planning, poor site management, shortage of advanced construction material, skilled labour shortages, effect of this dispute, arbitrations, The method used for this is same relative importance index method.

The importance index, weighted average are used to rank causes and effects.

Importance index = Weighted Average × 100⁄4

Weighted Average=(ΣWi × Xi) /N

Where Wi is option of cause,Xi is no. of respondent selected that cause and N is total no.of respondent.

III. OBJECTIVES:

1. The detailed review on the literature related to Change Order data.
2. To collects and know causes of construction change orders in construction projects in Pune.
3. To know effects of change orders on construction Projects in Pune.
4. To identify control measure for change orders in Construction projects in Pune.
5. Provide the solution and recommendation to minimize the adverse effect of change orders on construction projects in Pune.

IV. METHODOLOGY:

a. At the very first stage defining problem statement and fix the objectives by reviewing previous literature.
b. By studying the previous literature which will helps to prepare questionnaire related to causes and effects of change orders in construction projects.
c. At the same time discussion with actual field persons also helpful for preparation of questionnaire .with this Questionnaire carried out survey for data collection.
d. Also data collected from actual site case studies. Finding out importance index. And main causes and effects of change orders.

V. DATA COLLECTION AND ANALYSIS:

From the previous literature review prepare the questionnaire for the survey from the construction projects in Pune. The respondent are engineering professional with having minimum five years of experience in the construction industry. The causes are divided into four section client based, contractor based, consultants based and other related causes. Effect and control sheet are prepared from the various literature papers After survey data first analyze for consistency test by finding Cronbach'alpha by using SPSS statistics software. A commonly accepted rule of thumb for describing internal consistency is as follow.

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

After that by using Relative Importance Index rank the causes, effects controls for the data collected by questionnaire survey.

Sr.No	CAUSES OF CHANGE ORDER	RII	RANK
	A) Causes due to Owner		
1	Owner instructs additional works & modification to design.	78.43	1

2	Owner fails to make decisions or review document at the right time.	61.57	14
3	Unilateral decisions made by owner without proper considerations to contract.	65.10	6
4	Owner's needs during the design stage are unclear or not well-defined.	64.31	7
5	Owner's change of schedule due to financial problem.	63.92	8
6	Obstinate nature of owner.	52.16	28
7	Owner fails to maintain hold on the project schedule.	60.39	18
	B) Causes due to contractor		
1	The contractor misuses variations Instructions.	63.14	9
2	The scope of work for the contractor is not well defined.	52.16	27
3	The required equipment and skilled labour are not available.	60.39	17
4	Poor project management and planning by contractor.	65.49	5
5	Lack of contractor's involvement in design.	74.51	2
6	Contractor's lack of judgment and experience.	58.43	19
7	Contractor's desired profitability, cost escalation & financial problem.	61.96	12
	C) Causes due to Consultants		
1	Unrealistic design periods & Design errors.	67.45	3
2	Failure by consultant to perform design and supervision effectively.	54.12	26
3	Consultant's lack of judgment and experience.	54.51	25
4	Obstinate nature of consultant.	54.90	24
5	Failure by the consultant to provide adequate and clear information.	61.18	16
6	The lack of coordination between consultant and contractor or subcontractors.	66.27	4
7	Consultant fails to supervise drawing prepared by their junior team.	58.04	20
	D) Other Causes		
1	Delay in decision making process by site engineers.	62.75	11
2	Problems on Site, Unfamiliarity with local conditions and safety consideration.	57.25	21
3	Non availability of construction manual and procedure for project construction in Pune.	61.57	15
4	Non availability of records of similar project in Pune	54.12	23
5	Replacement of materials or procedures.	62.75	10
6	Demolition and re-work ,Quality improvement.	61.96	13
7	Unforeseen problems and weather conditions.	56.86	22

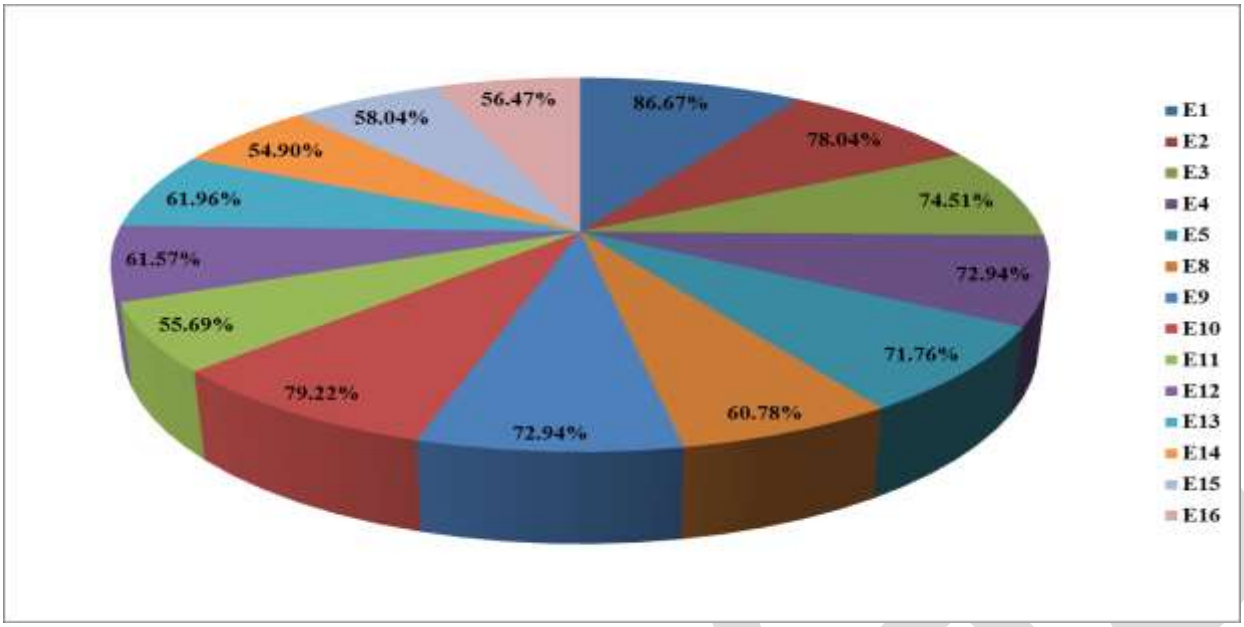
Table No.1

The actual result collected from data shown in above table no.1. The data surveyed from construction sites in Pune from Engineering Professionals with having minimum five years' experience in construction industry. The data analysis done by using Relative Importance Index method.

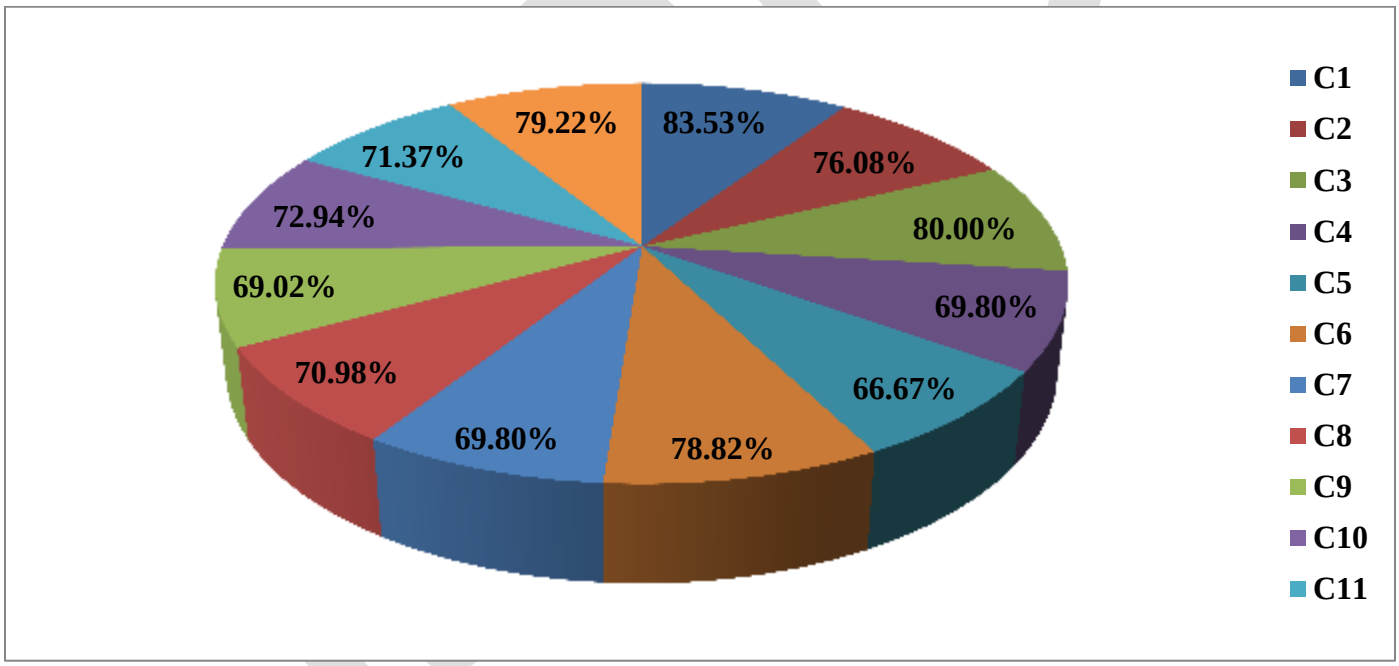
$$RII = \frac{\sum W}{A \times N}$$

where w = weighting given to each factor by the respondents and ranges from 1 to 5 where '1' is 'not significant' and '5' is 'extremely significant', A = highest weight (i.e. 5 in this case), and N = total number of respondent.

The below pie chart shows the relative importance index in percentage for ranking of effects of change order.



The below pie chart shows the relative importance index in percentage for ranking of control measures of change order.



VI.CONCLUSION:-

1.As per survey carried out get many types of answers and responses from the construction sites .The main causes of change orders in construction projects in Pune is owner changes, additional work and modification to prior work. The second main reason is lack of contractor involvement in design stage. It may leads to lack of understanding design at the time of actual construction. The other causes are unrealistic design periods, the lack of communication between contractor and the consultants.

2. The effects are the most important change orders increases the cost of the projects. Likely increase the duration of individual activates that effects on completion schedule of the projects in Pune.Paying extra money for the contractor is the mostly effects caused on many construction sites..

3. The control measure is change is negotiated by the knowledgeable person whether the solution on it or we have to do extra work demolition. The mostly control by the freezing design at certain stage of construction projects. The use of planning technique work breakdown structures, preparation of weekly reports, monthly reports. To hold on project or track the project.

4.At the time of survey one new cause found that the changes need by the customer change as per their requiremnts.This cause lot of extra work but same changes provided at the starting avoid the extra work.

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