

# Optimum Cost Analysis For Selecting Best Suited Flexible Pavement Road Type For Reducing Direct Construction Cost Of Road Project

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**Abstract -** The goal of this study is to determine which of the five flexible road types listed in IRC 37-2012 will result in the lowest construction costs for a range of CBRs from 2% to 15% and a range of traffic volume circumstances in msa. Based on the district schedule rates the roads specifications, standards and the proportions of the cost of the materials, equipment and direct construction (MORTH Specifications). In order to choose the least expensive road crust type at a specific location of a particular CBR, a correlation between the cost, road forms, CBRs, and traffic volumes is computed.

**Key Words:** Direct Construction Cost, Road Types, Traffic, CBRs, and Proportions of Construction Cost.

## 1. INTRODUCTION

For development of any specific region, we must unravel one thing or we should know about primary communication conveniences of that region. Besides is it in good condition or not? How can we communicate existing amenities with their proper suitability? Else someone can insinuate also. This is integral part of development of any region that's why road construction plays first rated role. There are a lots of road projects who has been facing various setbacks throughout their entire project life but yet it posses 3.64% of total GDP of India. In fact one main challenge is to realize cost difference which is frequently in increased manner due to time taking process of planning and during construction phase. Road construction costs vary on average by 16.73%, according to observations. Several studies have found that 9 out of 10 construction projects ran over budget by an average of 28%. When opposed to road construction with larger construction time and budget, smaller road projects with shorter construction periods have higher cost variation. For different combinations of flexible pavement crusts at different CBRs and different traffic volumes, the least direct construction cost technique can be employed to cut down on the direct construction cost. It is crucial to gather information on cost overruns at the key construction sites since changes in the kinds of road crust during ongoing development have a significant influence on planning for construction costs.

## 2. DISCUSSION AND OBSERVATION

As per mentioned in IRC-37 (flexible pavement) there are 5 types of flexible pavements. Their suitability depends upon

ground conditions and available construction equipments for that particular region. It is obligatory that it should low budgetary with their appropriate functioning hence we should choose low budget road crust type of flexible pavement regarding with region on which we have to construct flexible pavement road. IRC-37 specifies five distinct types of flexible pavement road crusts. This study evaluates the effect on direct construction costs owing to changes in the resultant flexible road crust type of construction techniques or scope adjustments for any combination of sub grade CBRs ranging from 3 to 15% and traffic from 50 to 150 msa. A cost baseline can be established or altered based on the cost variation percentages described in this article.

## 3. LITERATURE REVIEW

**Harshavardhan N. Shinde et.al[1]** By comparing the cost deviation percentages, it is possible to determine the impact on a road's direct construction costs caused by a change in the flexible road crust type as a consequence of a change in construction approach or change in scope. For various combinations of traffic volumes and subgrade CBRs, cost deviation percentages are determined in comparison with the flexible pavement crust type with the lowest cost. For any combination of flexible pavement crust type, subgrade CBR, and traffic volumes ranging from 50 msa to 150 msa, cost savings or escalation may be computed with ease. The construction cost baseline, construction planning, and cost optimisation for flexible pavements may be completed quickly by using the cost deviation percentages shown in this study.

**Harshavardhan N. Shinde et.al[2]** The goal of this study is to determine which of the five adaptable road types listed in IRC 37-2012 will result in the lowest construction costs for a range of CBRs from 2% to 15% and a range of traffic volume circumstances from 2 msa to 30 msa. The District schedule rates, the Roads' specifications and standards (MORTH Specifications), as well as the cost of materials, equipment, and direct construction, are used to compute these costs. In order to choose the least expensive road crust type at a specific location of a particular CBR, a correlation between the cost, road kinds, CBRs, and Traffic volumes is computed.

**Harshavardhan N. Shinde et.al[3]** In order to frame the maximum baseline cost variation for cost optimisation and proper planning of construction at various CBRs from 2% to

15% and different traffic volume conditions from 2msa to 30msa, this study was conducted to determine the maximum possible direct cost deviations in materials and construction of flexible road crust type among the five flexible road types cited in IRC 37-2012. If it becomes necessary to alter the kind of road crust, this study may be used to determine if there will be a likely increase in direct construction and material costs or a reduction in project costs. The district schedule rates, the Roads' specifications and standards (MORTH Specifications), and their respective weights are used to compute the costs of materials, equipment, and direct construction for various forms of flexible pavement. The lowest construction costing road pavement crust type is chosen from all of the available crust types, and the cost variance in direct material and construction costs for the other pavement crust kinds is discovered.

**Badake Sanju Kumar et.al.[4]** The study will be used by the R&B department's Design and Estimate of Flexible Pavement. Phase 1 of the "Devarakonda-paddavuru-miryalaguda-kodad" project has been delegated to the Government of Telangana. A lane road lane of 2 or road lane of 4, paved shoulder-configured corridor of state and national highways with a tentative length of 115 KM has been sanctioned in principle for designation as national highways. Designing flexible pavement in accordance with 'IRC 37-2015,' and planning road infrastructure in accordance with 'IRC SP 19-2001'. MX Road software is a powerful string-based modelling tool that makes it possible to quickly and accurately create all sorts of roads using MX Road. It is simple to create design options for the development of the optimum road system. With MX road modeling, further features that need to be added into the process once a design option has been verified, saving both time and money. The project estimate needs to be reasonable and should paint a clear picture of the financial commitment required.

**Mette K.Skamris Holm et.al.[5]** The main intent of this article is that it goes through different factors which are main causes to increase in actual cost of project. This article studied over 258 rail sites, different bridges as well as tunnel projects, whose overall expenditure goes to 90 billion dollars. Further it have been giving focus on how cost deviation is offended. For these there are several factors such as total length of project complement phase, size of overall project and project ownership variant. However it was found that the actual length of overall project complement has significant impact on cost deviation of project. The consequences for policies are obvious. Expenditures escalation are major impact on project due to which project planners management department, execution managers are also worried about such delays causes to expenditure increases. Also it has discovered that bigger projects have biggest percentages in increasing cost value. Earlier we discussed about ownership of project. It has also different scenario regarding increase in expenses of project.

If we compare government ownership, private ownership and other ownership, it seems that it has no any major or significant impact on expenditure increases.

Keywords: expenditure increasing intent, construction time delays, overall size, ownership of project.

**Chantal C. Cantarelli et.al.[6]** This study investigates the relationships between three independent explanatory factors and cost overrun to determine whether Dutch infrastructure projects differ from those found globally. There are three types of variable factors, which are not dependent on each other. One of them is, actual time requirement to fulfill the project, other one is actual size of construction site based on expected expenses and last one is variants of project which include road infrastructure ,rail projects and other rigidly connected projects. The average increase in cost for dutch projects are different which are mainly depend on their significant factors. Based on studies it is going up to 18.5% for road infrastructure. For railways, stands up to 11% and 22% for firmly depended project. In another prospective, it is observed that smaller projects have higher increase in expenditure compare to it, larger projects have greater part of overall overrun. This makes a significant contribution to our understanding of cost overruns since it reduces the time frame during which projects are most likely to experience them.

Keywords: cost overruns, infrastructure, ex-post studies.

**Ghulam Abbas Niazi et.al.[7]** According to the author, finishing a building project within budget is one factor in determining if it was successful. This presents more of a difficulty in developing nations due to a number of reasons, where poor project performance is frequently caused in part by budget issues. In such types of regions, we have to face local parties regarding a construction project, construction material supplier, different contractor, their sub contractors, main builders – contractors and various client companies. This all things lead to increase in cost immensely in Afghanistan as well as there is other aspect also such as local level corruption. This is a very serious issues in such region. Owner also postponed their payments making progress. In Afghanistan contractors of different sectors has to face various financial challenges. During construction, security is also significant factors that we have to look after. Sometimes owner changes their orders during construction and market inflation. This all circumstances ought to increase in overall cost of construction project. This all things have to discussed and reported in this authors report

**Ibrahim Mahamid et.al.[8]** In this paper, author collected a lots of data of various road project, which was constructed in west band and Palestine amidst 2007 to 2010. From this all types of collected data, he has examined the impact of different practical aspects on expenditure in their project. For that he has conducted data from road projects near about 74 roads. Regression models are created using these

data. We should ascertain the influences of such specifications on expenditure on construction sites. He also made a questionnaire study. In the questionnaire survey, there were 25 consultants, 30 contractors, and 14 owners. Some of parameters that we have to consider such as the actual size of construction site, what will be the expected expenditures, the total length of roads and with their width as well as available load, different topographical conditions, soil bearing capacity of soil, piling work or piers construction, hard strata. After analyzing and studying, outcomes tell that the overall expenses of all construction projects has ups in costing and that ranges from 21% to 56%, with an average of 17%. It is looked at if there is a relationship amidst the expenditure changing in different construction projects such road line projects and building sites and the aforementioned factors.

**Mr. Peter Morris et.al.[9]** According to the author, he has found a lot of volatility from industry infrastructure recently, and it continuously anticipated in the near future because of the struggle for resources and qualified employees, as well as the sector's sustained strong growth and surplus work. Contractors, builders and project managers has gotten tenders, bills and estimations of relatable projects, which are much in increased manner than it. It should be set quickly because currently market rise are quite apprehensive and anxious about this scenario. There are enough resources to deliver the final programmed on time and under budget. Risk evaluations are frequently quite wrong because they are frequently significantly impacted by short-term judgments based on the most recent news. Hence, escalation results from the interaction of changes in input costs-real or anticipated risk perceptions, and perceptions of the competition. In certain instances, it is based on accurate data regarding the rates of essential commodities. The capacity of contractors to increase their pricing ultimately rests solely on the condition of local market. In fact all tenders which have been filled will be raising their rates. A "pass through" is not an actual phenomenon.

#### 4. OBJECTIVE

- To study of literature review.
- To calculate direct construction cost of five flexible road crust types given in IRC 37 for various traffic volumes and CBRs by using DSR for sample traffic and CBR of location.
- To obtain low costing best suited road among five road crust types given at IRC 37 for sample traffic and CBR of location by using optimum cost analysis method.
- To calculate the construction cost proportions of equipment cost, material cost with reference to direct construction cost so as to make baseline for budget.
- In case of change in road type due to change in scope, finding out cost escalation by calculating cost

variance percentage for all five types of flexible pavements.

#### 5. METHODOLOGY

The following methodology will be adopted -

- ❖ Collection of preliminary information through a literature survey.
- ❖ Manifesting of problem statement, objectives, IRC-37(2012) and analyzing types of flexible pavements.
- ❖ Study of MORTH specification and standards then collecting appropriate require data for our project as well as study of general conditions given in standard data book published by NHAI.
- ❖ Calculation of material cost and direct construction cost for various flexible pavements given in IRC-37 such as,
  1. Granular Base and Granular Sub-base (GB and GSB).
  2. Cementitious Base and Cementitious Sub-base of aggregate interlayer for crack relief (CB and CSB).
  3. Cementitious base and sub-base with SAMI at the interface of base and the bituminous layer (CB and CSB with SAMI).
  4. Foamed bitumen/bitumen emulsion treated RAP or fresh aggregates over 250 mm Cementitious sub-base (RAP).
  5. Cementitious base and granular sub-base with crack relief layer of aggregate layer above the cementitious base (CB and GSB with crack relief layer).
- ❖ Finding out parameters for cost reduction and cost escalation by optimum cost analysis

method and cost variance method.

- ❖ Suggesting the best recommendations for formation of baseline for low budgeting direct cost of road construction, material and equipments.

#### 6. CONCLUSION

The cheapest road crust type for the present traffic volume is cemented base and cemented sub base with SAMI layer and highest cost of road crust type is granular base and granular sub base layer.

Moreover, by changing the kind of flexible road crust at any time during construction, this research may be utilized to determine the impact on direct construction costs. This analysis can also be used in future when traffic volume increases to 30 to 50 msa.

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