

Planning and Scheduling of a Suspension Cable Bridge Using Project Management Tool Primavera P6

Ankit Jain¹, K. K. Punjabi²

¹P. G. Scholar, Department of Civil Engineering, SATI Vidisha, Madhya Pradesh, India

²Professor, Department of Civil Engineering, SATI Vidisha, Madhya Pradesh, India

ABSTRACT

Attributable to an augmenting context of environment, Construction industry is ever upfront for the development and advancement in tools and equipment features, tools of communication, techniques of efficient management, educating the human resources about it. This unique specialization necessitates highly focused whose construction was planned to start at Bhopal, Madhya Pradesh, India. Project Planning and Controlling tools or techniques. In the current study, implementation of the computer based Project Management software/tool Primavera P6 for the Planning, Scheduling and Allocation of resources for a Suspension Cable Arch Bridge It helps to know the resemblance between the planned the planned progress of construction work and actual progress of the performed work. Thus the essentiality and the advantages of using Primavera will be outlined through the data results obtained. The acceptance of the software Primavera as a platform of scheduling is been on a boom in Multi National Construction Companies, but due to ignorance and lack of Project Management concepts and discourage towards the use of computer based programs, small and medium scale Indian construction companies confront various issues such as inefficient planning, project delays, inefficiency of resources and many other issues. Therefore, attempt to educate one such medium scale construction company about the advantages of Primavera in execution of any construction projects efficiently.

Keywords : Planning, Scheduling, Resources Allocation, Primavera P6, Resource Levelling.

I. INTRODUCTION

In today's world construction industry is one of the most widely used and rapidly booming industry of our nation and across the world. Hence, it is considered to be the second largest industry of India in terms of generating huge amount of revenue and employment. Though the construction and infrastructure industry being second largest industry of our nation (India), the identity and recognition of this industry has not been grown in all dimensions of the country. Especially, at the remote places like small villages, rural places and the large part our

country is by these small villages and rural habitats. Therefore, there is a requirement of certain tools and techniques for the improvement of national economic upliftment, adequate land use and their environment planning to manage with the level of improvement in town and urban areas and the time required to tackle this goal can shortened. There is an intense necessity for effective Project Management.

Project Planning is a general and most common term in construction management which refers to attain the expected goals and destinations. Planning is the key to bring the expected projects into reality or in

existence. Therefore, the term ‘Project Planning’ has been used at various platforms to get the close meaning of different things. Generally planning involves the breakdown of the undertaken whole project works into small definable, identifiable and quantifiable tasks or activities or works and then constitutes the logical interdependencies between them. Basically, the process of Planning refers to 3 dominant questions, they are as below

- i) What is to be done..?
- ii) Who does it..?
- iii) How to do it..?

Scheduling refers to slotting out the time duration by the thorough and explicit analysis of the planning tem to each and every activity to know the final project duration and the project delivery date. In other words it governs the timing of each work activities recognised by the planning process before or during project execution. Typically it shows and signifies the sequential order or phasing various individual project activities in a systematic way to complete the project. The schedule is a tool or a technic of every project management team which is used and practiced to predict most probable project completion time and thus enabling the in/ on time resources conception which are budgeted on the particular work.

The general steps to develop a proper schedule are as follows

1. Proper time estimation of every activities.
2. Project planner should know the obligations of time for the project completion and delivery.
3. The activities such as must start and must finish should be establish well recessed.
4. Sorting out of activities which are crucial to timely completion of project should be recognized and kept in mind.

Project Management Stages

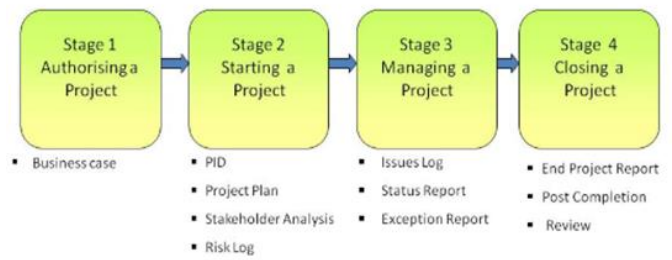


Fig 1 : Project Management

1) Objective

To conduct the study successfully, clear objectives of the study should be placed. Therefore, the following objectives has been chosen for the production of these thesis topic, project management using primavera software. A case study of project “planning & scheduling of construction project using primavera software.” Following objectives are:

1. To Develop scheduling and planning using Primavera p6 8.3 of a running project.
2. To prepare construction sequence for case study on Rani Kamla Vati Flyover (Cable suspension bridge at kamla park) using primavera P6.
3. Financial Risk analysis was done using Primavera P6.
4. To prepare resource allocation for individual activities as per I.S. 7272-part-I.
5. To assign proper sequence and links between different activities for early finish.

II. LITERATURE REVIEW

T. SIVA NAGARAJU et. al. (2018) actualize venture administration strategy in a metro rail venture utilizing administration programming primavera p6, give appropriate booking asset assignment to advocated a legitimate connection among expense and development of an undertaking. Additionally diminishes paper work require in a development venture.

P.M. WALE et. al. (2017) expressed that the venture may have a straight forward objectives that does not require numerous individuals or a lot of cash or it might be very intricate, calling for differing aptitudes and plenty of assets and furthermore gave near examination between customary way and Microsoft venture arranging. They inferred that Traditional route turns out to be uneconomical and expends additional time with numerous complexibility and huge mistake while Microsoft Project is the advanced apparatus of Project Management that guide to conquer the deterrents confronted attributable to customary method for Planning and Management.

A.R. NIKUMBH and S.S PIMPLIKAR (2016) suggested that the utilization of Project Management Consultancy (PMC) offers one of the powerful administration answer for increment and enhance the productivity and result of a venture in development and inferred that the Project Management Consultants deal with the Project by use of their Knowledge, Skills, and Experience at different stages and is viable and effective just when it is engaged with Total Project Life Cycle from Conception to Closeout.

SHAIK MOHAMMAD MASOOD et. al. (2014) H.N showed that numerous development venture experience the ill effects of time and cost overwhelms because of various variables. EVM is an performance of venture assessment which is utilized for the application in undertaking administration. This method helps in correlation of planned expense of work to genuine expense of work performed.

Outcome of the Literature Review

- Authors presented resource allocation using management tool primavera or Microsoft project but no one explained allocation of resources using I.S. 7272 provisions.
- Authors presented scheduling of a residential or commercial live project but no one

explained scheduling of a bridge structure using management tool.

- In past researchers explained the importance of risk analysis in a construction project whereas in the study, project analysis in several activities is considered.
- In past researches Primavera visualize and tracking is not implemented till date.

III. Methodology

Step-1: Collecting site data

Step-2: Checking site conditions and problems

Step-3: Preparing planning of the project using management tool Primavera P6

Step-4: Scheduling project by linking activities

Step-5: comparing site data and scheduled data

Step-6: Computing allocation of resources

Step-7: Assigning machineries and labor as per quantity

General Information of Project

Table 1 : Project Details

Name of work	River Crossing Bridge near kamla park to Ginnori road (Cable Suspension)
Salient Features	Steel Girder bridge with RCC structure and suspension cables
Name of Agency	Neelkamal Construction Pvt Ltd
Amount of contract	27.34 cr.
Date of Start	10-06-2017
Tentative Date of Completion	10-06-2019
Length of Bridge	210m
Arch Length	150m

Width of Bridge	10 m
Width of footpath	2m (both side)
Pier Size	2 m Diameter (Circular)
Girder Size	650 x 400 mm
Deck	350 mm
Design Load	I.R.C. 70 R
Cable	60 mm

Construction of suspension bridge

This bridge is proposed above the water way linking kamla park to Ginnori road. This proposed bridge is cable suspension bridge designed considering IRC 70 R loading. This bridge is aimed to flow the traffic directly to rajbhavan road.

This project is divided in WBS (work breakdown structure) considering preconstruction work, structure work and finishing work.

Here preconstruction work will shows the activities to be assign and finish before starting of the project.

Superstructure work will start from dewatering of area for footing to construction of slab and cables. This is most important work which need proper maintenance and monitoring.

Finishing work is consider as the work to be done after completion of structure it consist of welding, repairing and painting job.

Table 2. General abstract sheet (detailed received from BOQ*)

S.No	Description	Cost (Rs)
1	Construction of footing	2,78,54,800
2	Construction of abutment bed	1,84,42,865
3	Construction of Piers	3,76,30,685
4	Construction of Deck slab& Cable	14,88,00,000
5	Coating of oxide	95,000

Add 1 % for quality assurance = 23, 28,233.50

Add 1% Extra for construction workers welfare cess act, 1996.

Total = 23,28,283.50

Add 3 % contingencies = 69,847.005

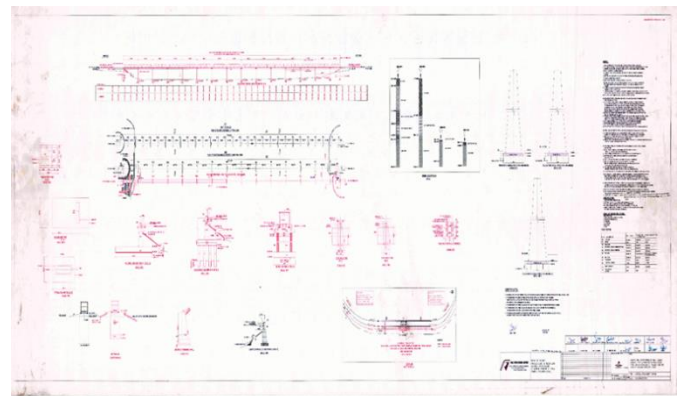


Fig 2: Plan of the bridge

Allocation of resources and cost:

Table 3. Manpower Assessed in Construction Sector

S. No.	Category	1995		2005		Growth % in 10Yr.
		No.	% Total	No.	% Total	
1.	Engineers	687,000	4.70	822,000	2.65	19.66
2.	Technicians & foreman	359,000	2.46	573,000	1.85	59.61
3.	Secretarial	646,000	4.42	738,000	2.38	14.24
4.	Skilled workers	2,241,000	15.34	3,267,000	10.54	45.78
5.	Unskilled workers	10,670,000	73.08	25,600,000	82.58	139.92
	Total	14,603,000	100.00	31,000	100.00	100.00

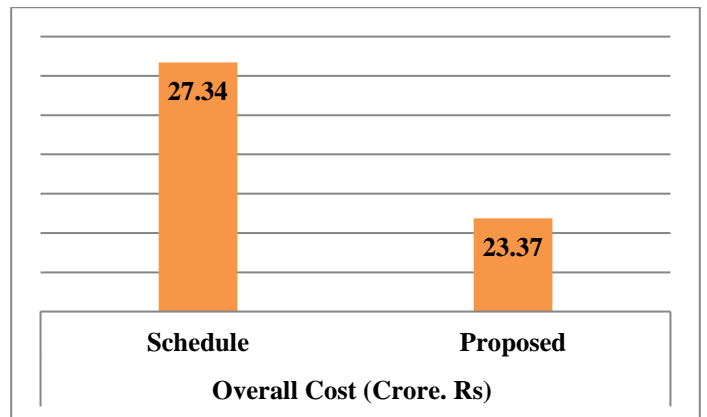
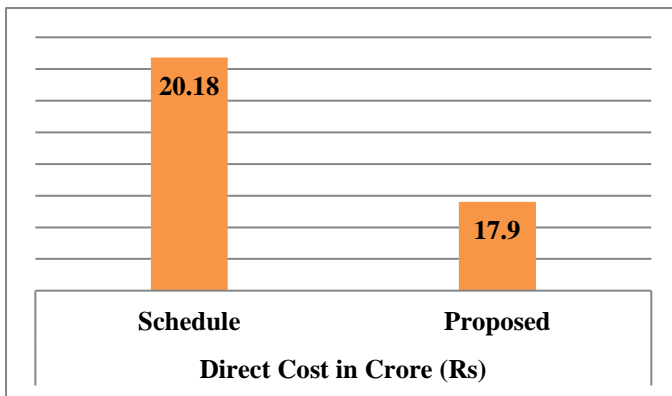
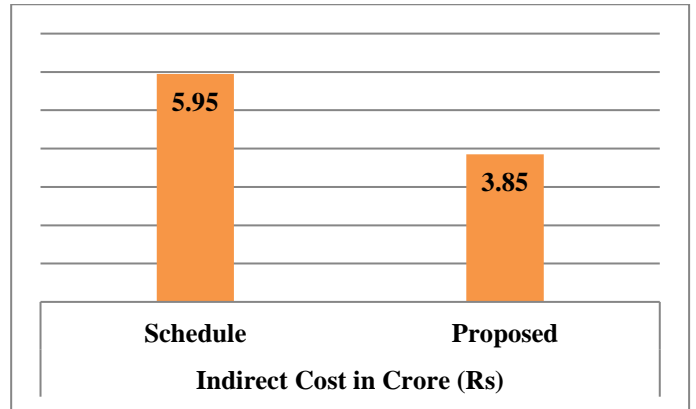
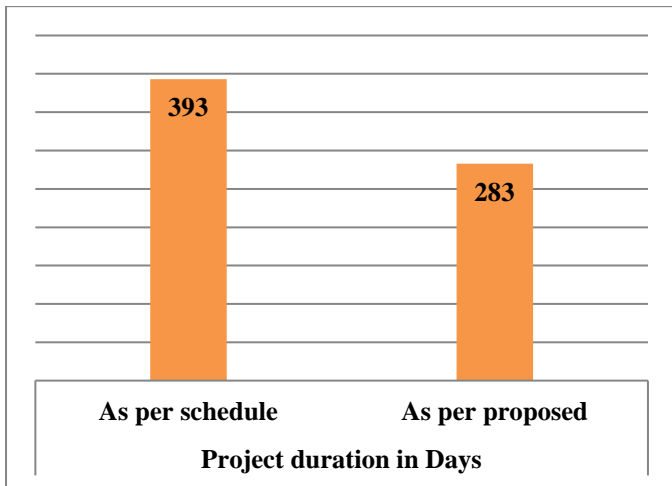
Table 4. Indirect Cost Table for Project

S.NO.	Category	pay scale per month (Rs)
1	G.M. Project	235000
2	D.G.M.	185000
3	Senior Project Engg.	65000
4	Quality Engineer	50000
5	Billing Engineer	50000
6	Trainee Engg.	6000
7	Computer Operator	10000
8	Peon	7000

Table 5. Direct Cost

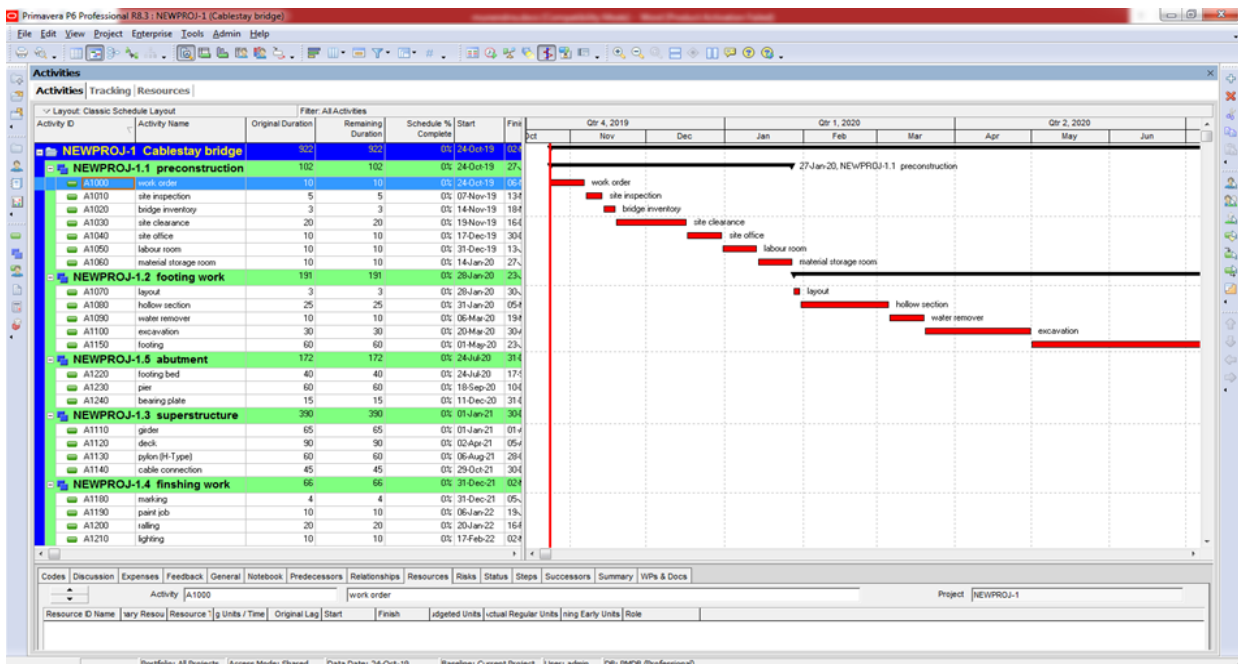
Direct Cost (Rs)				
S.NO.	Material	Qty.	S.O.R. rate	Total Cost
1	Concrete (Cu. M)	4950	7800	38610000
2	Reinforcement (kg)	975000	48	46800000
3	Steel (ton metric)	580	90000	52200000
4	Steel Cable (ton)	302	70000	21140000

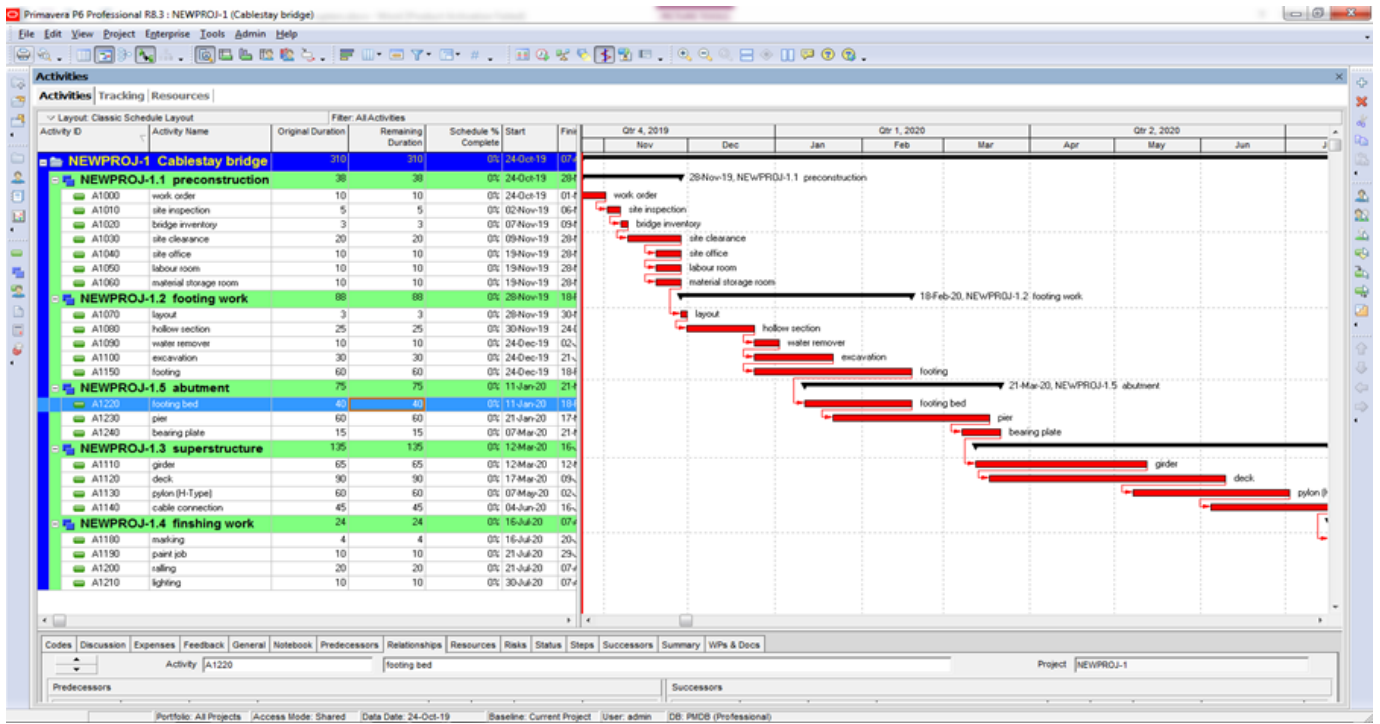
Scheduling reports



Gantt Chart for Comparison

IV. Proposed Work





V. CONCLUSION

The study presents project plan on a running project of bridge (210m span). The observation stated the drawbacks which ultimately become the reason for the delay of the project and later proposed a new schedule using Primavera P6.

The proposed schedule links all the activities in order to incorporate a proper flow of the project in order to generate information at any stage of project with the use of Gantt Chart.

In this study, minimization of delay was done by allocating resources as per activity demand based on consumption as per I.S. 7272 part-1

The study elaborated work breakdown structure to activity level to have proper lagging of activities and their scheduling.

Here results concluded that using project management tool Primavera P6 assigning and monitoring each activity as per running conditions besides, also analyze water logging in excavation activity due to environment (rain water) which was resolved and 5 days are saved.

Project Duration: Observation stated that the process of preconstruction was managed equally by linking all such activities namely preparing site office, labour room and laboratory setup. By linking the activities, the time lapse reduces simultaneously.

Overall Cost: The cost proportionate is reduced due to decrease in time consumption and effective management of available resources. In order to utilize every day, the tasks were assigned proportionately without any lag so as to reduce the project completion time and this was effectively monitored using Primavera P6. In the above chapter I have observed that overall cost decreased by 14.6%.

Overall it is observed in this running project that management of all activities and observations on their previous and next activity is necessary to run activities simultaneously, so as to optimize the time and cost.

VI. Future Scope of Study

- This contemplates goes for labor and assets arranging and planning of a venture. Then again

one can build up an arrangement and timetable for gear with their expenses or for finish development asset of a task.

- In this examination suspension bridge project is taken though in future other framework can be considered
- To promote extent of study we arranged, planned and followed labor of earthwork gradation for development and basic way of the undertaking movement is acquired and break down by utilizing the product Primavera one can create utilizing some other programming.

VII. REFERENCES

- [1]. Prof. A. Beam Chaudhuri, B. Sivakonda Reddy, "Asset Management in Construction Projects - a contextual analysis" Engineering Science and Technology: An International Journal (ESTIJ), ISSN: 2250-3498, Vol.2, No. 4, August 2012 PN (660 - 665)
- [2]. Indrasen Singh, P. Venkateswaralu, "Arranging and controlling of a National Highway Project- A contextual analysis", Journal of the Indian Road Congress Paper No.613, April - June 2014 PN (91 - 102)
- [3]. Antony Prasanath MA, Thirumalai Raja K, "Investigation of expense and calendar Performance of Residential Building Projects by EVM system", Journal of Construction Engineering, Technology and Management ISSN: 2347-7253, Vol. 4, (2014) PN (1-7)
- [4]. Tarek Hegazy, Wail Menesi, "Basic Path Segments Scheduling Technique" Journal of Construction Engineering and Management ASCE/(Oct 2010) PN (1078-1085)
- [5]. Awad Hanna, Aviad Shapira, Mounir Asmar and Craig Taylor, "Effect of group planning on task execution", Practice Periodical on Structural Design and Construction ASCE (2013) PN (35 - 44)
- [6]. Robert B. Harris, "Pressing strategy for Resource Leveling", Journal of Construction Engineering and Management © ASCE, vol no 116, June 1990 PN (331 - 350)
- [7]. Khaled El-Rayes and Dho Heon - "Advancing Resource Leveling in Construction Projects", Journal of Construction Engineering and Management © ASCE, Vol. 135, No. 11, November 1, 2009. PN (1172 - 1180)
- [8]. James E. Seibert and Gerald W. Evans, "TimeConstrained Resource Leveling", Journal of Construction Engineering and Management, ASCE Vol. 117, No. 3, September, 1991. PN (503 - 520)
- [9]. O. Shaked and A. Warszawski, "Conshed : Expert System for Scheduling of Modular Construction Projects", Journal of Construction Engineering and Management, ASCE/vol 118, Sept. 1992 PN (488 - 506)
- [10]. Piotr Jaskowski and Anna Sobotka, "Booking Construction Projects Using Evolutionary Algorithm", Journal of Construction Engineering and Management, ASCE/Aug 2006 PN (861 - 870)
- [11]. Daniel Castro-Lacouture, Gürsel A. Süer Julian Gonzalez-Joaqui; and J. K. Yates, " Construction Project Scheduling with Time, Cost, and Material Restrictions Using Fuzzy Mathematical Models and Critical Path Method" ASCE , ISSN 0733-9364/2009/10-PN (1096- 1104)
- [12]. A. Kastor a, K. Sirakoulis, "The viability of asset leveling apparatuses for Resource Constraint Project Scheduling Problem", Science Direct International Journal of Project Management 27 (2009) PN 493- 500
- [13]. Liberatore MJ, Pollack-Johnson B, Smith CA. Undertaking n development: programming use and research heading. J Constr Eng Manage 2001;127(2):101- 7.
- [14]. IS : 7272 (Part I) - 974 "Suggestion For Labor Output Constants For Building Work Part I North Zone (Sixth Reprint February 2001)

- [15]. Maharashtra Jeevan Pradhikaran (Government of Maharashtra Undertaking) Schedule Of Rates For The Year 2012 - 2013 (Effective from 24th December 2012)
- [16]. "Estimating, Costing, Specification and Valuation in Civil ENGG.

Cite this article as :