

COMPARATIVE STUDY OF COST AND DURATION RELATED TO NIGHT TIME AND DAY TIME CONSTRUCTION OF FLYOVER PROJECT

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ABSTRACT

High volume traffic on many city roads make it difficult to perform any construction activity during peak hours of any construction work which is carried on the road. It introduces the issues to the traffic flow, issues for the worker, issues of the cost and productivity of the work. Therefore many activities of these types of works are scheduled during off peak hours generally during night time to minimize the problems. This paper contains the identification of different construction activities during night time. It also includes different types of issues occurs during night time construction of flyover project and the solutions on that issues. The selection of night time construction activities is based on the quality and productivity of the work.

KEYWORDS: Night Time Construction, Off Peak Hours, Peak Hours, Productivity of the Work, Quality of Work

INTRODUCTION

Construction of flyover projects in the city areas usually causes disruption to traffic, which resulting in delays, increasing fuel consumption, some negative impacts on environment and comparative higher construction cost. Therefore scheduling some construction activities during night time is beneficial to overcome those problems. But all the activities are not carrying out during night time because of the several risks like safety risk, cost risk, productivity risk, schedule risk, quality risk and technical risk. The selection of activities should be such that it minimizes the different types of issues related to the night time construction. There are some issues like traffic, construction, social, economic and environmental that impacts on the feasibility of night time construction work.

The advantages to schedule the activities during night time are

- Reduction in delay and congestion: During night time the traffic is at lower level which leads to timely completion of activities and less congestion in work areas.
- Energy conservation: The reduction in delay and congestion at sites leads to less fuel consumption and less energy conservation
- Minimizing inconvenience to the travelling public.
- The night time construction have longer work period as compared to day time off peak period.
- The economic impact on surrounding businesses is very less due to night time construction as compared to day time construction.

The causes of different types of risks are-

- Safety risk- it is due to the vehicle intrusion into work zone, intrusion of construction equipment on operational traffic lane and poor visibility
- Cost risk- It is increased by need for more traffic control equipment, labour premiums. Material premiums. It is decreased by less delivery cost, less user cost due to fewer delays and substantial time saving.
- Productivity risk- It may be because of inadequate lighting, difficulty for achieving good supervision and inspection, extra time required to set up and take down traffic control devices.
- Schedule risk- Workers accidents may cause this risk Also lack of co-ordination among inspectors and engineers regarding day activities on projects with night work.

These risks are minimized by drawing the lighting plan and traffic control plan. To increase the visibility during night time the new lighting technology is used that is balloon lighting. In this the balloons are used to diffuse the light

OBJECTIVES

- To identify different construction activities during night time by considering quality and productivity.
- To study the impact of night time work on total duration of project compared to work completed in the day time.
- To study the impact of night time work on total cost of project compared to work completed in the day time.

PROBLEM STATEMENT

The literature suggests that there is no any specific procedure or specific guidelines to decide that whether to carryout activities during night time or not. This evaluation is necessary to avoid the serious disruption to traffic during daytime and to reduce the time of construction

SCOPE OF THE STUDY

This paper discusses the different construction activities which will carry out in night time and different types of risks during those activities. The construction of flyover in urban areas faces many problems mainly due to the traffic congestion. Therefore greatest advantage of shifting some construction activities during night time is to minimize the congestion. Overall this study will be very useful to reduce the delay in construction of flyover project.

METHODOLOGY OF WORK

The methodology adopted for this study is the hand distribution of questionnaire to the different stakeholders of the flyover project. The questionnaire is based on general survey, quality, safety, nuisance, illumination, productivity and cost of the flyover site. From this questionnaire the night time construction activities are selected. Then the scheduled and actual data from the site is collected which are used to shift the activities from day time to night time. Then the percentage difference in duration and cost of the project is found out.

DATA COLLECTION

Name of site: Proposed widening of existing road over bridge no. 189/3 between rly kms 189/11-12 near Sancheti hospital, Shivajinagar on Pune Mumbai section.

Client: Pune Municipal Corporation

Project Management: Vishal Nirmitti private ltd. (formerly P.P.P.L.) 205, Devavrata, sector 17, Navi Mumbai-400705

Consultant: Kiran consulting engineers, 1004 Tara towers, Sangam press road, opp PMC Karvenagar ward office, Pune

Contractors: T and T group, B1-Vasant vihar, Kondhwa Bibwewadi road, Market yard, Pune-411037.

The flyover to be constructed at a cost of Rs. 67 crore, is supposed to ease the traffic at the junction near CoEP. The total length of the three flyovers will be 1.75km.

- **Flyover 1:** Between shoppers stop on old Mumbai-Pune highway to sangam bridge (980m)
- **Flyover 2:** Between CoEP junction and shoppers stop (380m)
- **Flyover 3:** Between Sancheti chowk to CoEP junction (390m)

The work has been allotted to J. Kumar Infrastructure Company in 2012 by PMC, but due to changes in design, PMC floated another tender for additional work, in which T and T infra Pvt. Ltd. showed interest with 14% extra cost over the cited Rs. 22 crore. The T and T infra Pvt. Ltd. constructed the 4 span flyovers which started from 3rd January, 2012. The project is planned for 699 days up to 5th September, 2014. But the project is getting delayed for 12 months and opens to traffic on 15th October, 2015.

RESULTS AND DISCUSSIONS

From the questionnaire survey the different activities which are suitable for night time construction and its duration are as shown in table 1.

Table 1: Night Time Activities and its Duration

Sr. No.	Activity	No. of Structural Members	No. of Night for One Structural Member	Total No. of Nights
1.	Placing of reinforcement of foundation during day time and night time	5	5	25
2.	Concreting of foundation during night time only	5	1	5
3.	Placing of reinforcement of pier day time and night time	5	3	15
4.	Concreting of pier during night time only	5	1	5
5.	Placing of reinforcement of pier cap day time and night time	5	5	25
6.	Concreting of pier cap during night time only	5	1	5
7.	Placing of reinforcement of girder day time and night time	32	2	64
8.	Concreting of girder during night time only	32	1	32
9.	Placing of reinforcement of deck	4	10	40

	slab day time and night time			
10.	Concreting of deck slab during night time only	4	2	8

Total no. of working nights = 224

Increase in duration of project due to delay:

This flyover construction is getting delayed for 12 months due to some design problems and due to traffic, and which is open to traffic on 15th October, 2015. Since the work began, there have been five traffic accident deaths near Sancheti Chowk.

Actual duration of project= 1064 days

Percentage increase in duration due to delay of construction= $100 \times (1064 - 699) / 699 = 52\%$

After shifting the above activities to the night time the total duration of project reduced to 567 days.

Percentage reduction in total duration= $100 \times (699 - 567) / 699 = 18.8\%$

Due to change in duration of project there is change in cost of project. By shifting the activities during night time the labour charges are increased by 25%. Also the additional cost require for good illumination. The cost analysis of the project is as shown in table 2.

Table 2: Total Rate of Labour

Sr. No	Name of Activity	No. of Structural Members	No. of Labours for One Structural Member	No. of Days for One Structural Member	Labour Rate Per Day (Rs.)	Total Rate of Labour (Rs.)
1	Placing of reinforcement for foundation	5	7	5	334	58450
2	Concreting of foundation	5	138	1	334	230460
3	Placing of reinforcement for pier	5	20	3	334	100200
4	Concreting of pier	5	82	1	334	136940
5	Placing of reinforcement for pier cap	5	6	5	334	50100
6	Concreting of pier cap	5	104	1	334	173680
7	Placing of reinforcement for girder	32	3	2	334	64128
8	Concreting of girder	32	33	1	334	352704
9	Placing of reinforcement for deck slab	4	14	10	334	187040
10	Concreting of deck slab	4	108	2	334	288576

Increase in cost of project due to delay:

Due to the delay of construction the total cost of project is also increases.

Extra labour charges for 138 labours due to delay of 12 months= $365 \times 138 \times 334 = \text{Rs. } 16823580$

Equipment charges= Rs. 500000

Overheads= 5% of $(16823580 + 500000) = \text{Rs. } 866179$

Total extra charges due to delay= $16823580 + 500000 + 866179 = \text{Rs. } 18189759$

Percentage increase in cost of project due to delay= $(18189759/220000000)*100= 8.26\%$

Total amount required for labours for concreting and placing of reinforcement during day time is= Rs. 1642278

During night time the labour's salary is increased by 25%

Therefore extra salary require during night time= $2161648 * 0.25= \text{Rs. } 410570$

Generator charges:

Total number of working days which are shifted to night time= 224

Generator rate = 232/hr

Total charges= $224*232*8=\text{Rs. } 415744$

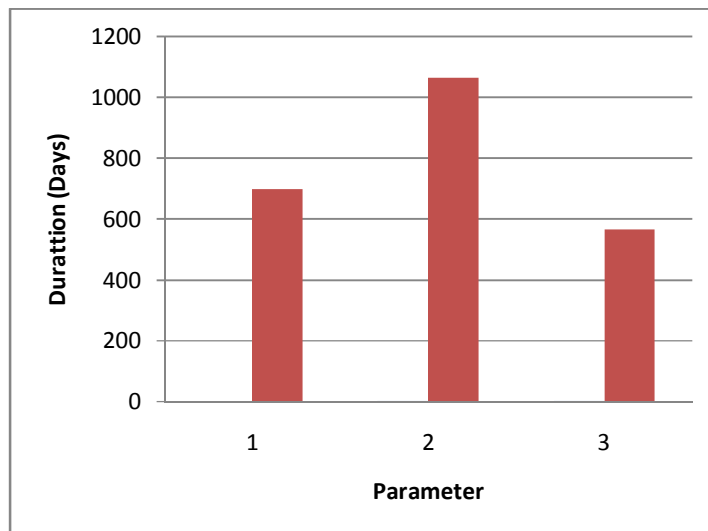
Total increase in cost= $410570+415744= \text{Rs. } 826314$

Total cost of project= Rs. 220000000

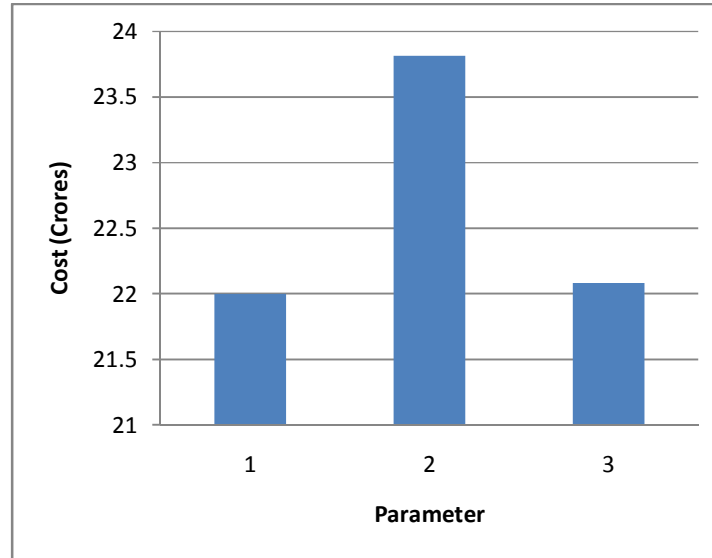
Percentage increase in cost of project= $(826314/220000000)*100= 0.376\%$

Table 3: Comparison of Cost and Duration

Parameter	Duration (days)	Cost (Rs.)
1. When project completed during day time (actual cost and duration)	699	220000000
2. Due to delay of project during day time because of traffic and accidents	1064 (Increased by 52%)	238189759 (Increased by 8.26%)
3. When project completed during day time and night time	567 (Decreased by 18.88%)	220823614 (Increased by 0.376%)



Graph No. 1: Comparison of Duration



Graph No. 2: Comparison of Cost

CONCLUSIONS AND RECOMMENDATIONS

- The selection of activities for night time depends on rate of traffic, resources available, site location. For the flyovers we can carry out concreting and reinforcement placing during night time because it require more time and more work space.
- The total duration of project is decreases by 18.88% shifting some day activities during night time, which increases the total cost of project by 0.376%.
- The construction project is delayed due to accident happened on site by 52%, which increases the cost of project by 8.26% that is 7.26% more than the cost of project which are carry out during night time.

Based on the literature survey and current site condition the recommendations to improve the night time construction are:

- A detailed night time work plan should be prepare to improve the work.
- The lighting plan and traffic control plan should be design before the work started.
- Special sign board should be erected on the night time construction site with flash light mounted on it.
- A night time construction training program should be arrange to train all the labours who are working during night time. Generally this program should be arranged in night time.
- The use balloon lighting is better than the conventional lighting for good illumination.
- Bid the night time pay items separately. The night time work includes the extra things like lighting equipments. Bidding night time items separately, prevents contractor from complaining about prices and results in more accurate bid.
- There should be a proper communication between the different stakeholders that may adversely affect on the

productivity of construction.

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