



Night time construction and its effect on flyover project duration and cost

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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. 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. The night time construction work based on the explicit consideration of the following three main aspects is presented: (a) the travel time savings produced by night- time construction work, (b) the impact that nighttime work has on workers' human factors (e.g., sleep deprivation and disruption of family and social lives) and (c) the impact that pay differentials for night- time workers would have on project costs.

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I. INTRODUCTION

In a context of increasing congestion, daytime highway construction work already a major source of non-recurrent congestion is bound to produce significant traffic disruptions. This has prompted Departments of Transportation to increase the frequency of nighttime construction work to reduce the congestion impacts of highway projects. This trend has been clearly observed in the State of New Jersey where, according to the local construction industry representatives interviewed for this project, the frequency of nighttime work has increased in the last five years. The estimates produced by the research team, on the basis of these interviews, indicate that approximately 25% of the highway projects are completely conducted at night; while approximately 80% of the daytime highway projects have some sporadic nighttime work component. Assuming an average duration per highway project equal to 60 days, and that the amount of sporadic nighttime work is 5 days, the above figures translate

into 30% of the project- hours being conducted during the night.

There is an increasing demand for performing many transportation related construction and maintenance

operations at night, especially in urban areas, to reduce conflicts with the traveling public. This approach can be beneficial for reducing traffic disruptions; however, there are several concerns to state highway departments and contractors which must be considered. There is a perceived loss of productivity in performing night-work which can increase the costs of the work and an increased risk for the safety of the workforce. There is also an exposure for liability for the safety of the traveling public and increased citizen complaints of noise near night-time project locations. Because of these, and



several other factors, special guidelines are needed for the proper implementation of night-time construction.

1.1. Factors affecting night-time construction

In order to accurately assess the potential of a project for night-time operations it is important to identify the issues and parameters that affect night work.

NIGHT OPERATION PARAMETERS:

1. Traffic related parameters: - Safety, congestion, traffic control, works time rest. lighting, urban vs. rural, enforcement, new technology.
2. Construction related parameters: - quality, productivity, safety, work operation, new technology, schedule limits, blasting, material available, equipment repair, work lighting, communication.
3. Social parameters: - driver condition, worker condition, business disturbance, public disturbance, local events.
4. Economic parameters: - business losses, road user cost, accident cost, maintenance cost, construction cost, incentives / disincentives, liquidated damages.
5. Environmental parameters :- new technology, light pollution, noise, fuel consumption quality, workers health.
6. Cabinet issues: - personnel assignment, resources, decision making, public relations, political, time limitations, type of work.
7. Legal issues: - local ordinances, local restrictions.

1.1.1. Traffic Related Parameters:

Safety: The safety of the travelling public should be a leading factor in the decision to work at night.

Congestion: The impact of the proposed construction on the traffic flow through the site.

Traffic Control: Traffic control affects both safety and congestion.

Work Time Restriction: Any operating hour restrictions that have been placed on the project through local, state, and federal agencies as well as contract restrictions.

Lighting: Construction lighting must be arranged in a manner that minimizes glare to the travelling public while still adequately illuminating the job site.

Enforcement: Traffic control and construction speed limits must be enforced in order to be effective. This is generally achieved through local or state police departments.

New Technology: Signage, message boards, channelling devices, etc. that is more conducive to night-time construction.

1.1.2. Construction Related Parameters:

Quality: The effect night work will have on the quality of the final product.

Productivity: The effect night work will have on the productivity of the contractor.

Safety: Methodologies employed for night operations may differ from identical daytime operations for safety reasons.

Work Operations: Whether night-time conditions require different procedures or methodologies than daytime operations.

New Technology: The effect improved equipment and methodologies can have on night operations.

Schedule Limits: Restrictive schedule limitations. Possibility of decreasing completion time through double shift work.

Blasting: Careful considerations should be made concerning blasting operations at night.

Material Availability: Arrangements for the delivery of materials to the job site. Also added expenses for night-time material production and delivery may be incurred.

Equipment Repair: Contingency plans for dealing with the breakdown of major pieces of equipment should be developed.

Work Lighting: Lighting can affect nearly every aspect of night work.

Communication: During night operations communication between field and office personnel is difficult at best.

1.1.3. Social Parameters:

Driver Condition: Drivers at night are more likely to be fatigued or under the influence of drugs or alcohol.

Worker Condition: Workers are more likely to be fatigued at night.

Business Disturbance: The effect (noise, traffic, dust, etc.) that night operations will have on surrounding businesses.

Public Disturbance: The effect (noise, traffic, dust, lighting, etc.) that night operations will have on the surrounding residential areas.

Local Events: The presence of local community events (church functions, sporting events, concerts, etc.). If necessary, work may have to be suspended during the function.

1.1.4. Economic Parameters:

Business Losses: The economic impact on surrounding business (including trucking and shipping) due to inaccessibility and construction interference.

Road User Cost: The road user cost (day and night) should be calculated for the area of the project.

Accident Costs: The costs associated with motorist accidents and their impact, both financial and traffic wise, on the project and surrounding community.

Maintenance Costs: Costs associated with equipment maintenance activities to be performed

Construction Cost: The contract price of the project.

Liquidated Damages: Financial losses resulting from the late completion of the project.

1.1.5. Environmental Parameters:

New Technology: Equipment or methodologies that reduce the environmental impact of

Night-time construction including improved mufflers, reduced working time, etc.



Lighting Pollution: Excessive illumination caused by over-lighting a site.

Fuel Consumption: Generally at night less fuel is burned through idling vehicles in congestive situations.

Air Quality: Pollution from automotive exhaust emissions could be lessened by reducing Congestive situations.

Worker's Health: Health issues arising from the inhalation of automotive exhaust fumes.

1.1.6. Cabinet Issues:

Personnel Assignment: Selecting the personnel to work at night based upon employee satisfaction, family disruptions, supervisory problems, etc.

Resources: The ability of the Cabinet to staff and operate both day and night operations.

Decision Making: The ability of onsite field personnel to make decisions regarding the project.

Public Relations: Activities undertaken to inform the public about the nature of the work, why it is being performed at night, what delays are expected, and the availability of alternate routes.

Time Limitations: Employee work hour limitations.

Type of Work: Activities which the state has deemed unacceptable for night work or activities in which the state encourages night work.

1.1.7. Legal Issues:

Local Ordinances: Legal policies or rules established by the local government regarding the performance of construction work at night.

Local Restrictions: Restrictions imposed by non-governmental organizations such as unions, materials suppliers, etc.

1.2. Advantages to schedule the activities during night time

In case of the flyover projects which are constructed in India disruption in the working zone and the disruption of construction equipment on road is the major problem. It may cause the accident on site which ultimately delays the project, which increases the total cost of construction. Then this total cost and total duration of project is compare with the actual cost and duration.

- Less congestion in work and timely completion of activities
- Less fuel consumption
- Minimizing inconvenience to the travelling public
- Safety risk
- Cost risk
- Productivity risk
- Schedule risk

these risk are minimized by drawing the lighting plan and traffic plan .to increase the visibility during night time the new lighting technology is used that is balloon lighting .in this the balloon are used to diffused the light.

II.OBJECTIVES

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

III. 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

IV. METHODOLOGY OF WORK

For this report the methodology adopted is as follows.

1. First prepare the objectives and problem statement for the project. As stated in problem statement the main objective of project is decided as the effect of night time construction on total duration and total cost of project by considering quality and productivity of work.
2. Then, collect all the data in forms of journals, research papers, articles and prepare literature review with consideration research work. For this about 5 researches paper were collected and their summary report submitted in this report.
3. Select the flyover site and collect all the data required for the project.
4. Analyze the data and find out activities which are suitable for night time construction
5. Also by analyzing the data find out the total change in duration and change in cost of project.

V. DATA COLLECTION

1. Name of site :Construction of elevated structure ,road and service road of NH4 from km 24.500to 25.770in the state of mharashtra under pc mode.
2. Locatin:Old Mumbai-pune highway,dehu toad ,pune
3. Client:MSRDC Project
4. Total cost :43.20Cr
5. Length:-1.70

The work is allotted to T&T infra private imitated constructed the 4 lane flyover which is started from 1st December 2016 .the project is planned for 517 days up to 1st May 2018.

VI. THE SELECTION OF ACTIVITIES FOR NIGHT TIME

The selection construction activities for night time are one of the important tasks of this project. For the selection of activities during night time a



questionnaire is distributed to the site engineers who are working on the site. The questionnaires is based on the general survey, quality of construction, safety during construction, nuisance during construction (like noise, dust, vibration), illumination, productivity and cost of construction. From the different site engineer the we get the different answers. The questionnaire and its answers are as follows:

- 6.1 Questionnaire based on general survey
 - 1. Does your company use night time construction?
 - 2. At what project development stage does your company perform night time construction?
 - 3. What are the factor that affect your choise to use night time construction?
 - 4. Dose your company have specification for performing night time construction?
 - 5. Do you encounter any problem associated with a night schedule?
 - 6. In your opinion ,do the following general areas contribute problem to night construction ?
 - 7. How important do you fell about the following disadvantages of performing night time construction
- 6.2 Questionnaire based on night time construction aspect :Quality
 - 1. Based on your experience ,do you think night time work significantly impact construction quality
 - 2. Identify the impact on quality for each activity completed during night time
 - 3. Do the specification for night time construction quality differ from the daytime construction
 - 4. Are there any innovation method of quality control being applied by your company when performing night time construction
- 6.3 Questionnaires based on night time construction aspect: safety
 - 1. Are construction related accident more likely to occur in night time work zones?
 - 2. Which are the different causes of accident on site during night time construction ?
 - 3. Based on the following scale ,how safe do you feel working during night time ?
 - 4. Which are the different techniques adopted for safety during night time
- 6.4 Questionnaires based on night time construction aspect: nuisance
 - 1. Rate the following items as sources of night time construction nuisances.
 - 2. Does your company uses specific noise control strategies and methods to minimize the noise during night time operations?
- 3. How often does your company receive complaints of the following source of night time construction nuisances?
- 6.5 Questionnaire based on night time construction aspect: Illumination

- 1. Are contractors required to provide lighting plans prior to starting night time construction activities?
- 2. Are there any innovative methods of lighting being applied by your company when performing night time construction?
- 6.6 Questionnaire based on night time construction aspect: Productivity
 - 1. Does night time work significantly impact construction productivity?
 - 2. In your opinion, do the following night time factors impact productivity of night time operations?
- 6.7 Questionnaire based on night time construction aspect: cost
 - 1. Has your company compared the cost between daytime and night time construction?
 - 2. In your opinion, does the following construction cost impact night time operations?
 - 3. Does your company have night time cost control guidelines for night time construction?

This site location is in so much crowed area Therefore RMC truck requires more time to reach the destination, which ultimately delays the project. So it is necessary to shift some of the critical activities in night time which require more manpower, material and equipments. For this construction all the activities are completed during day time, therefore for analysis of duration and cost of project all the concreting work is shift to night time and reinforcement placing work is compete during day time and night time by increasing the men resource. The selected activities for night time and its durations are as follows:

Sr. No.	Activity
1.	Placing of reinforcement of foundation
2.	Concreting of foundation
3.	placing of reinforcement of pier
4.	Concreting of pier
5.	Placing of reinforcement of pier cap
6.	Concreting of pier cap
7.	Placing of reinforcement of girder
8.	Concreting of girder
9.	Placing of reinforcement of deck slab
10	Concreting of deck slab

By shifting those activities to night time project duration get reduced 517 to 425 indirectly cost of project also get reduced. When project get delayed by some month then project cost is increase.



V.CONCLUSION

1. 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.
2. The total duration of project is definitely decreases by shifting some day activities during night time, which increases the total cost of project; because the labour charges are more at night than day time and night there should be a good illumination system is required.
3. The construction project is delayed due to accident happened on site, which increases the cost of project that is more than the cost of project which are carry out during night time. Therefore to avoid the delay of project, accident on site due to traffic and for more working area it is necessary to shift some activities to night time for flyover project.

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

1. A detailed night time work plan should be prepare to improve the work.
2. The lighting plan and traffic control plan should be design before the work started.
3. Special sign board should be erected on the night time construction site with flash light mounted on it.
4. 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.
5. The use balloon lighting is better than the conventional lighting for good illumination.
6. 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.

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