

Impact on Traffic flow Due to Construction On Roadside: A Case Study Of Thaltej Gam to Vijay Cross Road

Meet Vidja¹, Assi. Prof. S. C. Rathod²

¹Final year M.E. Student, Civil Engineering Department, L. D. College of Engineering, Ahmedabad, Gujarat, India

²Assi. Prof. Civil Engineering Department, L. D. College of Engineering, Ahmedabad, Gujarat, India

Abstract - The historic city Ahmedabad is the largest city in the Indian state of Gujarat. The population of Ahmedabad in 2016 is over 7 million people in the city and approximately 8 million in the urban agglomeration. So as solution and improve the overall quality of life of the residents of Ahmedabad, the Government of Gujarat is considering building of a metro transport facility. At present scenario metro construction work are ongoing. Long term work zones on urban Roads leads to many problems such as reduction in capacity, increase the travel time delay, queue length, fuel consumption, and roadway accident which leads to unaccounted economic losses. So it becomes necessary to study and quantify the impact of mass rapid transit system construction work zones on traffic which will further help in estimating the economic loss due to metro rail construction work zone.

Key words: Work zones; capacity loss; speed reduction; travel time delays; fuel consumption; economic losses, etc.

1. INTRODUCTION

In a developing Country like India, it is necessary to meet the expectations of growing demand with the increasing population. It paves way to Construction and reconstruction of transportation Infrastructure. In this Construction work zones are inevitable.

Several attempts have been made worldwide to reduce traffic congestion by improving old and constructing new rapid transit systems. Since the late 19th century, rail-based transit systems have been considered as a better solution to the problem of street or traffic congestion by virtue of having their own rights-of-way, capability of alleviating environmental pollution, and accelerating economic growth.

The historic city Ahmedabad is the largest city in the Indian state of Gujarat. The population of Ahmedabad in 2017 is over 7 million people in the city and approximately 8 million in the urban metropolitan.

There are approximately 31,000 rural families living in Ahmedabad with about 1,700 of them living below the poverty line. In addition to the rural families, around 250,000 people are living in slums. The population density is around 9,900 people per square kilometer or around

26,000 per square mile. There are around 2,500 registered non-resident Indians living in the city as well. As per the recorded of Ahmedabad Municipal Corporation (AMC) the city has 26 lacs vehicles which are growing at the rate of 2.19 lacs per year. To promote and enhance regional mobility and serve the public by providing quality transit services and solutions that improve the overall quality of life of the residents of Ahmedabad, the Government of Gujarat (Gujarat infrastructure development Board) is considering building of a metro transport facility, up gradation of regional rail facility and the present initiative of BRTS.

It becomes necessary to study their impacts and operational issues. Speed delays, bottlenecks, accidents are more pronounced during reconstruction activities in construction work zones, analysing the impacts of the work zones and formulation of strategies is vital for effective Management and safety of road users.

2. CRITICAL LITERATURE REVIEW

The following are the previous research review based on application of value engineering in building construction project.

Ravi Bhutani et.al. (2014) quantified the impact of mass rapid transit system construction work zones on traffic environment which will further help in estimating the economic loss due to metro rail construction work zone. And also simulate various scenario using ViSSim software and study the impact of changing work zone conditions on traffic flow characteristics. And concluded that, Systematic work zone scheduling and traffic management techniques are required to be implemented and to reduce impacts of work zone. The maximum percentage of economic losses is due to loss in time by bus passengers in the work zone. Public transport should be given priority in the work zones.

Benekohal, R.F. et.al. (2017) evaluate queuing analysis procedures and relevant factors affecting queue length and road user costs, to evaluate the performance of current techniques for estimating delays and queue lengths, to assess the role of intelligent transportation systems (ITS) in work zones, and to recommend a queuing analysis and road user cost estimation method. New UIUC Models were developed to determine capacity, speed reduction, delay,

and queue length. The UIUC Models consider effects of heavy vehicles, work intensity, narrow lanes and shoulders. and after analysed the data they concluded that, Incentive/Disincentive and lane rental procedures were more effective in reducing the delay in work zones. For road users cost calculation, QUEWZ and spreadsheets were used more often than other techniques. States were very satisfied with their spreadsheets for road users cost calculations.

Dixon, K. et.al. (1996) analysed speed-flow behaviour for evaluation of work zone sites based on lane configuration and determine the location within the work zone where capacity is lowest. Capacity information will help designers to determine the number of open lanes required during construction, adjust the construction schedule, calculate user costs, and perform other traffic control tasks. The difference appears to be primarily due to driver type and familiarity.

Hang Shen et.al. (2011) study the road construction issue with traffic assignment theory and analyse the influence of road construction on traffic flow distribution quantitatively. And concerning the influence of traffic distribution on both motor cars and non-motor cars. And applies shortest path with capacity limitation method to distribute traffic volume, and then applies MATLAB software and calculate data, and analyse the influence of road construction on traffic flow distribution.

Ingrid P. S. Araujo et.al. (2014) identified and characterize the PM emissions on a construction site with different aerodynamic diameters (PM_{2.5}, PM₁₀, total suspended particulates (TSP)).study applied on a multifamily residential building construction site during three different construction phases (earthworks, superstructure and finishings). Result show that the activities on construction sites emit different types of particles with environmental impacts through a higher emission of TSP.

Mir Shabbar Alia et.al. (2014) estimate the congestion cost on an arterial route of Karachi. (A metropolitan city of Pakistan) that has significant importance due to the industrial and port associated activity. It describes the complete methodological process from data collection to cost per minute delay. The results obtained that indicate Pak Rs. 1 million are lost daily due to traffic congestion, which is extrapolated for whole Karachi. The amount is a composition of opportunity and fuel consumption costs caused due to excessive delays in congestion.

Vidya R. et.al. (2012) study and assess the impact of work zones on Speed characteristics during widening of a highway. The variation of speed in different construction work zones is analysed during different construction stages in different stretches with a case study of the Four Laning project of Trichy-Thanjavur Section of the NH-

67. On the basis of the results from the study, speed of the vehicle is more in the advance warning zone and decreases as it enters the approach transition zone and then decreases further in the activity zone and increases again in the terminal transition zone. The average speed of the vehicles at the transition zone of the construction area was reduced by 60 % of the speed at the advance warning area.

CHEN Yanling et.al. (2009) points out key issues and the problems existed in present work, such as the relationship between infrastructure construction and plan, road construction, and post project supervision. It also provides experiences for Beijing and other cities on Traffic Impact Analysis (TIA). Beijing's TIA has helped coordinate the relationship between urban transport and land use. Especially, TIA measure, as one of the duties of Beijing Municipal Committee of Transport, has played an important role in improving the surrounding transport condition of construction projects and promoting the construction on the preliminary planning stage of such projects since 2004. Therefore, TIA in urban construction should have a well handled interface with transport infrastructure construction and relevant plans.

Ashish Dhamaniya et.al. (2013) introduced in the ratio of difference in 85th and 50th percentile speed to the difference in 50th and 15th percentile speed. If Speed Spread Ratio (SSR) is unity then speed data are truly normally distributed. It is noted that on six lane urban roads, speed data follow a normal distribution only when SSR is in the range of 0.86 - 1.11. The range of SSR is validated on four lane roads also.

3. SUMMARY

Long term work zones on urban Roads leads to many problems such as reduction in capacity, increase the travel time delay, queue length, fuel consumption, and roadway accident which leads to unaccounted economic losses. So, due to long term construction work zone as the number of lanes reduce from three in non-work zone area to two in work zone to one station work zone area. This has significant effect, as drastic decrease in capacity creates bottleneck which leads to congestion. Due to congestion in work zone area leads to increase in travel time, reduction in speed and increase in fuel consumption. It is very important to calculate the economic losses resulting from these parameters.

ACKNOWLEDGEMENT

I would like to thank to my Guide Prof. S. C. Rathod, Assistant Professor, Civil Engineering, Civil Department L.D.C.E, for his moral support, constant unceasing encouragement, critical evaluation, suggestion, constant untiring guidance and affection during the entire span of my post-graduation study.

REFERENCES

- [1] Benekohal, R. F., Kaja-Mohideen A., Chitturi, M. (2003), "Evaluation of Construction Work Zone Operational Issues: Capacity, Queue, and Delay", Report No ITRC FR 00/01-4, Department of Civil and Environmental Engineering.
- [2] CHEN Yanling, DU Huabing, "Relationship between Traffic Impact Analysis and City Construction—A Case Study in Beijing.", *J Transpn Sys Eng. & IT*, 2009, 9(6), 21-25.
- [3] Dixon, K., Hummer, J. E., Lorscheider, A. R. (1996): "Capacity for North Carolina Freeway Work Zones", *Transportation Research Record 1529*, Transportation Research Board, Washington, D.C.
- [4] Hang Shen, Huiyuan Jiang, "Research on Road Construction Effect upon Traffic Flow". 978-1-4244-9600-6/11/\$26.00 ©2011 IEEE.
- [5] Ingrid P. S. Araújo, Dayana B. Costa, and Rita J. B. de Moraes, "Identification and Characterization of Particulate Matter Concentrations at Construction Jobsites", *Sustainability 2014*, 6, 7666-7688; doi:10.3390/su6117666.
- [6] Mir Shabbier Alia, Muhammad Adnan, Syed Muhammad Noman, Syed Fazal Abbas Baqueria, "Estimation of Traffic Congestion Cost-A Case Study of a Major Arterial in Karachi", *Fourth International Symposium on Infrastructure Engineering in Developing Countries, IEDC 2013*, *Procedia Engineering 77 (2014) 37 - 44*
- [7] Ravi Bhutani, Dr. Sewa Ram, Dr. Kayitha Ravinder. "Impact of metro rail construction work zone on traffic environment", *11th Transportation Planning and Implementation Methodologies for Developing Countries, TPMDC 10-12 December 2014*, 2014, Mumbai, India.
- [8] Vidya R, Santhakumar Moses, Mathew Sampson, "Impact of work zones on speed variation during widening of highway", *International Journal of Engineering Science and Technology (IJEST)* ISSN : 0975-5462 Vol. 4 No.02 February 2012.
- [9] The Indian Road Congress, IRC: SP 55. 2013 (First Revision).
- [10]. The Indian Road Congress, IRC 86-1983.