TRANSPORTATION RECOMMENDATIONS FOR TRAFFIC DELAYS AT AT-GRADE INTERCHANGES

Ali Samet Ayvaz
Samsun University, Technical Sciences Vocational School
Samsun, Turkey
alisamet.ayvaz@samsun.edu.tr

Abstract

In this report, there are suggestions for solutions to traffic delays and problems experienced at level crossings on the Samsun light rail system route. There are 8 level crossings on the 1st Stage Samsun LRS route. These are the passages on Denizevleri, Atakum Municipality, Mimar Sinan, Türkiş, Ömürevleri, Atakent, Yeni Mahalle and Körfez Stations, respectively. In the traffic counts measured on the Türkiş level crossing in November 2017, it was determined that approximately 30,000 vehicles passed in one day. When it is calculated that the traffic moment (number of trains x number of vehicles) on this intersection is calculated as 9.000.000, the railway or highway should become level at this intersection. As an example, approximate exploration costs of 3 different alternative crossings on the Türkiş level were calculated.

Keywords: level crossing, Stations, crossing, at-grade intersection, traffic count, traffic moment, railway, highway, approximate exploration costs.

I. INTRODUCTION

 The infrastructure sewerage and drinking water lines at the Türkiş level railway crossing located at the intersection of Atatürk Boulevard-Alparslan Boulevard in Atakum district of Samsun province can be seen in the figure.

Fig 1. Sewerage and drinking water lines of the infrastructure

II. RAILWAY VIADUCT MODEL

One of the ways to level the railway on the Türkiş level is to remove the railway from the highway level and cross it with a viaduct. A length of 350 m is required to pass this viaduct on a 6% slope. In static calculations, 9 viaduct pillars over 350 meters were calculated. Highway traffic circulation can be operated as a roundabout under the viaduct.

Fig. 2. Türkiş Railway Viaduct Model

Before the construction phase of the viaduct, existing platforms and truss shelter areas should be moved and temporary and new truss and platform fabrications should be made. The construction period of the project is 90 days. The continuation of the operation can be ensured by running the ring between the temporary tram stops and the operating viaduct, which will be built for a period of 90 days, or by operating a bus between Türkiş and University.

The approximate cost for this project is $2,992,139.

III. HIGHWAY UNDERPASS MODEL

This system will only become applicable with the displacement applications of pile foundation and water and sewerage infrastructure lines. There are waste water and storm water main crossing lines 1m below the level of the at-grade junction. These lines should be displaced and the highway underpass tunnel should be crossed with a pile wall and box. However, the rail and catenary works in the section corresponding to the tunnel must be completed after the tunnel manufacturing is completed. The continuation of the tram's operation can be provided in two directions by adding 2 S scissors-rail before the station before the construction phase of the viaduct.

Left turns at the highway junction can be made by turning right from the nearest street after the underpass crossing. These streets need to be made one-way.

Fig. 3. Türkiş Highway Underpass Model

The approximate cost for this project is $3,051,106.

IV. RAILWAY TUBE TUNNEL CROSSING

Another suggestion for the Türkiş at-grade junction is to take the LRS line under the highway with a tube passage tunnel. The entrance and exit slope of the tube passage tunnel is again designed as 6%. Before the construction phase of the tunnel, the existing platforms and truss shelter areas should be moved and temporary and new truss and platform fabrications should be made. The construction period of the project is 90 days. The continuation of the operation can be ensured by running a ring bus between the temporary tram stops and the operating viaduct, which will be built for a period of 90 days, or by operating a bus between Türkiş and University.

The approximate cost for this project is 3,497,435 dollars.

Fig. 4. Türkiş Railway Tube Tunnel Crossing Model

References

1. Akçelik, R.. Traffic Signals: Capacity and Timing Analysis, Research Report ARR No:123, ISBN 00 869910 015 7, 108, Australia, 1993.
2. Akçelik, R.. Traffic Signals: Capacity and Timing Analysis, Research Report 123, Australian Road Research Board, Melbourne, Australia,1991.
3. Ayvaz A. S. and Alalou M., "Lubrication Models in Railway Curves," International Journal of Innovations in Engineering Research and Technology, vol. 8, no. 4, pp. 154–160, Apr. 2021.
4. Ayvaz A.S. and Alalou M., "Situational Assessment Of Cost-Benefit Analysis Of Lubrication In Curves" JournalNX-A Multidisciplinary Peer Reviewed Journal, vol 7, no 10, pp.226-230, 2021
5. Doherty, A, R. Comprenhensive Junction Delay Formulae, LRT1 Working Paper, Department of Transport, U.K, 1971.
6. Gökdağ, M., Sinyalize Kavşaklarda Meydana Gelen Taşıt Gecikmelerinin Simülasyon Modellemesi, Doktora Tezi, Karadeniz Teknik Üniversitesi Fen Bilimleri Enstitüsü İnşaat Mühendisliği Anabilim Dalı, Trabzon,1996
7. Murat, Y. Ş., Denizli Şehiriçi Kavşaklarındaki Trafik Akımlarının Bilgisayarla İncelenmesi, Pamukkale Üniversitesi, Fen Bilimleri Enstitüsü, İnşaat Mühendisliği Anabilim Dalı Yüksek Lisans Tezi, Denizli,1996
8. TRB, Special Report 209: Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., USA,1994
9. TRB, Special Report 209: Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., USA,2000
10. Webster, F. V., Traffic Signal Settings, Road Research Technical Paper, No39,Road Research Laboratory, Her Majesty Stationary Office, London, UK,1958

11. Webster,F.V.,Traffic Signal Settings, Road ResarchTechnical Paper, No39,Road Research Laboratory, Her Majesty Stationary Office, London,UK,199

12. Vuillemier, F., Weatherill A., Crausaz. B, Safety Aspects of Railway and Road Tunnel : example of the Lötschberg railway tunnel and Mont-Blanc road tunnel, Tunnelling and Underground Space Technology, vol 17, no 2, pp. 153-158, April 2002.

13. Dr. K. Chandramouli, J. Sree Naga Chaitanya, K. Divya, B. C. Koteswara Rao, A Study on Marmary Tunnel, International Research Journal of Modernization in Engineering Technology and Science, vol 5, no 3, pp. 1587-1590, March 2023.