Kuril Flyover – Elegant by Natural Solution

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Summary

Kuril 'flyover' is in reality a road-rail traffic interchange in Dhaka city which has been opened to traffic in August 2013. The interchange replaces two skewed major-major T-junctions across a multi-track railway level-crossing. The congested intersection has a projected ADT of 452 000 PCU in 2020. Complex road-rail traffic interaction, severe space constraint, generous railway clearance demand and height restriction by civil aviation authority offered a unique intersection problem with no standard solution. This paper describes development of a non-standard interchange solution and attempts to establish that elegant structures are the natural outcome of straightforward engineering. Core of the solution is an elegant central lake developed from a wetland, perimeter of which acts as a one-way traffic roundabout. The tributary left-merging traffic would arrive and depart by at-grade roads, or via 'flyovers' where obstructions such as railway and conflicting traffic streams exist.

Keywords: flyover; traffic interchange; curved box girders; post-tensioned I-girders.

1. Introduction

Kuril intersection was a traffic nightmare at the international gateway to Dhaka city. Airport Road, a major dual-carriageway thoroughfare from the International Airport to city, runs alongside a multi-track intercity railway line at the location. Another major dual-carriageway road joins the Airport Road crossing the railway lines to form a complex skewed T-junction cum level crossing. A third dual-carriageway road was under construction that would meet the intersection in yet another T-junction a few meters from the existing level crossing (Fig. 1). A solution to the problem by adopting a standard intersection form was not available; certain amount of ingenuity was required to devise a simple yet effective solution.

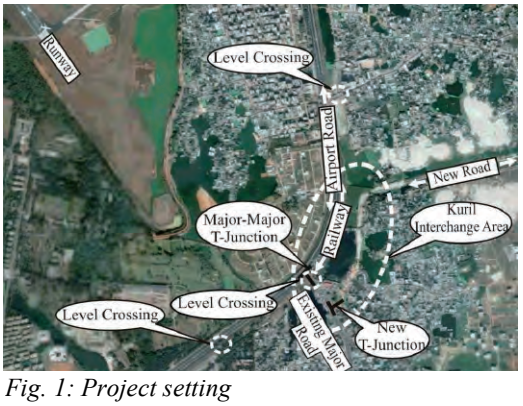

Fig. 1: Project setting

This paper describes development of an interchange solution which aimed to improve traffic handling capacity of Kuril intersection, improve level of service of Airport Road, reduce vehicle operating cost and passengers' value of time cost, and reduce junction operation cost by eliminating level-crossing.

2. Analysis and design

Having decided that a completely no-conflict free-flow interchange facility would be created at Kuril, grade separation for segregation of road and rail traffic became a necessity. Roads meeting at the intersection convey traffic from five origin-destination (O-D) nodes, giving rise to twenty

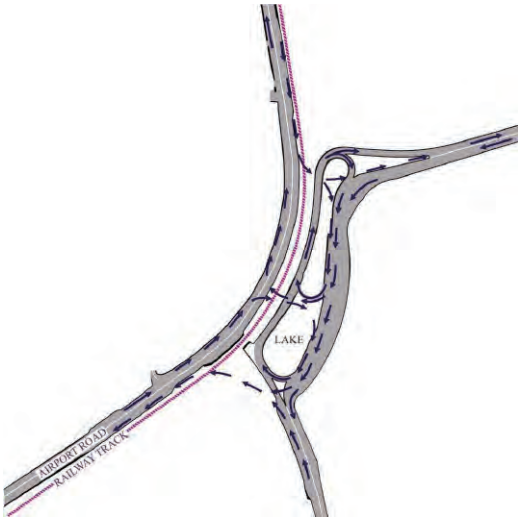

Fig. 2: Elongated 'roundabout' with connecting ground and aerial routes

Fig. 3: Panoramic view of constructed interchange

directional flow demands. Desirable solution would require channelization of all traffic through the junction in unidirectional paths merging and diverging on the left. A simple solution was devised by creating a one-way circuitous path on ground in a strip of marshy wasteland beside the railway tracks. To preserve the area bounded by this 'roundabout', a lake was to be developed there by cleaning and dressing the marshy wasteland.

The 'roundabout' was connected to roads on the same side of railway tracks by one way ground roads. To reduce travel distance of some of the routes, an at-grade link bridge across the lake was also planned. Connection to the arterial Airport Road lying on the other side of railway tracks needed some aerial paths. The resulting connectivity diagram is shown in Fig. 2. The aerial paths were materialized by two Y-shaped and two U-shaped flyover loops. The total interchange facility thus evolved (Fig. 3) featured complete segregation of road and rail traffic and conflict free one way travel in all twenty directional routes.

Elevated elements of the interchange consisted of four separate flyovers each curved in plan. Choice of structure type depended on span length, economy, aesthetics and constructability by local contractors. A combination of post tensioned concrete I-girders acting compositely with cast-in-situ RC deck slab and curved RC box girders has been used for the structures. Ancillary structures in the project consist of an at-grade bridge over the lake and three pedestrian over bridges. A three-span continuous RC box girder configuration has been used for the at-grade bridge. A single span through-type tied-arch truss configuration bridging over the entire six-lane carriageway as well as the flanking footpaths was chosen for the pedestrian over bridges.

3. Aesthetics and Elegance

Geometrical layout of the facility evolved strictly around functional requirements. The design yielded four flyovers and an at-grade bridge spread over the interchange area like carefully laid ribbons with the lake being the central flower in the bouquet. Channelization and spread of traffic from a point of concentration to a wider area have helped create a serene environment within a chaotic city.

Result of the conscious effort to satisfy functional, structural, economic and aesthetic requirements has been a total interchange solution which has brought relief to city traffic at Kuril. The elegance of Kuril 'flyover' stems from the fact that it is a simple yet extremely effective solution to a seemingly chaotic traffic congestion problem.

Kuril Flyover stands out as an example of elegance achieved through ingenuity in finding a simple yet effective solution. The project demonstrates that elegant structures come naturally when problem and site specific considerations are carefully attended to.