Rehabilitation and Widening of the Markham Road Bridge over CPR

In the Spring of 1993, Markham Road will be widened from four to six lanes between Sheppard Avenue and Steeles Avenue. In preparation, several of the bridges in this section of Markham Road are being rehabilitated and widened.

Erection of prestressed box girders for the Markham Road bridge widening. This is a five span structure, longest span 33.5 metres.

In May 1992, the Municipality of Metropolitan Toronto retained LEA Consulting Ltd. to carry out the condition survey, structural design, and the preparation of contract documents for the widening and rehabilitation of a 5 span, 105 metre long bridge over 8 CPR tracks (2 mainline and 6 yard tracks) north of Sheppard Avenue. As required by the National Transportation Agency's Board Order application process, we filed an Environmental Assessment Report for the bridge proejct, and obtained the Board Order. This required considerable consultation and liaison with the CPR during the 5 month period from the start of the design to the start of construction (fast-track process). Sonterlan Construction Corporation began work in September 1992 and they are scheduled to finish by May 1993. LEA are supplying fulltime inspection services to Metropolitan Toronto.

Use of precast concrete girders for the widening allowed fast erection over a busy CPR corridor. 425 mm wide cast joint area is visible between new and old bridge portions. Minimal formwork is required in this widening design, again simplifying work over rail.

The bridge will be widened by erecting three pre-stressed box girder lines on new piers and abutments constructed on each side of the existing deck. The new concrete deck will be cast on the girders before the new and old piers are connected and before the mating joint between new and old girders is cast. This is required to minimize differential settlements between the new and existing spread footings; that is, it was necessary to place all possible dead load on the new substructure before connecting it to the existing substructure. Construction of the pier footings was constrained by extremely tight shoring clearances to the CPR tracks.

PROJECT SUMMARY

Client:
City of Toronto

Location:
City of Toronto, Canada

Services Provided:
Structural Engineering, Condition Survey and Construction Administration

Completion Date:
1993

1429

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The rehabilitation works include deck repairs, replacement of the asphalt overlay and waterproofing, installation of new expansion joints, repairs at pier caps and columns below two deck joints and replacement of the rocker bearings with laminated elastomeric.

During the engineering design for this project we encountered towo issues which required novel solutions:

- A Bell Canada duct bank located in the east sidewalk and containing six cables, a fibre optics cable, and ancillary cables had to be relocated as part of the bridge widening and rehabilitation. In order to avoid costly recabling work, each cable in the old sidewalk duct bank will be chipped free from it's duct, arranged in proper sequence and shifted laterally to a new "split duct" structure mounted on the outside edge of the new girders. At the north approach to the bridge a new section of cable has been spliced into each existing cable in order to create the slack required to shift each cable separately to the new duct structure.

- Because of the heavy volumes of traffic going to and from Toronto during the morning and evening rush hours, Metro Transportation were concerned about the potential disruption to traffic that would occur if traffic flow across the Markham Road bridge was restricted during these periods. In order to minimize delays to motorists and to respond to the strong directional shifts in demand, a movable concrete barrier was installed to help channelize traffic flow. In the morning peak period this system provides two lanes for southbound traffic and one lane for northbound vehicles. Prior to the evening peak period the barrier is moved to provide two lanes northbound and one southbound.

As a final note, this project was of historical interest to LEA since the original bridge structure was designed by a precursor firm to LEA Consulting Ltd., Lazarides and Loundt 30+ years ago.

"Quickchange TTV" parked at layby area near end of movable barrier system. The barrier was relocated twice daily during a major construction stage when deck width was restricted to three lanes total.