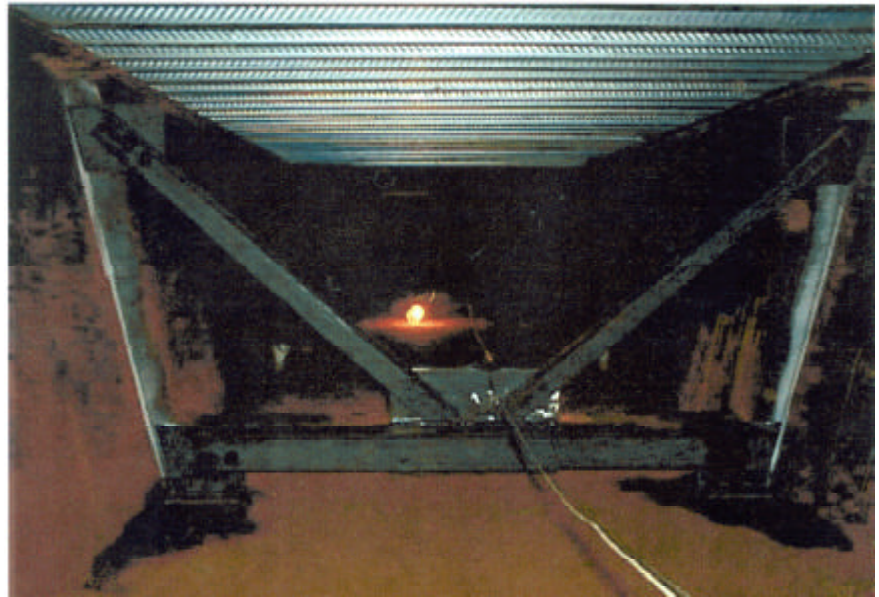


QEW and Highway 403 over Ford Drive Interchange Bridges

LEA were retained to carry out detailed inspection work and NDT testing at 14 fatigue critical bridge structures for MTO, Central Region. During the assignment, the work was extended to include inspection of 4 steel box girder bridges at the QEW and Highway 403 over Ford Drive Interchange.

Cracks had been noted at some box girder webs during routine OSIM inspections. LEA found that distortion-induced cracking had occurred in girder webs at 119 out of 120 locations where internal X-bracing angles connected to web stiffeners near the bottom flange. Stiffeners had not been connected to the bottom flange, and forces in these angles were transmitted to the web plate causing out-of-place bending. These bridges are subject to heavy truck traffic volumes, but were only 20 years old at the time. The cracking in the webs varied in severity, but at some locations had progressed 450 mm up the web vertically and 400 mm horizontally above the bottom flange.



View of new K-Bracing inside box girder, connection also added for stiffener to bottom flange.

LEA then carried out 3D FEM modelling to determine out-of-place stresses in the girder webs under various patterns of truck loading, and to examine alternatives for repairs. Contract documents and drawings for repair of the bridges were prepared for tender.

LEA then supervised and inspected the repair work in the field, and were responsible for NDT and inspection work in the shop.



Typical distortion induced cracking at box girder web viewed from outside.

PROJECT SUMMARY

Client:
**Ministry of Transportation,
Central Region**

Location:
City of Oakville, Ontario

Services Provided:
**Project Management, Structural
Engineering, Inspections, NDT**

Cost:
\$ 1 Million

Date of Completion:
1999



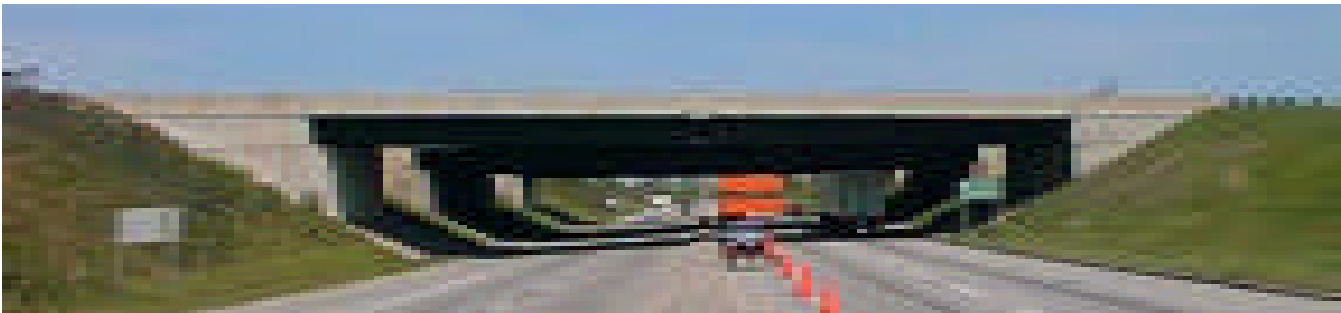
Repair details included:

- ◆ Shift internal X-bracing frames away from damaged web areas by one stiffener location. This provided access to the webs for repairs and eliminated further out-of-place forces to damaged areas. The detail at the new internal bracing location included connection of the stiffener to the bottom flange and installation of new K-bracing.

- ◆ NDT testing was again carried out to define the ends of cracks;
- ◆ Cracks in the webs were drilled at the ends to arrest further growth.
- ◆ Following a pre-determined sequence, the lower parts of stiffeners at damaged web areas were cut, and the area ground smooth. Abrasive blast cleaning was carried out and

non-slip splice plates installed utilizing high strength bolts. The connection of the web to bottom flange was restored and the web stiffener rebuilt.

Photographs with this fact sheet illustrate some of the project details.



Elevation of four Hwy. 403 and QEW bridges over Ford Drive near Oakville, ON.



Typical web repair plate assembly inside box-girder, note also stiffener restoration and bottom flange connection.