

SC/08/009

BRIEFING NOTE

The partial collapse of the ‘de la Concorde’ overpass bridge: Laval, Canada

This briefing note is derived from the official inquiry report noted in reference 1.

On 30th September 2006 the central ‘drop-in’ span of the de la Concorde highway over-bridge in Laval, Canada, suddenly collapsed onto the road below causing 5 fatalities and 6 injuries. This shocked both the general public and the professional communities. A Commission of Inquiry was quickly established and this reported in October 2007 [1].

The Commission concluded that the collapse was due to a number of factors, none of which was sufficient in itself to cause failure, but which came together on that day. They reflected both technical shortcomings, and human failings: the latter amounted to negligence in respect of the construction, and serious lapses in the management of the structure throughout its life.

The de la Concorde overpass structure was built in the 1960s as part of Canada’s post-war infrastructure expansion. The structure was innovative for its time in the manner in which the central span was designed- allowing a single span over the roadway. The in-situ side spans had raking columns. A short cantilever, ending in a half-joint, picked-up the central ‘drop-in span’ of precast prestressed concrete boxes placed side by side. The structure failed at the half joint.

The Commission gave early warning to the authorities of shortcomings they had discovered in the design standards for thick slabs without shear reinforcement in the presence of concrete deterioration. As a consequence, the maintenance inspection standards, and associated quality controls for highway bridges, have been reviewed throughout Canada.

This type of half-joint is no longer an accepted detail: it is vulnerable to deterioration and very difficult, if not impossible, to inspect and maintain. The joint relies on accurate reinforcement placement and good quality concrete. Neither was achieved in this case.

Lessons for the UK

The Commission of Inquiry concluded that the fate of the structure¹ was found to be determined by:

- Poor design (although in accordance with contemporary codes)
- Failure on the part of the designers to look beyond the design code
- Poor quality control and supervision during construction
- Deterioration over its life as a consequence of poor quality materials, salt contaminated water and freeze-thaw cycles.
- Poor maintenance and repair procedures
- Inaccessibility of critical elements
- Failure by the maintaining authorities to act decisively

Although the UK's procedures differ from those of Canada, the conclusions drawn by the Commission should be carefully considered, viz:

- Failure of parties to discharge their contractual responsibilities in respect of quality control and supervision during the construction,
- Failure of the maintaining authority to relate the maintenance regime to the needs of the structure and its risk profile; inspections were not allocated sufficient time and lacked proper consideration,
- No one shortcoming was dominant in the cause of the collapse: it resulted from an accumulation of shortcomings over time.

The Commission recommended various measures designed to ensure engaged consultants and contractors are competent, have appropriate staff and identify sub-contracted work. It was also recommended that the performance of engaged organisations be recorded and that appointments take account of these wider issues. However, the inference is that once satisfied, cost determines the successful appointee.

Commentary

The need to undertake an assessment of highway structure proposals from a holistic perspective stands out from this incident. Good design does not just stem from application of design codes. It requires consideration of aspects outwith many codes: buildability, required supervision levels, ease of maintenance and whole-life costings.

The UK has developed good practice both within HA and at national level (for example the new HA Bridge Inspection Manual and the CSS Code of Practice for Management of Highway Structures). Forward looking authorities are using these guides to manage infrastructure effectively with regard to relative risks. However the standard at which it is

¹ There is a disconcerting parallel- in part at least- with the causes which led to the collapse of the Wolverhampton Pipers Row car park structure in 1997.

applied does appear to vary (along with appropriate funding). Some authorities are no longer able to provide dedicated bridge engineers to manage infrastructure, nor do they engage consultants to undertake the management function. Occasional engagement of consultants is sometimes based on lowest cost rather than a mix of cost and quality.

The competency of those undertaking inspections is a subject which is attracting the attention of some of the major clients. There is a strong argument for a recognised training regime and NVQ or similar qualification.

The pressures on maintenance budgets will lead to a temptation to delay any remedial work if the safety of the structure can be justified (sweating the asset); although more sophisticated analysis can sometimes support this approach, it requires careful thought by those with suitable competency, and an appreciation of the long-term consequences.

Reference

- 1 Commission of Inquiry into the collapse of a portion of the de la Concorde Overpass October 3, 2006-October 15, 2007. REPORT at http://www.cevc.gouv.qc.ca/UserFiles/File/Rapport/report_eng.pdf

Prof. Jonathan Wood has also produced a summary paper published in the Structural Engineer Vol 86 No 1 pp 16-18 8 January 2008.