Corrosion

Local corrosion on girder edge

Broken girder edge due to corrosion

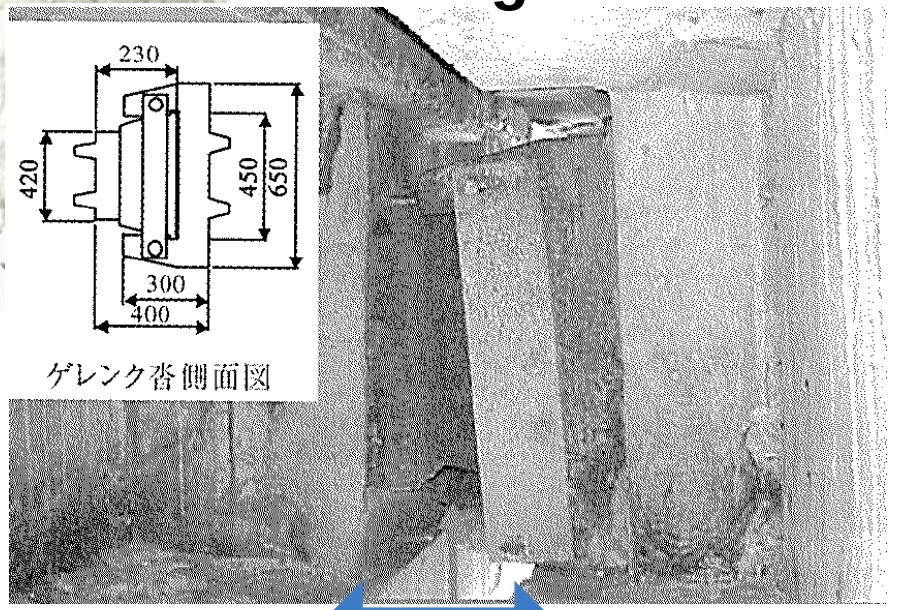
Anchor of PC cables inside the girder

Sag at the mid-span hinge position

Built in 1971

L = 161.65 m (33.5 + 72 + 53)

Horizontal metal bearing



2002 & 2012 Specifications for Highway Bridges

1. International trend in promoting performance-based codes to ease trade barriers (ISO2394 (1998))
2. Flexible acceptance to innovative technologies in construction projects to meet diversifying technical proposals
3. Needs for durable and maintenance-friendly structures

Advent of Performance-based Specifications

1) From prescriptive to performance-based: Required performance criteria were philosophically set out, as requested by ISO2394
2) Performances comes first and mandated. Standards are regarded as acceptable solutions. Alternatives can be confirmed to see if the alternatives offer equivalent or greater performances than the standards.
3) Prescriptions for durability demands on fatigue in steel members, and chloride ingress in concrete members, durable RC deck slab design etc were shown.
4) A maintenance plan and relevant countermeasures are required in initial design.

A big Issue in promoting innovative procurements:

How to evaluate the durability & establish QA/QC processes in construction for new materials and structures

Figure 10. This photograph, taken in the westbound D Street portal tunnel after the accident, shows a number of roof hanger plates that have begun to pull away from the tunnel roof, including the two-anchor hanger plate in the foreground and the four-anchor plate adjacent to it.

I-95 Mianus River Bridge

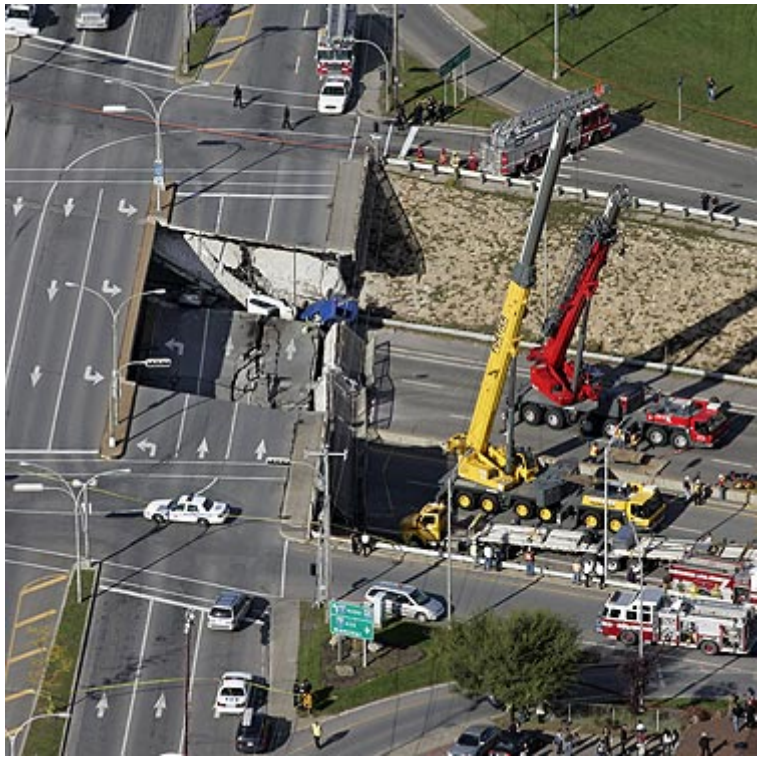
CONNOR, R.J. et al., Inspection and Management of Bridges with Fracture-Critical Details, NCHRP SYN. 354, 2005

Sudden collapse of de la Concorde Overpass, Quebec, Canada, in 2006

RC drop-in girder, L = 60.8 m

Built in 1970 and collapsed in 2006 (36-year old)

Cause: Corrosion of reinforcement bars, inadequate reinforcement arrangement, & insufficient amount of reinforcement, resulting in shear failure of a drop-in span



Ref: "Commission of Inquiry into the Collapse of a Portion of the de la Concorde Overpass"

Collapse of I-70 Bridge, US, in 2005

Post-tension PC bridge,

Length = 26 m

Built in 1950 and <u>suddenly</u> collapsed in 2005 (55-year old)

Cause: Corrosion and failure in PC cables

出典：http://www.post-gazette.com/pg/05362/628813.stm

Collapse of Ynys-y-Gwas Bridge, UK, in 1985

Post-tension & segmental girder PC bridge, Length = 18.3 m

Built in 1953 and <u>suddenly</u> collapsed in 1985 (32-year old)

Cause: 1. Corrosion and failure in PC cables

2. Insufficient grouting inside sheaths ➔ <u>Prohibited to construct PC bridges with grouting until 1996</u>

3. De-icing salt in winter

http://www.youtube.com/watch?v=PUg_EqQN6Gg&translated=1

Malfunctioning of two girders in Hoan Bridge (2000.12)

3-span plate girder bridge with 3 main girders

Fatigue crack starting from a welding part of gusset to attach a lateral member

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