Effective Bridge Management

Area Engineers March 2014

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Overview

- Introduction
- Inspection types
- Factors affecting bridge durability
- Bridge Defects
- Structural Capacity Assessments
- Repairs and Strengthening
Irish Stone Bridges (O’Keeffe and Simington): “...there is no reason to dispute the date range 1390-1410...”

Irish Stone Bridges (O’Keeffe and Simington): “…Richly mantled with ivy, this ancient Bridge is very picturesque, blending as it were with the ivy-clad walls of the castle...”
Minneapolis bridge collapse exposes inspection failures

A M M I N I S T R A T I O N  of the federal highway program's bridge inspection regulations were found to be insufficient in preventing the collapse of the 16th Street Bridge in Minneapolis.

The bridge was constructed in 1977 and had been inspected in 2010, but the inspection was conducted by a contractor that did not follow the required procedures. The inspection was scheduled to be repeated in 2014, but the federal government did not have the funds to do so.

Poor maintenance blamed for Montreal collapse

C A S A D I C S (Canadian Association of Municipal and Community Affairs) has called for better maintenance of public infrastructure in Montreal following the collapse of a bridge.

The bridge was part of a new road network and had been in use for only a few months. It collapsed due to poor maintenance and inadequate supervision. The Canadian government has announced a $500 million package to repair the damage and prevent future incidents.
Bridges on the NRA Network

- Almost 3,000 structures on NP & NS network > 2.0m span
- 60% Concrete, 27% Masonry, 8% Steel
- Not responsible for managing PPP bridges although we monitor the Concessionaire’s management of bridges
- MMaRC Contractors responsible for RM for bridges on their networks & NRA manage structural work
Eirspan Database

- New desktop version of database for Regional Road bridges will issue to LAs next month from NRA IT
- Existing data requires converting by NRA IT
- Booklet with screenshots from database explaining data transfer etc.
- New web-based version for NRA bridges
Inspection Types

- **Routine Inspection**
  - Previously an annual inspection by LAs
  - Engage consultants now

- **Principal Inspection**
  - Structural inspection by experienced bridge engineers
  - Interval 1-6 years

- **Special Inspection**
  - Defect investigation, underwater inspection, assessment
Routine inspection and maintenance

Vegetation clearance prevents stonework deterioration, debris clearance from watercourses prevents scour damage
Scour:
• Debris build-up must be cleared when found

• BD97/12 Assessment of scour at highway bridges

• CIRIA C551 Manual on scour at bridges and other hydraulic structures
PI – Inspect difficult access components
Special Inspection - Youghal Bridge
PTSI Phase 3 Inspection
Factors affecting durability

Leaking expansion joint or failed waterproofing. Modern construction of integral bridges where possible.
Waterproofing Application & Testing
Bridge Inspector Decisions – RC Defects

- BA 35/90 Inspection and repair of concrete highway structures
- CBDG Technical Guide 2: Testing & monitoring the durability of concrete structures
Leenane Bridge collapse

Build-up of debris at bridge following rainfall which exceeded 1/100yr return
Bridge Inspector Decisions – Parapet Damage

Is the failure mode of these parapets correct? Inspector to check for cracked posts
Bridge Inspector Decisions – Steel Defects

Plate Girder corrosion

BD12 includes for concrete invert to prevent such corrosion.
Structure Work Types and Numbers

- Road Bridge Replacement
- New or Replacement Footbridge
- Bridge Widening
- Masonry Arch Bridge Strengthening or Rehabilitation
- Concrete Bridge Strengthening or Rehabilitation
- Steel Bridge Strengthening or Rehabilitation
- Expansion Joint Replacement Only
- Parapet and Safety Barrier Only
- Scour Repair Only
- Retaining Wall Works Only
Issues to Consider Before Repair

- Condition rating & likely rate of deterioration
- Durability
- Structural capacity – assessment should be considered before significant repairs. Assess using BD21/01, BA16/97, etc for structures designed pre-BS5400.
- If bridge fails assessment, strengthening may be required
- No link between condition rating & assessed capacity
- Whole life cost – is it better to undertake cyclical concrete repairs to a slab soffit or replace the deck?
Assessments

- Coring to determine arch barrel depth
- Rare example of failure under load
Repair historic structures sympathetically

New NRA Specification Series 2400. Lime mortar 1 part NHL5 to 2.5 parts well-graded sand, full joints, stonework to match existing
Poor Aesthetics, Durability Issues
Expansion Joint Awareness
Masonry arch construction