PIARC COMMITTEE TC4.4:
Bridges & Related Structures

CONCLUSIONS

TASKS

- *TASK 1: Design and Construction for Durability*
- *TASK 2: Increase of Durability or lifetime in existing bridges*
- *TASK 3: Approaches to Cost Effective Bridge Management*

CONCLUSIONS: Durability in design and construction phases (1/2)

- **Durability must be considered explicitly at all stages**: specification, conceptual design, detailed design, construction, inspection and maintenance
- The increasing search for overall **optimal financial performance for the whole life** of such structures has raised the profile of questions of durability
- The **environmental conditions** which the infrastructure inhabits is of vital importance
- **Design standards** continue to respond to durability

CONCLUSIONS: Durability in design and construction phases (2/2)

- Major durability problems emanate from **poor construction** (e.g. low covers to reinforcement), leaking deck joints, chloride attack (often associated with leakage paths from failed joints) and deck **waterproofing failure**. The significance of these factors depends on the severity of the environment and specific design practices.

- Recognition of these problems has led in general to a shift in design concept for short/medium span bridges towards **eliminating (or reducing) deck joints** by adopting integral bridges (or favouring continuous decks).

- The **data set from questionnaire** provides a valuable reference point for bridge engineers to take an overview of the situation in their own country, and contrast it with the situation in other countries with similar conditions but with perhaps alternative approaches to mitigating durability problems, which may warrant closer examination.

CONCLUSIONS: Comparing traditional with innovative techniques for solving problems

- The major inspiration for proposing new alternative methods were considerations about the free traffic flow and the reduction of repair cost
- The use of new organic materials for repairing damages is a common innovative alternative.
- Frequent proposed recommendations were: avoiding bridge joints or mid span hinges and bridge parts accessibility for maintenance and repairing.
- Make every part of a structure accessible for maintenance, repair or replacement

CONCLUSIONS: *Approaches to Cost Effective Bridge Management*

- **Network analysis** essential to identify cost-effective priorities.
- Various prioritization methodologies and attendant factors have been adopted by the surveyed jurisdictions however **condition/deterioration** is the primary factor in the surveyed systems.
- The relatively low weighting of financial aspects in the prioritization factors is probably related to the subsequent moderation process.
- **Unfunded priorities** must be proactively & transparently managed.
- All surveyed countries conduct a **manual review** of the system derived investment candidates to take account budgetary limits and aspects of operation and maintenance of the road works not considered in the automated analysis.

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FUTURE

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FUTURE

- Future work for tasks developed
- Proposals by current Committee
- Proposals in Strategic Plan 2008-2011

FUTURE: Durability in design and construction phases

- Durability is a concept too wide to be covered in a single period.
- Environmental factors affecting
- Laws of chemical attack and progression models
- Physical and chemical damages
- Definition of the condition of a structure
- Detection of damages
- Increased use of corrosion resistant reinforcement
- Development of High Performance Concretes (HPC)
- Corrosion inhibitors
- Increased use of High Performance Steels
- New organic materials
- Increased use of Cathodic Protection
- Research on and wider use of Integral Bridges
- Special development of vulnerable members e.g. edge beams

FUTURE: Approaches to Cost Effective Bridge Management

- Bridge performance measures and relative influence on prioritisation.
- Non-bridge factor influence on prioritisation with particular reference to financial factors.
- Methodology for evaluating bridge needs relative to other infrastructure elements.
- Mappings of condition/defect and treatment options and the relative efficacy of options.
- Deterioration model investigation covering the various deterministic, stochastic and artificial intelligence approaches or combinations thereof.

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Proposals by current TC4.4

- Assessment of existing structures
- Monitoring of bridges: Methods and benefits
- Management of historical bridges
- Aesthetics in bridges: Efforts and cost

Proposals by Strategic Plan 2008-2011

- Inspections and NDT
- Assessment of the condition of bridges
- Innovative maintenance techniques
- Management of the bridge stock

Current TC 4.4	Strategic Plan
▪ Assessment of existing structures ▪ Monitoring of bridges: Methods and benefits ▪ Management of historical bridges ▪ Aesthetics in bridges: Efforts and cost	▪ Inspections and NDT ▪ Assessment of the condition of bridges ▪ Innovative maintenance techniques ▪ Management of the bridge stock

CLOSING