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# **INSPECTOR ACCREDITATION, NON-DESTRUCTIVE TESTING & CONDITION ASSESSMENT FOR BRIDGES**

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# INSPECTOR ACCREDITATION, NON-DESTRUCTIVE TESTING & CONDITION ASSESSMENT FOR BRIDGES

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## Setting the Context

- Why do we need to know bridge condition?
- What is bridge management?
- What type of inspections are we talking about?



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## Purpose

- Inspections and Non-Destructive Condition Surveys
- Assessment of the Condition of Road Bridges



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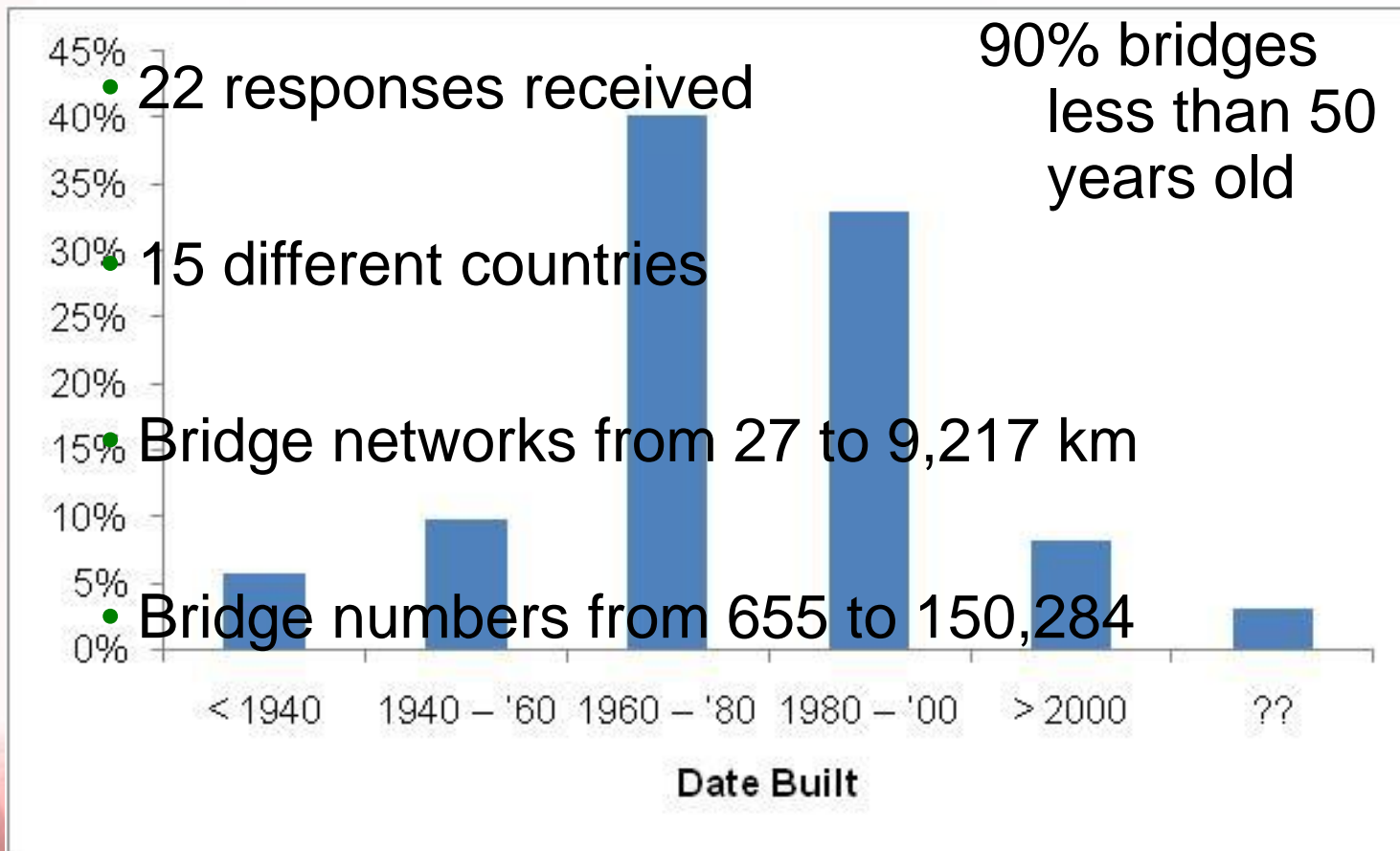
## Collecting the Data

- Background summary information
- NDT methods
- Training and accreditation of inspectors



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## Responses – Summarised





# INSPECTOR ACCREDITATION, NON-DESTRUCTIVE TESTING & CONDITION ASSESSMENT FOR BRIDGES

## INSPECTOR ACCREDITATION Introduction

- Bridge Inspection
  - Critical importance
  - Must be consistent
  - Qualitative assessment



# INSPECTOR ACCREDITATION, NON-DESTRUCTIVE TESTING & CONDITION ASSESSMENT FOR BRIDGES

## INSPECTOR ACCREDITATION

### Inspector Characteristics & Qualifications

- Responsibility of an Engineer
- In-house or External?





# INSPECTOR ACCREDITATION, NON-DESTRUCTIVE TESTING & CONDITION ASSESSMENT FOR BRIDGES

## INSPECTOR ACCREDITATION

### Course Organisation & Duration

- Organisation
  - Theoretical and practical

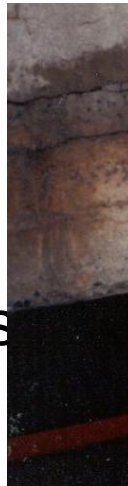




# INSPECTOR ACCREDITATION, NON-DESTRUCTIVE TESTING & CONDITION ASSESSMENT FOR BRIDGES

## INSPECTOR ACCREDITATION Course Content

- Content
  - Material Aspects
  - Structural Aspects
  - Performance Aspects
  - Repair Activities
  - Safety



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## INSPECTOR ACCREDITATION Requalification

- Refresher course
- Audit of completed inspections



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## INSPECTOR ACCREDITATION

### Conclusions

- What is the best program?
- Reliable detailed bridge inspection is fundamental
- What does a program need?
- Remember: All inspections are QUALITATIVE





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## NON-DESTRUCTIVE TESTING

### Introduction

- What is NDT?
- Selecting the best NDT
  - Direct results?
  - Specialist personnel?
  - Cost
  - Accuracy
  - Safety
  - Support
  - Further testing?



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## NON-DESTRUCTIVE TESTING

### Concrete – Location of Reinforcement

- Possible NDT:
  - Cover-meter
  - Gammagraphy
  - High Frequency Radar
  - X-Ray



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## NON-DESTRUCTIVE TESTING

### Steel – Hardness

- Possible NDT:
  - Hardness Test
  - Rebound Test  
(dynamic hardness)



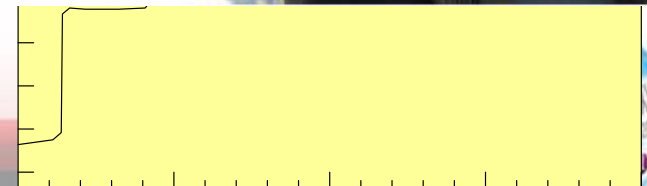


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## NON-DESTRUCTIVE TESTING

### Cables – Broken Wires and Cracks

- Possible NDT:
  - Acoustic Emission
  - Eddy Current
  - Magnetic Leakage Flux
  - Reflectometric Method



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## NON-DESTRUCTIVE TESTING

### Conclusions

- Advantages
  - No/limited damage
  - Availability
  - Cartography for further investigation
- Disadvantages
  - Accuracy affected by calibration
  - Indirect results
- Which NDT is best for you?



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## CONDITION ASSESSMENT

### Introduction

- What is a Condition State?

*Judgement of the current physical state compared to what it was the day it was built*

- Qualitative assessment





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## CONDITION ASSESSMENT

### Damage Catalogues

- What is a Damage Catalogue?

*Defines the extent of damage and details damage states*

- 95% have a Damage Catalogue

- What does it contain?

- Typical damage types
- Extent of material defects
- Descriptions of causes
- Consequences and severity of damages

#### Example 9.2-38

Insufficient cover as well as honeycombing on the entire underside of the bridge deck have resulted in exposed reinforcement bars with signs of superficial corrosion. The bridge is 30 years old, is situated inland and has not been subjected to environmental impacts.

Type of Damage: 209  
Insufficient/Damaged Cover

211

Honeycombing

214

Corrosion of Reinforcement

Degree of Damage/Consequences: 2M

Cause of Damage: 32

Incorrectly placed Reinforcement

Procedures:

Mechanical repairs and surface treatment to be carried out within 7 years

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## CONDITION ASSESSMENT

### Procedures

- Divide a bridge into elements/components
- Major structural elements only



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## CONDITION ASSESSMENT

### Element Ratings/Scores

- Condition State 3  
Condition State 4  
Condition State 2  
Example:  
Example:
- Concrete member has a  
Condition State 4  
One concrete pier has a  
crack in concrete (1/4 in. wide  
has some rust  
there may be showing  
staining  
signs of advanced  
corrosion with some loss  
of section.



Rust staining is evident.

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## CONDITION ASSESSMENT

### Overall Bridge or Global Ratings/Scores

- 4 approaches to Overall Bridge Evaluation
  1. Highest Condition Rating
  2. Independent Overall Condition Rating
  3. Cumulative Condition Rating
  4. Weighted Cumulative Condition Rating
- Subjective score





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## CONDITION ASSESSMENT

### Use of Condition Assessment Ratings

- Element Ratings
  - Inspection management
- Overall/Global Ratings
  - Maintenance programming
  - Primary ranking
  - Life cycle planning
  - Management and funding across a network
  - Assessment of deterioration
  - Budget development and funding submissions
  - Feedback to designers and contractors
  - Strategic planning
  - Development of standards
  - Reporting on overall health
  - Estimation of residual bridge life
  - Scenario planning for bridge program of works
  - Testing of new maintenance techniques



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## CONDITION ASSESSMENT

### Conclusions

- Standardised approach
- Consistent framework for decision making
- Communication of bridge performance
- Subjective



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- Any questions?

