Background for Long-term Bridge Performance Program

NSF/FHWA LTBP Workshop
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Overview

- Provide context, motivation and background of LTBP
- Explain importance of LTBP to achieving strategic goals
Background on Bridge Performance Information

- National Bridge Inventory (NBI)
- Element Level Data
- Bridge Management Information Systems Laboratory
- Nondestructive Evaluation (NDE) Center
  - Validation Study of Visual Inspection
  - R&D on sensing, measurement and monitoring
Bridge Deficiency Summary

![Chart showing the number of bridges with deficiencies in various categories.](chart.png)

- **Approach**: A small number of bridges with deficiencies, mostly in the 0-20000 range.
- **Clearance**: A moderate number of bridges with deficiencies, mostly in the 20000-40000 range.
- **DeckWidth**: A significant number of bridges with deficiencies, mostly in the 40000-60000 range.
- **Load**: A substantial number of bridges with deficiencies, mostly in the 60000-80000 range.
- **Deck**: A large number of bridges with deficiencies, mostly in the 80000-100000 range.
- **Substr**: A significant number of bridges with deficiencies, mostly in the 80000-100000 range.
- **Super**: A large number of bridges with deficiencies, mostly in the 80000-100000 range.

The chart uses colors to represent different ratings, with 0 being the least severe and 4 being the most severe.
Bridge performance trend in USA

Proportion of functional obsolescence is growing!
Why propose LTBP?

- 160,000+ bridges currently deficient
- 500M+ vehicles use deficient bridges each day
- Currently replacing or rehabilitating 10,000+ bridges per year at an annual cost of over $7B
- Over 3,000 bridges become deficient each year
- Need for better data to support improved decision making has been recognized for some time
FHWA R&D Focus Areas

- Bridge of the Future
- Stewardship & Management
- Ensuring Bridge Safety, Reliability & Security
LTBP Program as an essential element of R&D strategic plan

- Representative sample (thousands of bridges)
- Program of detailed inspection and evaluations
- Long term (at least 20 years and preferably longer)
- Subset (hundreds) of instrumented “smart” bridges to monitor operational performance
- Forensic autopsies of decommissioned bridges
- Forensic studies of bridge failures
- Feeds into and draws upon Bridge of the Future
- Essential strategy to achieve strategic goals
What data was to be collected?

- Quantitative data on bridge condition
- Quantitative data on deterioration
- Quantitative data on operational performance of bridges
- Quantitative life cycle data
- Statistically valid data to support a probabilistic reliability management approach
- We need to learn from bridge failures
Quantitative data needed for LCC

- **Damage**
  - Impact
  - Overload
  - Scour
  - Seismic
  - Fracture
  - Settlement
  - Loss of section
  - Inoperative bearings

- **Movement**
  - Lack of movement
  - Cracking

- **Deterioration**
  - Corrosion
  - Fatigue
  - Water absorption
  - Loss of prestress
  - Unintended structural behavior
Quantitative data needed for LCC

- **Operation**
  - ADT
  - WIM
  - Traffic distribution
  - Maximum Stress
  - Stress Cycles
  - Deflection
  - Displacement
  - Environment

- **Level of Service**
  - Congestion
  - Accidents
  - Reduced capacity
  - Performance measures

- **Maintenance & Repair**
  - Routine
  - Repair actions
  - Rehabilitation projects
  - Cost
  - Efficacy
Guiding principles for LTBP

- Federally funded and managed program
- No new burden on owners!
- Uniform and consistent protocols
- New standards will be developed
- Quality control and assurance on data
- Data free and available to all
- Support for National R&D program
Thank You