FHWA
Long-Term Bridge Performance Program

“A Flagship Initiative”

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Outline

• Highlights
• Vision
• Methodology
• Focus Group Meetings
• Pilot Study
• Conclusions
Long-Term Bridge Performance Program (LTBP Program)

- Designated in the “SAFETEA-LU” surface transportation authorization legislation (August 2005)
- Anticipated to be a long-term research effort to improve our knowledge of bridge performance
- **Funding** was authorized **through FY-2009**
LTBP Program Activities (January 2006 – Present)

- Outreach (i.e., Conferences, Workshops, Meetings)
- Draft Framework (U. of Delaware)
- Workshop in January 2007 (Las Vegas, NV)
  - Participants: FHWA, AASHTO, Other Government Institutions, Academia, Industry, International Bridge Experts
    - Short-Term and Long-Term Goals
    - Specific Data to be Collected
    - Sample Bridges to Test, Evaluate and Monitor
LTBP Program Activities
(January 2006 – Present)

• FHWA Bridge Management Information Systems Laboratory
  – Synthesis Report on Bridge Performance
  – Sampling Methodology
  – Data Gaps
  – Deterioration Model
LTBP Program Activities
(January 2006 – Present)

- July 2007 (Solicitation)
- April 2008 (Contract Was Awarded to CAIT/Rutgers University)
- May 2008 – Present (Developmental Phase)
FHWA Launches **Flagship** Initiative to Collect Nationwide Data on Highway Bridges - A 20-year research effort to collect data on bridges nationwide will lead to better investment decisions on bridges
Objective

Collect, document and maintain high quality, quantitative performance data

Improved knowledge of bridge performance

Improved asset management
LTBP program is not intended to become a repository of vast amounts of bridge data without consideration of the value of the data in assessing bridge performance.
Anticipated Impacts of the LTBP Program

- Advances in deterioration and predictive models
- Effective use of Life-Cycle Cost Analysis
- Improved inspection/condition information thru NDE and SHM
- Support improved design standards
- Improved maintenance practices
- Help foster the next generation of bridge and asset management systems
Approach

- Detailed inspection, *periodic* objective evaluation and monitoring (from a representative sample of bridges, excluding long-span bridges)
- Forensic autopsies of decommissioned bridges
- Accelerated Testing
# Primary Tasks and Responsibilities

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- **CAIT**
- **PB**
- **UTC**
- **VTRC**
- **Siemens**
- **Adivtam**
- **BDI**

- Team Member is Significant Participant
- Team Member has Primary Responsibility
Methodology

- Systems Approach
- Top-Down/Heuristic Approach
Systems Approach

• Collect scientific quality performance data from the nation’s highway bridges, as representing critical node-points of the highway transportation network.

• The data and information to be collected is expected to advance our knowledge of how our highway transportation, together with its linkages to other infrastructures, performs as a complex multi-domain system, governed by dynamic interactions between human, natural and engineering systems and elements.
Top-Down/Heuristic Approach
Step 1
Defining Bridge Performance

Step 2
Data to be Collected

Step 3
Data Management System

Step 4
Design the Experimental Program

Step 5
Data Collection

Step 6
Data Analysis & Modeling

Step 7
Dissemination of Findings

Long-Term Bridge Performance Program
Performance Measure, Category, or Indicators

????
Bridge Performance?

• National Survey
  – Number of bridges needing work
  – Structural deficiencies and posting
  – Condition rating, sufficiency rating and health index
  – Deficiencies and load carrying capacity
  – Customer satisfaction
Performance Categories

All Limit States

- Serviceability
- Operation
- Scour and Floods
- Wind
- Hurricane
- Earthquakes
- Overloads
- Vessel Collisions
- Fire
- Fatigue
- Terrorism
Which Performance Category is More Critical?
Challenges in Measuring Bridge Performance

- It is not well defined and understood or documented
- Relies too heavily on expert opinion
- Based on significant assumption or generalization
- **Uncertainties**
  - Subjectivity of current condition ratings
  - Lack of proper documentation (i.e., records of actions and costs, deferring the action)
  - Incomplete data (i.e., cost, maintenance)
  - Many hidden deterioration and damage escape visual inspection
Step 1
Defining Bridge Performance

Step 2
Data to be Collected

Step 3
Data Management System

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Design the Experimental Program

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Program Outcome

Strategic Action Plan

Long-Term Bridge Performance Program
FOCUS GROUP Meetings

• Focus group meetings across a number of geographically distributed locations initiated

• Partnering with practitioners in order to get the information and data that is needed to improve the long-term performance of our bridge systems

• The program cannot be a one size fits all approach, and should not place additional burdens on highway agencies
FGM and Pilot Study

- Summer 2009
- Detailed inspection and Monitoring of 7 bridges
- Validate protocols and processes
- Viability of the data infrastructure
- Efficacy of sensor technology

John Penrod:
Pilot Study Program manager
**Phase I & II Data Collection**

**Development Phase Begins**

2008

**Pilot Program Begins**

2009

**Development Phase Completes**

**Pilot Program Completes**

2010

**Phase I Long-Term Data Collection Begins**

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**Phase I Tasks & Objectives**

- Review and determine lessons learned in pilot phase I; make appropriate adjustments and improvements to program approach
- Broaden data collection to additional bridges
- Enhance data infrastructure and coordination with existing bridge databases (NBI, PONTIS, BMSL)

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**Phase I Deliverables**

- Final report on pilot study outcomes
- User-friendly, high-quality database of information collected to date
- Implementation plan for phase II data collection

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**Phase I Final Result**

- Validated work to date, data infrastructure, and methods for gathering data
- Clear vision and plan for phase II data collection
Oversight

• Internal Expert Task Group
• External Expert Task Group
Outreach

- AASHTO Subcommittees on Bridges
- Organized a Workshop at TRB
- Presentation at AASHTO Annual Meeting
- SHRP-2 Initiation
- NIST and NSF
- International community
- Plan for Industry Involvement
Conclusions

- A dynamic program
- Not a one-size fit all program
- Not a data-warehouse
- Synergy among the FHWA, stakeholders, industry, academia, international bridge community
- Consider lessons learned from the LTPP
- Successful outreach strategy
- Take advantage of in-house expertise
Conclusions

• Be cognizant of program’s limitations
Web-Site and Contact Information

http://www.tfhrc.gov/ltbp
ltbp@dot.gov
Thank You!