FHWA Bridge Research Update

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Presentation Topics

- FHWA-Wide Infrastructure R&T Process
- Authorization and Funding
- Selected Studies of Interest to the Bridge Committee
FHWA-Wide Infrastructure R&T Process
Infrastructure R&D Strategic Plan

Highways of the Future—A Strategic Plan for Highway Infrastructure Research and Development

PUBLICATION NO. FHWA-HRT-08-068

JULY 2008
Infrastructure R&D Strategic Plan, cont’d

- Provided direction for future infrastructure research
- Supported reauthorization efforts in advance of the expiration of SAFETEA-LU
- Demonstrated how the focus on highway infrastructure research, development, and technology deployment benefits the Nation
Infrastructure R&D Strategies

I. Long Term Infrastructure Performance
II. Durable Infrastructure Systems
III. Accelerated Highway Construction
IV. Environmentally Sensitive Infrastructure
V. Performance-Based Specifications
VI. Comprehensive & Integrated Asset Management
Infrastructure R&D Strategic Plan

Infrastructure R&T Strategic Plan and Roadmap
Infrastructure R&T Strategic Plan: Objectives

1. **Highway Safety** - Reduce the number of fatalities attributable to infrastructure design characteristics and work zones

2. **Infrastructure Safety and Security** - Improve the safety and security of highway infrastructure

3. **Infrastructure Management** - Improve the management of infrastructure assets and advance the implementation of a performance-based program for the NHS

4. **Project Delivery** - Improve the ability of transportation agencies to deliver projects that meet expectations for timeliness, quality and cost

5. **Mobility** - Reduce user delay attributable to infrastructure system performance, maintenance, rehabilitation and construction

6. **Infrastructure Performance** - Improve highway condition and performance through increased use of design, materials, construction and maintenance innovations

7. **Environmental Sustainability** - Reduce the life-cycle environmental impacts of highway infrastructure (design, construction, operation, preservation, and maintenance)
Initiative Workplans

- Cross-agency work groups contributing to workplans
- Each workplan must consider the continuum from research, thru development, thru deployment (including education and training), and policy changes
Infrastructure R&T Strategic Plan: What’s Next?

- Complete workplans for each high-priority initiative
- IR&T Executive Board reviews and programs FY ’11 (partial) & FY ‘12 (anticipated) funds
- Initiation of workplans for funded activities
- Development and execution of Stakeholder engagement process
Authorization and Funding
Authorization & Appropriations

• SAFETEA-LU – FYs 2006 thru 2009
  – Originally provided little flexibility/discretion on R&T investments
  – Extended by Congress thru September 2011

• FY 2012 Administration Budget (proposed)
  – Focus on flexibility and accountability

• Next Authorization
  – What
  – How much ($)
  – When

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Selected Current FHWA Programs and Projects
Innovative Bridge Research and Deployment

FY ‘11 extension, partial-year funding

• In-house high priority initiatives
• EDC-focused State grants
  – Applications due June 3, 2011
  – States must coordinate with FHWA Division Office
Mississippi River Bridge Pooled Fund Study

- TPF Solicitation 1305 (Mississippi DOT)
- “Real Time Current Velocity (RTCV) Pilot Project for Mississippi River Bridges”

Objectives:

- Demonstrate the capability of a real-time current velocity monitoring system in assisting in river traffic safety
- Monitoring system to be installed on a bridge in Vicksburg, MS
- System communicates with barge tow operator about upstream current flow
Underwater Bridge Inspection Pooled Fund Study

- TPF Project 5(131)
- “Underwater Inspection of Bridge Substructures Using Underwater Imaging Technology”
- Objective – Assess the application of ROV-mounted sonar imaging and video technology with respect to Level I and II Underwater Inspections requirements
- Study now underway; contractor selected
- Project steering committee chaired by Caltrans
NDE – Gusset Plate Testing and Evaluation

- Objectives: develop inspection procedures for single- and multi-layer gusset plates
- Single-layer plates will be investigated with Pocket and Phased Array UT
- Digital radiographic inspection
- Expected completion in late 2012
Earthquake Reconnaissance – Bridge Performance

• Bridge collapse due to insufficient seat width
• Skewed and curved bridges damaged or collapsed due to insufficient rotational/ transverse constraints
• Bridges constructed without diaphragms suffered severe superstructure damage
• Bridges with shear reinforcement performed well
• Many bridges with good detailing collapsed due to Tsunami impact
• Ground failure caused damage and collapse (Chile EQ)
• MSE wall and anchored retaining wall performed well
Earthquake Reconnaissance – Bridge Issues

- Skewed/curved bridge design issues – rotational constraint
- Accelerated bridge construction – diaphragms and continuous spans preferred
- Alternative measure to repair – isolators reduce demand forces
- Long duration effects – large pounding effects
- Bridge design with consideration of Tsunami – large impulse load
- Subduction zones in Pacific Northwest – vertical acceleration effects
Lightweight HPC Structural Performance

- 90 of 94 structural tests complete
- Shear, dev. length, splice, …
- Recommendations for LRFD modifications being developed
UHPC/PBES Connection Details

Material, subcomponent, and full-scale test program underway
UHPC/PBES Connections: Early Results

TechNote: FHWA HRT-11-038

Report: NTIS PB2011-101995

TechBrief: FHWA HRT-11-022
Applied Hydraulics R&D

- Update scour prediction for course bed material
- Time dependent pressure flow scour (CFD at Argonne National Lab)
- Fish passage in large culverts with low flows (CFD at Argonne National Lab)
- Scour in cohesive soils/incipient motion of cohesive soils
Time Dependent Pressure Flow Scour

CFD modeling at TRACC/Argonne National Laboratory
Fish Passage in Large Culverts with Low Flows

Experimental set-up

CFD modeling at TRACC/Argonne National Laboratory