SHRP 2  R04 Innovative Bridge Designs for Rapid Renewal

AASHTO SCOBS General Session
SHRP R-04 ABC

Thursday May 27, 2010
Objective of the project...

RAPID RENEWAL – Bridge Systems

WHAT IS THE BIG IDEA?

Manufactured Bridges
RAPID RENEWAL – Bridge Systems

WHAT IS THE BIG IDEA?

Maximize Off-Site
Minimize On-Site
RAPID RENEWAL – Bridge Systems

- As Light as Possible
- As Simple as Possible
- As Easy to Erect as Possible
Phase 2 – **Develop Concepts**

**As Light as Possible …**

- Improve ratings
- Lighter equipment
Phase 2 – Develop Concepts

As Simple as Possible …

- Fewer girders
- Fewer field splices
- Fewer bracing systems
Phase 2 – Develop Concepts

As Easy to Erect as Possible …

- Less labor
- Less CIP
- Less temporary work
Three Phases

Promising New Concepts
Build on Existing Technology

- Phase 1 – Define
- Phase 2 – Develop
- Phase 3 – Demonstrate
PHASE 1 – Define

- What has been done?
- **What are the challenges?**
- Feasible concepts
Phase 1 - Define Concepts

1. Precast Substructure Systems
2. Complete Superstructure Systems
3. Construction Technologies
1 – Substructure Systems

On Site Assembly
2 – Superstructure Systems

Modular beam systems
- Deck Bulb Tees
- Double Tees
- Decked Stringer System
- Decked Trapezoidal Box girders

Segmental systems
- Segmental slabs
- Segmental voided slabs
Modular Beam Systems

Deck Bulb Tees
FOLDED PLATE - Modular Beam Systems
Solid Slabs and Voided Slabs
3 – ABC Construction Systems

Methods
- Launching,
- Sliding and Lateral shifting

Equipment
- Wheeled carriers / SPMT
- Straddle carriers
- Erection girders
Segmental and Slab Systems

Incrementally Launched Slab
Straddle Carrier
Equipment

Erection Girders
3 – Construction Systems

- **Tier 1**
  Weekend closures

- **Tier 2**
  Completed in a few weeks

- **Tier 3**
  Save weeks and/or months on the overall schedule
PHASE 1 – *What have we learned so far?*

- About Innovation?
- About Challenges?
- About Implementation?
PHASE 1 – What have we learned so far?

…About Innovation

- Out of the box is good
- Recognize the Lag
PHASE 1 – *What have we learned so far?*

... About Challenges?

- Least initial cost vs best value (Owners)
- Self-performance (Contractors)
- Reluctance to change (Designers)
PHASE 1 – What have we learned so far?

… About Implementation?

- Collaboration (ATC – DB)
- Construction – Value
PHASE 2 – Develop Concepts

- Final Short List of Phase 1 Concepts
- **Demonstration Project Design**
- Phase 3 Work Plan
Task 6
Final Short List of Phase 1 Concepts, Technologies and bridge systems

Task 7
Demonstration Project – Design in Progress

Task 8
Phase 3 Work Plan

Task 9
Develop a report for Phase 2
PHASE 3 – Deliver

Where to Next?
PHASE 3 – WORK PLAN

Part 1 – ABC Tool Kit of Design Standards
Part 2 – Construct Demonstration Project
Part 3 – Specifications for ABC
Part 4 – ABC Training Materials
TOOL BOX of ABC STANDARD SOLUTIONS

- Pre-engineered standards
- Repeatability, Volume, Economy
- Conventional equipment
Iowa ABC Demonstration Project

Tier 2 - Two week closure

US 6
Bridge over
Keg Creek

Council Bluffs
Iowa
Substructures Construction

Outside existing footprint
Precast Columns and Cap
Stage 1 work (prior to bridge closure)

- Construct drilled shafts to ground level
- Construct wingwalls on piles
Stage 2 work (during 14-day “ABC” period)

- Close bridge/enact detour
- Demolish existing bridge
- Assemble precast columns/capbeams
- Assemble semi-integral abutments
Stage 3 work (during 14-day “ABC” period)

- Assemble modular superstructure
- Cast UHPC closure joints
- Re-open bridge to traffic
Connection Details

Deck Joint

Abutment Joint
CONCLUSIONS

- **Phase 2** – Complete December 2010
- **Phase 3** – Complete December 2011