



# 2012 Annual Virginia Concrete Conference

## FHWA Prefabricated Bridge Elements & Systems Update

March 8, 2012



# Every Day Counts - Program

**Going Greener**

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**Shortening  
Project  
Delivery**

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**Accelerating  
Deployment  
Technology  
and  
Innovation**





# EDC Initiatives

## Shortening Project Delivery

- Design-build
- Construction Manager/General Contractor
- Planning and Environmental Linkages
- Legal Sufficiency Enhancements
- Expanding Programmatic Agreements
- In Lieu Fees and Mitigation Banking
- Clarifying the Scope of Preliminary Design
- Flexibilities in Right of Way
- Flexibilities in Utilities
- Enhanced Technical Assistance on EIS



## Accelerate the Deployment of Technology and Innovation

- Safety Edge
- Warm Mix Asphalt
- Adaptive Single Control
- Prefabricated Bridge Elements and Systems
- Geosynthetic Reinforced Soil Integrated Bridge



# EDC and PBES/ABC





# Opportunity!

“The EDC program has paved the way to allow bridge practitioners the opportunity to ***advance PBES and other innovations into the mainstream of the bridge industry.***”





# Prefabricated Bridge Elements & Systems (PBES)

1) Structural Components built:

- Offsite, or
- Adjacent to alignment



2) Include features that reduce:

- Onsite construction time
- Mobility impact time





# Benefits

- Safer:
  - Public
  - Contractor Personnel
- Improve Quality:
  - Off the Critical Path
  - Controlled Environment
- Build in an accelerated manner more efficiently





# Other Reasons to use PBES

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**Remote Locations**

**Limited  
Construction  
Season**





# Paradigm Shift

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PBES becomes the ***standard*** method of bridge construction, and the use of conventional construction methods - such as on-site CIP operations, are used in a limited manner.



# Challenges – current/future

- Aging Infrastructure
- Increased Traffic Volume
- Increased Work Zones

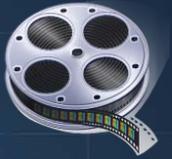
## Congestion Costs

- 4 billion hours/year
- 3 billion gallons/year
- \$80 billion/year





# Elements vs. Systems



Elements ↘



Systems ↘





# Deck Elements

Examples:

- Full-depth precast deck panels
- FRP deck panels
- Steel grid decks
- Aluminum deck panels





# Beam Elements

## Deck Beam Elements:

- Modular beams with decks
- Adjacent deck bulb-tee beams
- Adjacent double tee beams
- Adjacent box beams
- Adjacent slab beams





# Beam Elements

## Full-Width Beam Elements:

- Truss span without deck
- Arch span without deck
- Precast segmental





# Pier Elements





# Abutment & Wall Elements

Examples:

- Precast backwalls, wingwalls, footings
- Sheet piling – steel or precast
- Precast full-height wall panels
- MSE walls





# Miscellaneous Elements

Examples:

- Precast approach slabs
- Prefab parapets
- Closure pours
- Overlays





# Prefabricated Systems

Systems: rolled, launched, slid, etc.

- Superstructure
- Superstructure/pier
- Total bridge





# *CBC Methods*





# Raise the Bar

PBES



PBES:  
Pile Lagging

Conventional



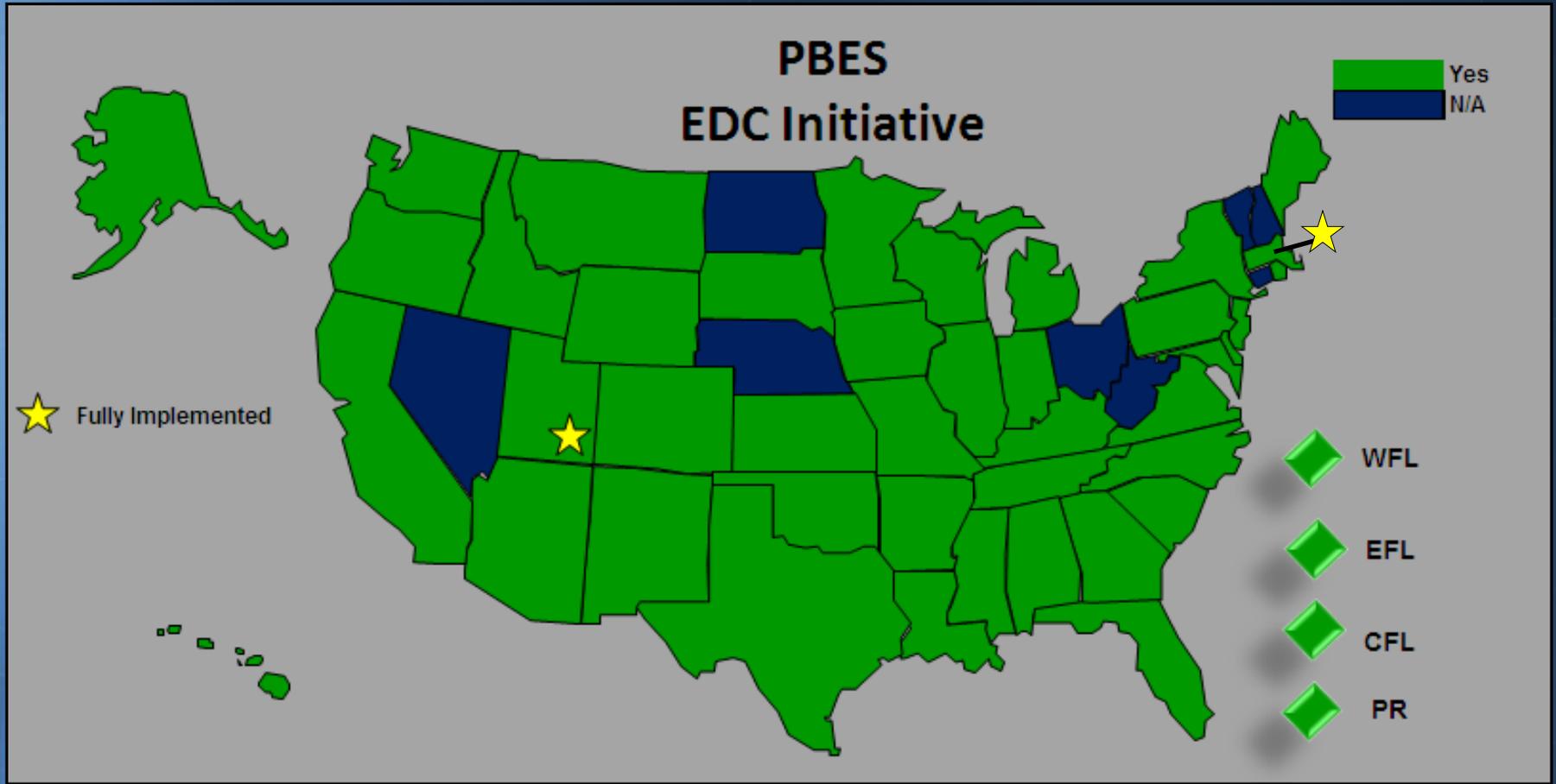
PBES:  
Grouted Couplers

PBES:  
Pile Pockets





# Implementing PBES





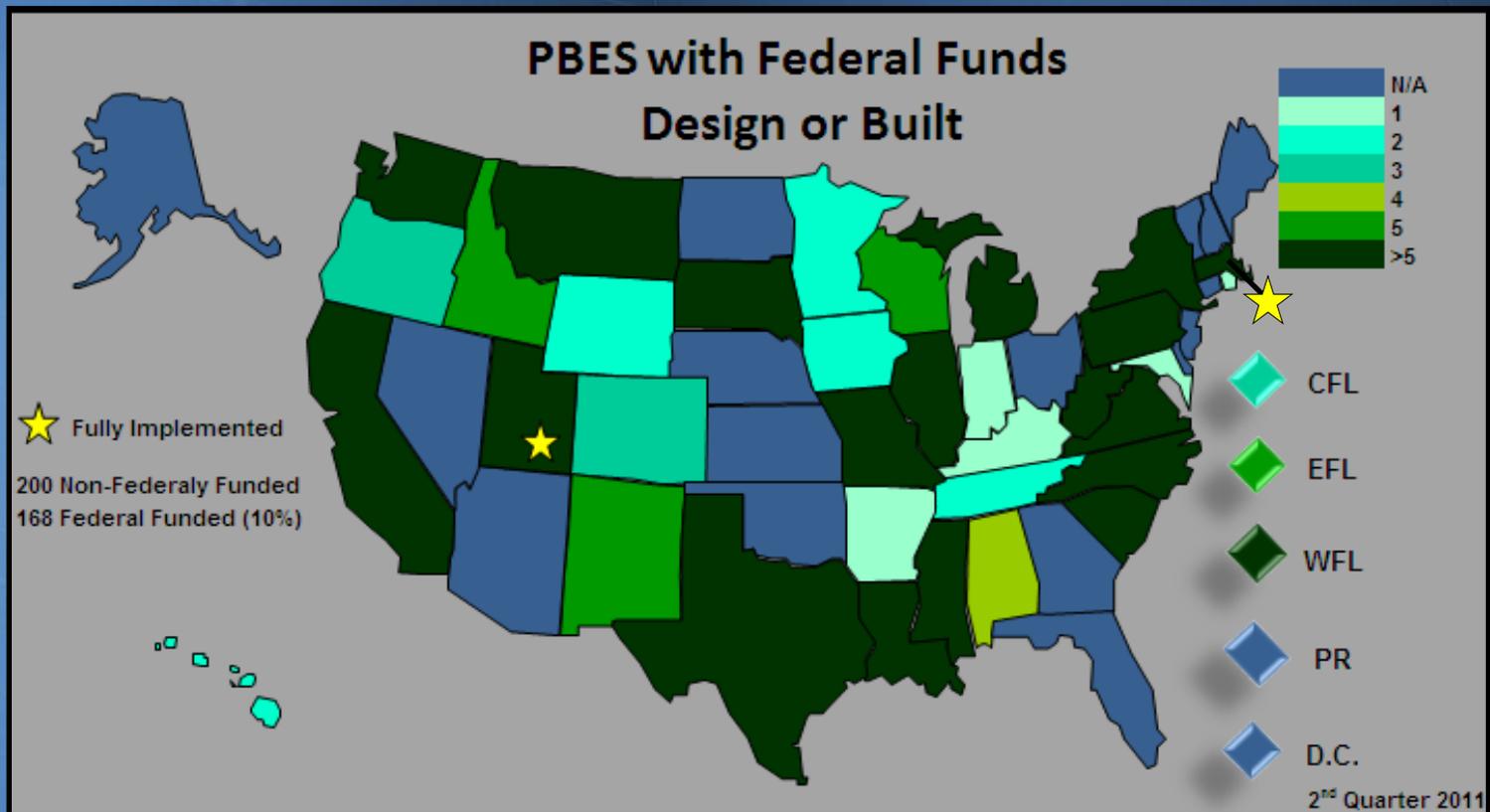
# PBES 2012 Goals

- **100 cumulative bridges** have been designed and/or constructed rapidly using PBES
- **25 percent** of bridge projects authorized using Federal-aid have at least one major prefabricated bridge element
- PBES **decision making framework** in the design process and **20 projects in 3 years**



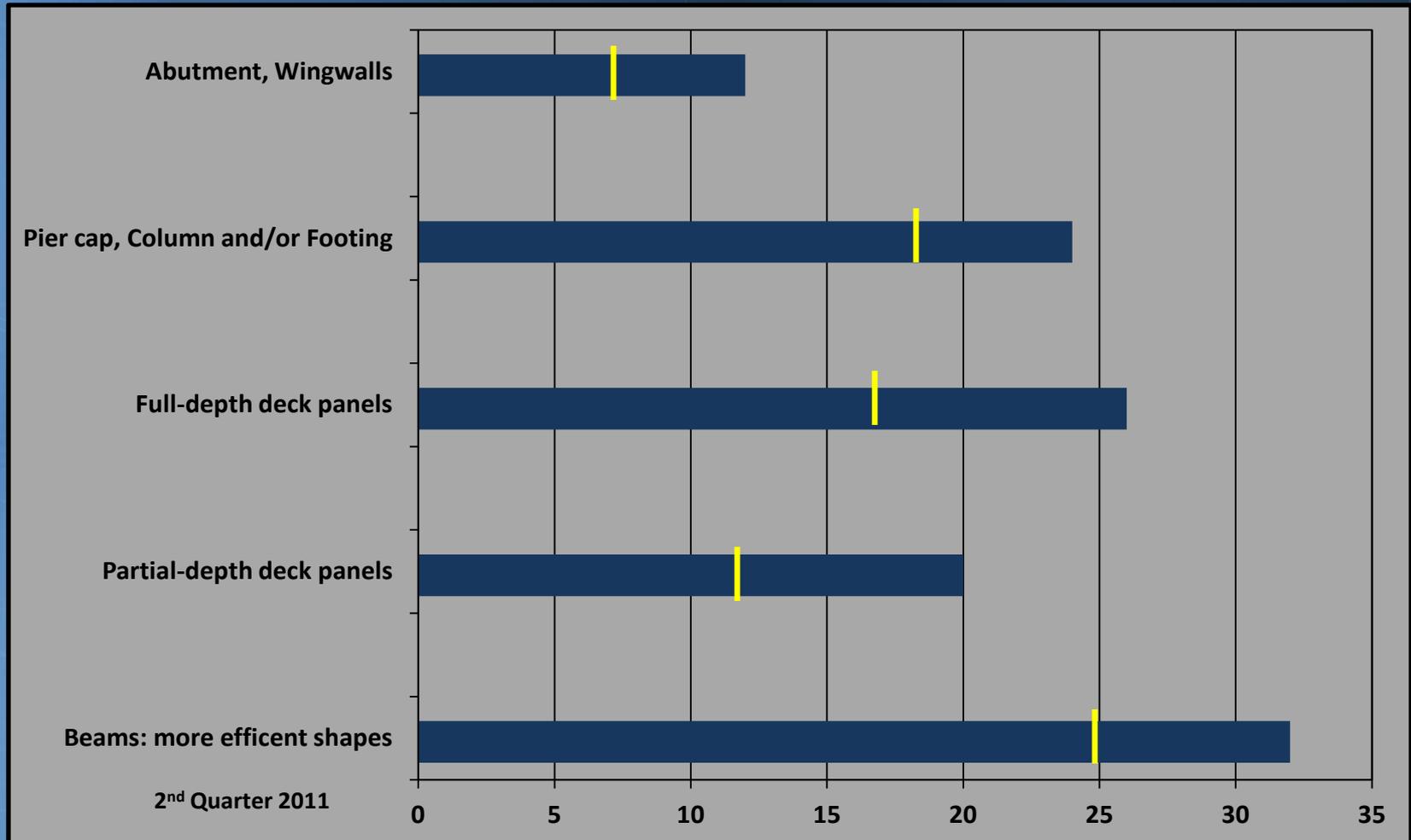
# EDC Goals

	1 <sup>st</sup>	2 <sup>nd</sup>
Authorized Projects	1,200	1,600
PBES	143	200
PBES w/ Fed Aid	132	168





# What they are selecting





# PBES Tools - website

U.S. Department of Transportation  
Federal Highway Administration

Search FHWA

Bridges

FHWA > Bridge > Accelerated Bridge Construction

## Accelerated Bridge Construction



Project Planning



Geotechnical Solutions

Foundations and  
Wall Elements



Rapid  
Embankment  
Construction



Structural Solutions

Prefabricated  
Elements &  
Systems



Structural  
Placement  
Methods

### Email Notification

Enter your E-mail

Submit

### Events

FHWA ABC Annual conference  
Minneapolis, MN  
Later part of 2012

[View Event Calendar](#)

### ABC Technical Contacts

Decision Making Framework  
Benjamin Beerman  
(404) 562-3930  
benjamin.beerman@dot.gov

Innovative Contracting

### What is ABC?

ABC is a paradigm shift in the project planning and procurement approach where the need to minimize mobility impacts which occur due to onsite construction activities are elevated to a higher priority.

Intrinsic benefits of the ABC approach include improvements in:

- Safety

[www.fhwa.dot.gov/bridge/abc/](http://www.fhwa.dot.gov/bridge/abc/)



# Publications

**Accelerated Bridge Construction**  
 Experience in Design and Erection of Prefabricated Bridge Elements and Systems  
**Final Manual**  
 Publication No. FHWA-XX-XX-XXX

U.S. Department of Transportation  
 Federal Highway Administration

Priority, Market Ready Technologies and Innovations

**HIGHWAYS FOR LIFE**  
 Accelerating Innovation for the American Driving Experience

**Accelerated Bridge Construction**  
 Experience in Design, Fabrication and Erection of Prefabricated Bridge Elements and Systems  
**Final Manual**  
 Publication No. FHWA-XX-XX-XXX

List of Revisions:

U.S. Department of Transportation  
 Federal Highway Administration

Priority, Market Ready Technologies and Innovations

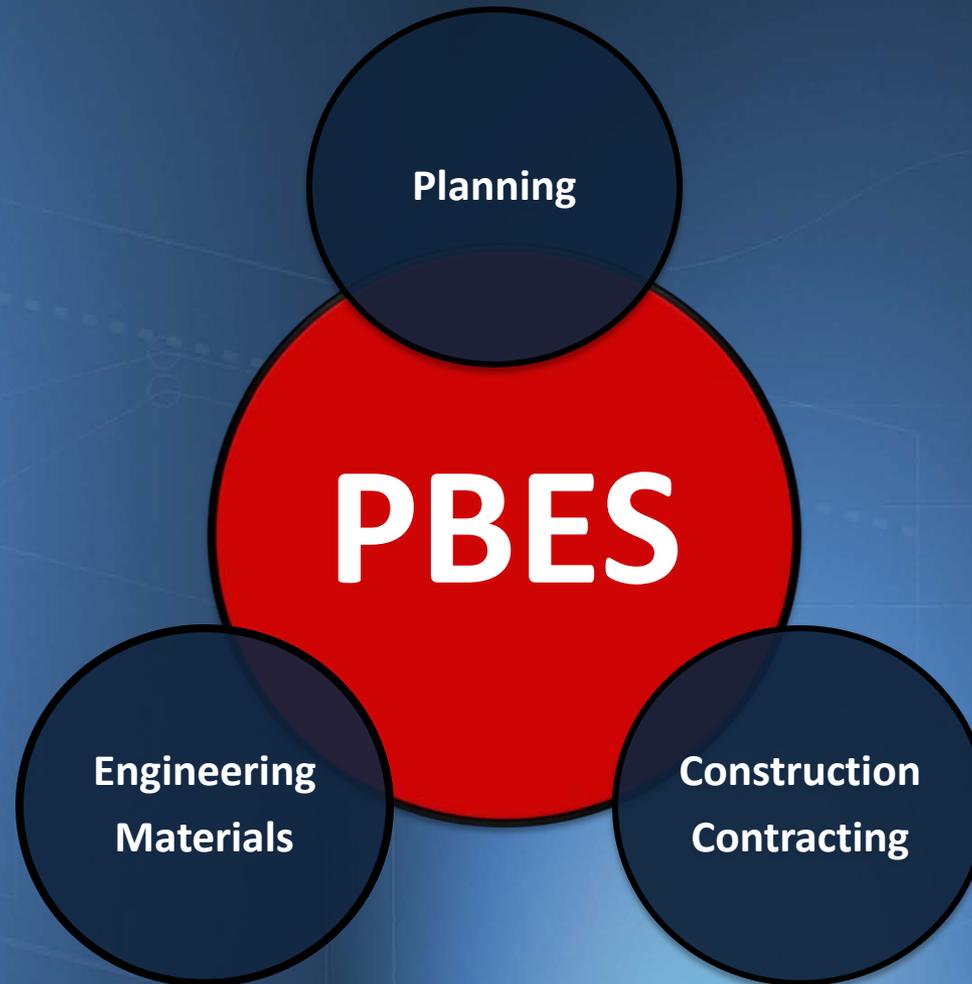
**HIGHWAYS FOR LIFE**  
 Accelerating Innovation for the American Driving Experience

**Manual on Use of Modular Transporters to Move and Replace Bridges**  
 June 2007

U.S. Department of Transportation  
 Federal Highway Administration



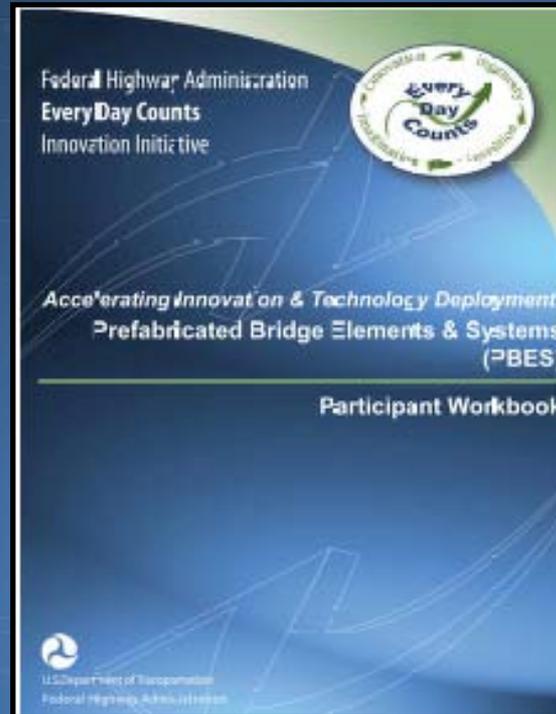
# Publications - future





# Webinar Training - Industry

- > Webinars
- > Intro PBES for ABC
- > ABC: the Keys to Success from an Owners Perspective
- > FHWA PBES Decision-Making Framework
- > Costs
- > ABC/PBES Specifications, Contract Drawings and Details
- > PBES Connections
- > Concrete
- > Steel
- > Composites
- > LWC
- > Construction
- > Multi-State ABC Decision Tool
- > Closeout





# Webinar Training - NHI

**4/2011**  
UHPC



**5/2011**  
Decision Making

**8/2011**  
PC Bent System for Seismic

**10/2011**  
MassDOT Fast 14





# Webinar Training - FIU

**FIU**

Accelerated Bridge Construction (ABC) Center  
FLORIDA INTERNATIONAL UNIVERSITY

## Archive of Past Events

[Webinar held on 01/17/2012](#) ( Everyday Solutions: ABC Standard Designs from SHRP2 )

[Webinar held on 12/15/2011](#) ( Recent Durability Performance Results in Closure Joints of Modular Bridge Decks )

[Webinar held on 11/17/2011](#) ( Full-Depth Prefabricated Bridge Deck Options for Durability and Cost )

[Webinar held on 10/11/2011](#) ( Field-Cast UHPC Connections in Full-Depth Precast Bridge Deck )

[Webinar held on 09/29/2011](#) ( State-of-the-Art Full-Depth Precast Concrete Bridge Decks )

[Webinar held on 08/25/2011](#) ( A Planning Phase Decision Tool for Accelerated Bridge Construction )

[Webinar held on 07/14/2011](#) ( Featured Presentation: Lightweight Concrete for Accelerated Bridge Construction )

[Webinar held on 06/02/2011](#) ( A Technical Overview of FHWA's Upcoming ABC Manual )

[Webinar held on 04/20/2011](#) ( ABC Technical Resources Available from Utah DOT )

[Webinar held on 03/11/2011](#) ( Inaugural Free Webinar on Accelerated Bridge Construction (ABC) )



# **Webinar Training - FIU**

## **Construction Contractor Series #1: Experiences with ABC Projects in Texas**

**Thursday, March 15, 2012  
1:00 to 2:00 p.m.**

**<http://www.abc.fiu.edu/>**



# PBES Deployment Team

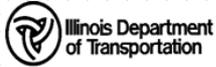
Workshops

Scanning Tours

Project Reviews

Project Showcases

Regional Peer Exchanges

 Illinois Department of Transportation						
<b>Estimate of Time Required</b>						
					Route	F.A.I. 57
					Section	(X1-6-2)HBK-2,HB-1,2,(1X-1)R-1
					County	WILLIAMSON
					Project	Dual I-57 Bridges
Item	Unit (Check One) <input checked="" type="checkbox"/> English <input type="checkbox"/> Metric	Quantity	Rate Per Day	Days	Days Not Affecting Time	Total Days Required
GRANULAR EMBANKMENT, SPEC	CU YD	305.00	100.00	3.00	3.00	0
REMOVAL OF EXISTING STRUCT	EACH	1.00	0.03	33.00		33.00
CONCRETE STRUCTURES	CU YD	1,250.00	15.00	83.00	40.00	43.00
CONCRETE SUPERSTRUCTURE	CU YD	2,230.00	20.00	112.00	60.00	52.00
BRIDGE DECK GROOVING	SQ YD	6,532.00	500.00	13.00	10.00	3.00
F & E STRUCTURAL STEEL	L SUM	1.00	0.02	50.00	25.00	25.00
STUD SHEAR CONNECTORS	EACH	19,800.00	1,500.00	13.00	10.00	3.00
REINF BARS, EPOXY COATED	POUND	740,200.00	8,000.00	93.00	45.00	48.00
SLOPE WALL 4 INCH	SQ YD	1,660.00	50.00	33.00	20.00	13.00
DRIVING PILES	FOOT	4,900.00	500.00	10.00		10.00
TEST PILE STEEL HP12x53	EACH	4.00	1.00	4.00		4.00





# Project Showcases

**3/2011**

Utah DOT – Sam White



**7/2011**

Mass DOT – Fast14



**10/2011**

Iowa DOT – Kegs Creek



**01/2012**

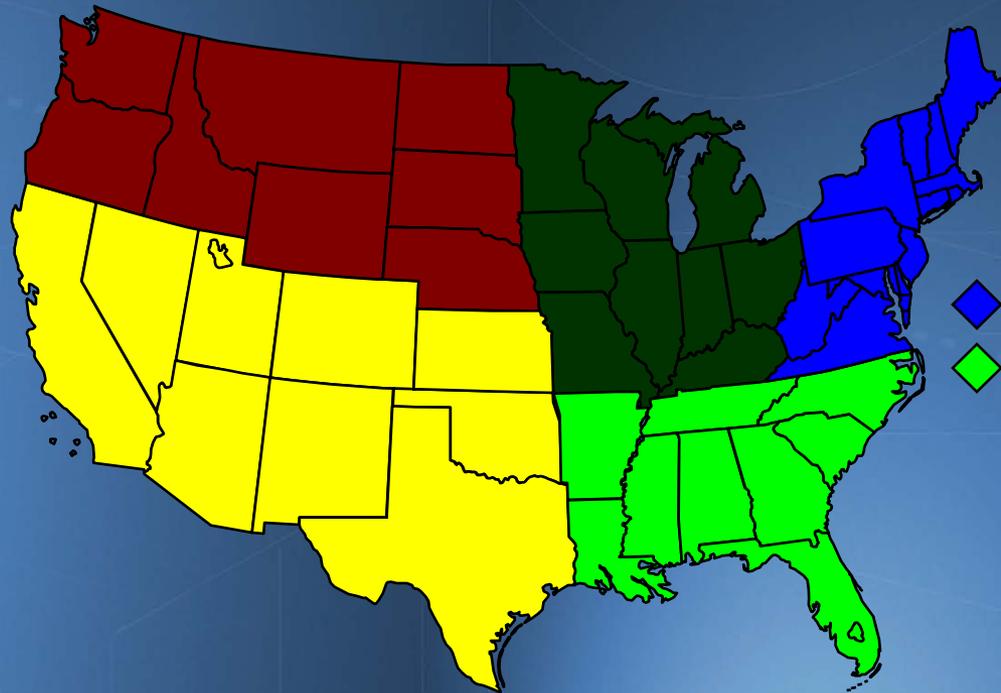
Nevada DOT – West Mesquite





# PBES/ABC Regional Exchanges

**DRAFT**



◆ DC  
◆ PR

■ N.E. Region  
■ S.W. Region  
■ S.E. Region

■ M.N. Region  
■ N.W. Region



# National ABC Project Exchange

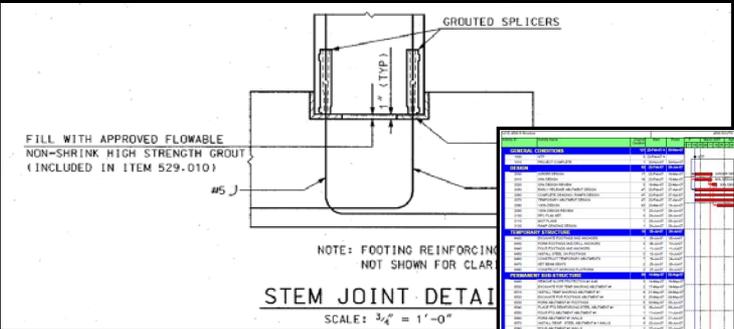
↑ ← → Folders ▸ PBE

UT-2007-4500 South

Download More Actions

<input type="checkbox"/>	Title
<input type="checkbox"/>	<a href="#">2-Contract Plans</a>
<input type="checkbox"/>	<a href="#">5-Construction S</a>
<input type="checkbox"/>	<a href="#">3-Specifications</a>
<input type="checkbox"/>	<a href="#">1-Photos</a>
<input type="checkbox"/>	<a href="#">4-Bid Tabs</a>
<input type="checkbox"/>	<a href="#">0-110829 ABC M</a>

Performance Materials	• Self-consolidating HPC in precast abutments																							
Photos																								
Additional photos	<a href="#">Additional photos</a>																							
Project Planning	Decision-Making Tools	Site Procurement	Project Delivery	Contracting																				
Geotechnical Solutions	Foundations																							
Structural Solutions	<table border="1"> <tr> <td colspan="4">Foundations &amp; Walls</td> </tr> <tr> <td colspan="4">Rapid Embankment</td> </tr> <tr> <td colspan="4">Prefabricated Bridge Elements &amp; Systems</td> </tr> <tr> <td>Elements</td> <td>Systems</td> <td colspan="2">Miscellaneous</td> </tr> <tr> <td> <ul style="list-style-type: none"> <li>Adjacent box beams</li> <li>Precast abutments</li> <li>Precast wing walls</li> <li>Precast footings</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>Grouted keys</li> <li>Bars in solid caupet</li> <li>Grouted PT girders</li> <li>Overlay - asphalt with membrane</li> </ul> </td> <td colspan="2"></td> </tr> </table>				Foundations & Walls				Rapid Embankment				Prefabricated Bridge Elements & Systems				Elements	Systems	Miscellaneous		<ul style="list-style-type: none"> <li>Adjacent box beams</li> <li>Precast abutments</li> <li>Precast wing walls</li> <li>Precast footings</li> </ul>	<ul style="list-style-type: none"> <li>Grouted keys</li> <li>Bars in solid caupet</li> <li>Grouted PT girders</li> <li>Overlay - asphalt with membrane</li> </ul>		
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Costs	<p>The engineer's estimate for the project was \$0.95 million. The low bid was \$1.05 million (\$97,000 = 10% higher than the engineer's estimate). There were six bidders. The cost per square foot of bridge was \$0.18 compared to \$1.87 for conventional construction in this region in 2004.</p> <p>Funding: Because this is a municipally-owned bridge, the Town of Epping contributed 20 percent of the project costs beyond the IBRC funding. Their contribution was in the form of services (pavement, machine method, pavement, hand method, uniformed officers w/ vehicles, bridge lighting system, ornamental light poles w/ supports, crushed gravel for drives, adjusting manhole covers and frames, adjusting/broaching hydraulic concrete filled barrels, removing small trees). The State paid for the balance of the project. In its simplest form, the funding was IBRC \$650,000, State \$312,000, Town \$78,000.</p>			<p>\$1.05 million</p> <p>27</p> <p>04</p> <p>20 percent</p> <p>form of</p>																				
Funding	Federal only	State only	Federal and State	Other																				
Incentive Program	See Costs																							
Contract Plans	Complete Set:	<a href="#">Contract (4)</a>																						
Specifications	Complete Set:	<a href="#">SP 520 (doc)</a>	<a href="#">SP 521 (doc)</a>	<a href="#">SP 522 (doc)</a>																				
		<a href="#">SP 523 (link to doc)</a>	<a href="#">SP 524 (link to doc)</a>	<a href="#">SP 525 (link to doc)</a>																				





# Submit Projects to...

**Mary Lou Ralls, P.E.**

**ralls-newman@sbcglobal.net**

**(512) 422.9080**



**Thank You!**



**FHWA**

**Benjamin Beerman, P.E.**



# Back Up Slides



Weighing Factor

Aggregate Industries

Las Vegas Paving

Meadow Valley

Madsworth Brothers

W.W. Clyde

Maintenance of Traffic

20%

38

70

50

51

70

Management Approach

25%

51

76

Other Technical Issues

55%

50

63

Technical Score

30%

47.85

67.65

Proposal Price

\$ 18,775,000.00

\$ 20,500,000.00

Price Score

60%

75.94

69.55

86.15

100.00

98.24

Two

Two

Com

Com

Sche



Total Score

100%

61.10

71.60

74.62

82.61

88.27

Ranking

5

4

3

2

1



# PBES Deployment Team

5/2011

Illinois – PBES/ABC

5/2011

Missouri – Deck Panels

6/2011

Illinois – I-57 over SR I13

11/2011

Idaho – Deck Panels

11/2011

Nevada – NEON Project

01/2012

Hawaii – Substructure

 Illinois Department of Transportation						
Estimate of Time Required						
			Route	F.A.I. 57		
			Section	[X1-6-2]HBK-2,HB-12,(1X-1)R-1		
			County	WILLIAMSON		
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# Composite Industry

