FHWA National Perspective

Efficiency through technology and collaboration



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Overview

- What is ABC?
- Cost of ABC
- How can ABC be competitive in the Marketplace?
- Lessons Learned ABC/State of the Industry
- Bonus Topic
- Test



What is ABC

27.1.1 ABC Overview

ABC is defined as bridge construction technologies that use innovative planning, design, materials or construction methods in a manner to specifically reduce the <u>onsite</u> <u>construction time</u> and <u>mobility impacts</u> that occur when building or replacing bridges.



Objectives - Owner

Improve:

- Safety
- Durability/performance
- Program Delivery/resources
- Operations network capacity (tollway)

!!! Customer Satisfaction !!!



Objectives - Contractor

Improve:

- Safety
- Project Close-out/Payment
- Labor Management
- Weather Related Delays
- Year around construction
- Scheduling (material/equipment/labor)
- Quality

!!! Customer Satisfaction !!!



Look at it another way

ABC = <u>Planed</u> Emergency Replacement (But, the fun way - it can always get worse!)



Look at it another way



What is good for our customers is good for all of us, <u>ABC</u>...

Demonstrates: good government/ good stewardship

Garners and fosters public/political support for transportation programs

Positive message of our contracting and engineering community

Better product: safer, less risk, better quality, better use of our time/resources



U.S.A. is the Global Leader No other country has completed more ABC projects in terms of Volume **Diversity** Complexity Effectiveness



COST OF ABC



if Construction Cost is the deciding factor neither ABC nor **Conventional Construction** is the right approach



if <u>construction cost</u> is the deciding factor <u>*build it slow*</u>

(ie. set no completion date)



build it slow

ignore:

safety, operational effectiveness, customer satisfaction, agency effectiveness, public/political capitol, essential services, business impacts, environmental impacts, global competitiveness,

<u>Bridge Cost X Project Cost X Program Costs</u>



20% "rule of thumb"

20% of what...

- <u>Bridge Costs</u> vs. Total Project vs.

Total Agency Costs?

- Bid Tabs Conv. Construc.?
- Engineer's estimate?



How good is the estimate?

At <u>preliminary</u> engineering design phase, how accurate are cost estimates? (~20% +/-)

What does this mean for ABC?



Vtrans ABProgram



<u>Bridge Cost X Project Cost X Program Costs</u>



ABC by the Numbers

54 ABC projects

Delivered from 2012 to date, which is

50% of all Projects

Representing

\$84 Million

Construction costs

100% New Bridges Opened on Time



ABP – Reduced Engineering Costs

BRIDGE PROJECT AVERAGES

Accelerated Conventional



40% savings in Engineering costs

- ABC Standardized approach
- Shorter duration design process = Preliminary Engineering (PE) Savings
- ABC = Shorter Construction Durations and Construction Engineering (CE) Savings



ABP – Positive Effect on Resource Demands

BRIDGE PROJECT AVERAGES





ABC Construction Savings

18% Savings

ABC vs Conventional Projects based on 37 new projects





What does it cost to <u>not</u> to do ABC?



How can ABC be Competitive in the Market?



Contractor's Perspective

"Labor, equipment, and materials cost are the same.

How we manage them is what makes us different from one another.

ABC projects allows us to better bid good project management for the Owner."



VEVADA	Weighing Factor	Aggregate Industries	Las Vegas Paving		Bid: A	+B
Maintenance of Traffic	20%	38	70	INEVADA Int	orchango Deri	an-Ruild
Management Approach	26%	61	76	VDOT	erchange Desi	gi - Dulla
Other Technical Issues	55%	50	63			
				City of Mesquite and NDC	T - Working together to co	nnect Mesquite
Technical Score	30%	47.85	67.65	/0.25	43.0	64.4
Price Two Two Corr Corr Corr						
Schedule Score	10%	1.18	9.57	1.85	9.53	10.00
Total Score	100%	61.10	71.60	74.62	82.61	88.27
						\sim
Ranking		5	4	3	2	

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Lessons Learned State of the Industry





Don't - unless you have to (DNA to PBSystems - as much)



Layout: ➢ KISS ➢ Repeatability (lean manuf.) ➢ Work off a common

reference line

- > Included tolerances (+/-)
- 😣 > "X rebar at X spacing" 😣



Layout cont... Straddle Caps ~ 40 ft (if you can) **Group the Pick Weights** > Build in front of the Abt. (if you can - Lateral Slide)



Profile: think about it!



Snovation

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Try to get "top down"













Clearances/Top Down







Design/Detail with Tolerances in mind













Detail/Work off Common Line



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		BENT CAP FABRICATION TOL	ERANCES
	Α	LENGTH	+ 3/4"
	в	WIDTH (OVERALL)	± 1/4"
	С	DEPTH (OVERALL)	± 1/4"
	D	VARIATION FROM SPECIFIED PLAN END SQUARENESS OR SKEW	$\pm \frac{1}{2} $
	E	VARIATION FROM SPECIFIED ELEVATION END SQUARENESS OR SKEW	± 1/8" PER 12 INCH WIDTH ± 1/2" MAXIMUM
	F	SWEEP, FOR MEMBER LENGTH (IF PRESTRESSED): UP TO 40 FEET 40 FEET TO 60 FEET OVER 60 FEET	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{2}$
	G	LOCATION OF GROUTED SPLICE COUPLER MEASURED FROM A COMMON REFERENCE POINT	± 1⁄4"
	н	LOCAL SMOOTHNESS OF ANY SURFACE	± 1/4" IN 10 FEET
	1	VARJATION FROM SPECIFIED CAMBER (IF PRESTRESSED)	+ $\frac{U_{\theta''}}{2}$ PER 10 FEET + $\frac{U_{2}}{2}$ MAXIMUM
	J	ERECTION ELEVATION TOLERANCE	± 1/4"
	S3	STIRRUP PROJECTION FROM CAP SURFACE	+ 1/4", - 1/2"



Balance Pic Weights Pull a crane pic chart









Clean Detailing/Repeatability











SPMTs...

Removal/replacement of bridge(s) [pairs] should occur in the same operation (not the next weekend) - if you can -



Specifications: Conventional doesn't always apply to ABC.





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100	Exit & Grade Proj - Fire Grading & Crane Pad	0 00 Jun 10 00 Jun 10 10			
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l of 1	Actual W	Vork		I-84 Bridge Work	
	A Remaining	na Wark		HOUDLY BOHEDULE	
28.Mar.	13			HOURLY SCHEDULE	



Lead Times & Start/Completion Dates:

- <u>Lead time</u>: more is needed
- <u>Start</u> date vs. <u>on-site</u> start date
- <u>On-site</u> start vs. <u>completion</u>

dates - where do they land?

- <u>Complete</u> vs. <u>Sustainably Comp</u>.



Communication:

> Talk

- Contract plan development
- Pre-bid meetings
- ATCs/CVEP/VE
- During Construction
- After Construction



In the Field:

- Proactive CEI
- Survey, survey, survey
- Be responsive make a decision
- Contingency plan(s) in the field how about Contingency details?



ABC Programmatic Success: - Lessons learned/opportunities to improve go to the next <u>ABC</u> job.

- There's always another project!



State of the Industry





2014 AASHTO HSCOBS Strategic Plan

Program Objective No. 5 of 8:

Accelerated Bridge Delivery and Construction





ABC Subcommittee Reorganization

AFF10 General Structures – parent committee

AFF10(3) – Subcommittee for ABC

AFF00 – Design Section (parent) AFH00 – Construction Section AFF00(2) Joint Subcommittee for ABC

www.trbaff103.com



Monthly ABC Webinars: (76th webinar to date!)



Thursday March 16, 2017 1:00 to 2:00 p.m. EST

???? Topic ????



www.abc-utc.fiu.edu







Sacramento Wash Crossing at Oatman Highway

Bid Amount	Contractor Name	Contractor Address
\$1,957,740.00	DEPARTMENT	PHOENIX, AZ
\$1,870,822.10	PULICE CONSTRUCTION, INC.	PHOENIX, AZ
\$2,370,741.00	FNF CONSTRUCTION, INC.	TEMPE, AZ
\$2,960,604.90	VASTCO, INC.	CHINO VALLEY, AZ

Workshop begins at 12:30pm

What: The Arizona Department of Transportation (ADOT) in partnership with Mohave County will construct a <u>new bridge using Prefabricated Bridge Elements</u> in 96-hours or less. See how this demonstration project is helping ADOT to implement accelerated bridge construction in a more routine programmatic manner.

New Structure Features:

- 113' 10" long x 38' 10" wide
- Full-width straddle cap abutments
- Modular Decked Beam (MDB) elements
- Prefabricated approach spans
- Nine-foot vertical raise in profile | 8,700 cubic yards of roadway fill paving









- 2 Bridges completed in Nov. 2016
- ➤ 1 of 2 a VECP
- \$15.00 UHPC vs.
 \$ 7.00 PT vs.
 \$ 1.25 ABridge



- www.accelbridge.com/Pages/default.aspx

Bonus Topic



Quantifying Safety from an ABC Perspective





Value of a Statistical Life

+ Work Zone Fatalities

The National Work Zone Safety Information <u>Clearinghouse</u> THE WORLD'S LARGEST INTERNET RESOURCE R U.S. Department of 1200 New Jersey Ave., S.E. Transportation Wasnington, DC 20590 Office of the Secretary workzonesafety.org Of Transportation June 17, 2015 MEMORANDUM TO: SECRETARIAL OFFICERS MODAL ADMINISTRATORS Kathryn Thomson Taltan B. Crash Data From: Expert Laws & News & Public Research Safety Standard General Counsel, x69136 Contacts Regulations Events Awareness Products & Practice Carlos Monje C- 4 CRASH DATA Home Assistant Secretary for Policy, x68152 Work Zone Fatalities Subject: Guidance on Treatment of the Economic Value of a Statistical Life Work Zone Fatalities (VSL) in U.S. Department of Transportation Analyses - 2015 Adjustment Occupational Injuries in Work Zones This page includes fatalities in roadway work zones as a result of motor vehicle Departmental guidance on valuing reduction of fatalities and injuries by regulations or Motor Vehicle included in the Fatality Analysis Reporting System (FARS) maintained by the I investments has been published periodically by this office since 1993. We issued a thorough Accident Costs Safety Administration (NHTSA). The data is available by year and state. For revision of our guidance in 2013 and indicated that we planned to issue annual updates to adjust for changes in prices and real incomes since then. Guidelines for Crash zones, visit our Occupational Injuries in Work Zones page. Data Collection Our 2013 revision indicated a VSL of \$9.1 million in current dollars for analyses using a base Work Zone Fatalities by Year and State vear of 2012. Using the 2013 value as a baseline, and taking into account both changes in prices and changes in real incomes, we now find that these changes over the past year imply an 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 | 20 increased VSL of \$9.4 million for analyses prepared in 2015. Last year the VSL was \$9.2 1998 | 1997 | 1996 | 1995 | 1994 | 1993 | 1992 | 1991 million. The procedure for adjusting VSL for changes in prices and real incomes is described on 1990 1989 1 1988 pages 6-7 of the guidance. 1983 | 1982 This guidance also includes a table of the relative values of preventing injuries of varied severity,

In square also includes a table of the relative values of prevening injuries of varied severity unchanged since the 2013 guidance. We also prescribe a sensitivity analysis of the effects of using alternative VSL values. Instead of treating alternative values in terms of a probability distribution, analysts should apply only a test of low and high alternative values of \$5.2 million and \$13.0 million.

This guidance and other relevant documents will be posted on the Reports page of the Office of Transportation Policy website, http://www.doi.gcv/policy, and on the General Counsel's regulatory information website, http://www.dot.gov/regulations. Questions should be addressed to Tony Homan, (202) 366-5406 or anthony.homan@dot.gov.

cc: Regulations officers and liaison officers

Economic Value of a Statistical Life (VSL)

Per Executive Orders 12866 & 12893, OMB Circular A-4, and DOT Order 2100.5....

Evaluate, in monetary terms, the cost and benefits of regulatory investments and administrative actions in order to demonstrate the faithful execution of their responsibilities to the public.



Economic Value of a Statistical Life (VSL)

The additional cost that individuals would be willing to bear for improvements in safety that, in aggregate, reduce the number of expected fatalities by one.

IT IS the economic benefit of preventing a fatality IT IS NOT the value of a life





2013 Fatalites	Not in Work Zone	In Work Zone Total		%	
Loro Futuritos	Number	Number	Number		
California	2,949	51	3,000	1.7	
Connecticut	273	3	276	1.1	
Florida	2,338	69	2,407	2.9	
lowa	315	2	317	0.6	
Massachusetts	324	2	326	0.6	
Michigan	939	8	947	0.8	
New York	1,189	10	1,199	0.8	
Texas	3,278	104	3,382	3.1	
Utah	215	5	220	2.3	
Vermont	69	0	69	0.0	
Wisconsin	533	10	543	1.8	

	Leap		
Fatality rate/month	~1% Fatality rate/month	9 months Conv.	3 weeks ABC
4.3	0.04250	0.38250	0.03188
0.3	0.00250	0.02250	0.00188
5.8	0.05750	0.51750	0.04313
0.2	0.00167	0.01500	0.00125
0.2	0.00167	0.01500	0.00125
0.7	0.00667	0.06000	0.00500
0.8	0.00833	0.07500	0.00625
8.7	0.08667	0.78000	0.06500
0.4	0.00417	0.03750	0.00313
0.0	0.00000	0.00000	0.00000
0.8	0.00833	0.07500	0.00625





VSL in Work Zones

2013 Fatalites		Difference	~92% Safety	
2015 Tutuntes	VSL \$9.2M	Min. VSL \$5.2M	Max VSL \$13M	Wovement
California	\$3,225,750	\$1,823,250	\$4,558,125	
Connecticut	\$189,750	\$107,250	\$268,125	
Florida	\$4,364,250	\$2,466,750	\$6,166,875	
lowa	\$126,500	\$71,500	\$178,750	
Massachusetts	\$126,500	\$71,500	\$178,750	
Michigan	\$506,000	\$286,000	\$715,000	
New York	\$632,500	\$357,500	\$893,750	
Texas	\$6,578,000	\$3,718,000	\$9,295,000	
Utah	\$316,250	\$178,750	\$446,875	
Vermont	\$0	\$0	\$O	
Wisconsin	\$632,500	\$357,500	\$893,750	



Safety national perspective

2013 Fatalites	Not in Work In Work Zone Zone 64		%	Difference				
zviji atames	Number	Number	Number	70	VS \$9.2	L M	Min. VSL \$5.2M	Max VSL \$13M
Total	32,140	579	32,719	1.8	\$36,62	1,750	\$20,699,250	\$51,748,125
Average	630	11	642	1.8	\$718,	074	\$405,868	\$1,014,669
Illinois	9	61	30	\$1,897	7,500	\$1,	072,500	\$2,681,25



Not Considered...

- Non fatal accidents/Injury
- Property damage



- On-site worker injury/reportables

Disutility Factors

WORK ZONE CR				
CRASH SEVERITY		CRASHES		
Property Damage		1,698		
Injury	TEN YEAR	DATA		٦
Fatal	YEAR	INJURY CRASHE	S FATAL CRASHES	
Unknown	2003	70	8 33	
TOTAL	2004	72	5 24	
	2005	65	4 40	
	2006	51	8 29	
	2007	47	8 31	
	2008	47	2 16	
	2009	51	8 9	
Storation ingente	2010	62	1 19	
(Ray)	2011	58	5 19	
a invention	2012	47	7 23	

AIS Level	Severity	Fraction of VSL
AIS 1	Minor	0.003
AIS 2	Moderate	0.047
AIS 3	Serious	0.105
AIS 4	Severe	0.266
AIS 5	Critical	0.593
AIS 6	Unsurvivable	1.000

<u>Safety</u> is our common thread, it is our No. 1 priority - one that we are all responsible for.





!!! Quiz Time !!!



Yes/No

<u>Bridge Cost X Project Cost X Program Costs</u>





Thank You!



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FHWA