Efficiency through technology and collaboration

Benjamin Beerman, PE
Federal Highway
Atlanta, GA
(404) 562.3930
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 **onsite construction time** and **mobility impacts** 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 = **Planed 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, ABC...

- 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, and Effectiveness.
COST OF ABC
if Construction Cost is the deciding factor neither ABC nor Conventional Construction is the right approach
if construction cost is the deciding factor build it slow (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, ....

Bridge Cost ≠ Project Cost ≠ Program Costs
20% “rule of thumb”

20% of what...

- **Bridge Costs** vs. **Total Project** vs. **Total Agency Costs**?

- Bid Tabs Conv. Construc.?

- Engineer’s estimate?
How good is the estimate?

At *preliminary* engineering design phase, how accurate are cost estimates? (\(\sim 20\% \pm /-\))

What does this mean for ABC?
Vtrans ABProgram

Bridge Cost ≠ Project Cost ≠ Program Costs
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

<table>
<thead>
<tr>
<th></th>
<th>Accelerated</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>$236,182</td>
<td>$451,725</td>
</tr>
<tr>
<td>CE</td>
<td>$250,634</td>
<td>$398,305</td>
</tr>
</tbody>
</table>

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

- **70-75% savings in resource demands**
  - ABC = Less impact to existing Utilities
  - ABC = Less ROW impacts
  - ABC = Less Environmental impacts
  - Team Co-organization and Co-location efficiencies

- **ROW**
  - Accelerated: $17,838
  - Conventional: $59,115

- **Environmental**
  - Accelerated: $3,424
  - Conventional: $13,174

- **Utilities**
  - Accelerated: $3,549
  - Conventional: $15,579
ABC Construction Savings

18% Savings
ABC vs Conventional Projects based on 37 new projects
What does it cost to not 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.”
<table>
<thead>
<tr>
<th></th>
<th>Weighing Factor</th>
<th>Aggregate Industries</th>
<th>Las Vegas Paving</th>
<th>Total Score</th>
</tr>
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<tbody>
<tr>
<td>Maintenance of Traffic</td>
<td>20%</td>
<td>38</td>
<td>70</td>
<td>70.25</td>
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<tr>
<td>Management Approach</td>
<td>25%</td>
<td>51</td>
<td>76</td>
<td>43.00</td>
</tr>
<tr>
<td>Other Technical Issues</td>
<td>55%</td>
<td>50</td>
<td>63</td>
<td>64.40</td>
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<tr>
<td>Technical Score</td>
<td>30%</td>
<td>47.85</td>
<td>67.65</td>
<td>88.27</td>
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<tr>
<td>Schedule Score</td>
<td>10%</td>
<td>1.18</td>
<td>9.57</td>
<td>10.00</td>
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<tr>
<td>Total Score</td>
<td>100%</td>
<td>61.10</td>
<td>71.60</td>
<td>82.61</td>
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<tr>
<td>Ranking</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>1</td>
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</table>

Low Bid: A+B
Lessons Learned
State of the Industry
Skew:

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”
- Use non-contact laps
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!
Try to get “top down”
Clearances/Top Down
Design/Detail with Tolerances in mind
Detail/Work off Common Line

**BENT CAP FABRICATION TOLERANCES**

<table>
<thead>
<tr>
<th>A</th>
<th>LENGTH</th>
<th>± 3/8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>WIDTH (OVERALL)</td>
<td>± 1/8&quot;</td>
</tr>
<tr>
<td>C</td>
<td>DEPTH (OVERALL)</td>
<td>± 1/16&quot;</td>
</tr>
<tr>
<td>D</td>
<td>VARIATION FROM SPECIFIED PLAN AND SQUARENESS OR SKEW</td>
<td>± 1/16&quot; PER 12 INCH WIDTH</td>
</tr>
<tr>
<td>E</td>
<td>VARIATION FROM SPECIFIED ELEVATION AND SQUARENESS OR SKEW</td>
<td>± 1/16&quot; PER 12 INCH WIDTH</td>
</tr>
<tr>
<td>F</td>
<td>SPREAD * FOR MEMBER LENGTH (OF PRESTRESSED)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 FEET OR LESS</td>
<td>± 3/8&quot;</td>
</tr>
<tr>
<td></td>
<td>OVER 50 FEET</td>
<td>± 1/2&quot;</td>
</tr>
<tr>
<td>G</td>
<td>LOCATION OF GRID POINT ** FROM A COMMON REFERENCE POINT</td>
<td>± 1/8&quot;</td>
</tr>
<tr>
<td>H</td>
<td>LOCATION OF PLANE</td>
<td>± 1/16&quot; IN 10 FEET</td>
</tr>
<tr>
<td>I</td>
<td>VARIATION FROM SPECIFIED CAMBER (IF PRESTRESSED)</td>
<td>± 1/16&quot; PER 10 FEET</td>
</tr>
<tr>
<td>J</td>
<td>ERICTION ELEVATION TOLERANCE</td>
<td>± 1/2&quot;</td>
</tr>
<tr>
<td>K</td>
<td>STIRUP PROJECTION FROM CAP SURFACE</td>
<td>± 3/8&quot;, ± 1/4&quot;</td>
</tr>
</tbody>
</table>
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.
<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>June 14, Start</td>
<td></td>
</tr>
<tr>
<td>June 20, End</td>
<td></td>
</tr>
</tbody>
</table>

- Prior to demo, we want to video mobilization?
- When/where will sleepers/grade beams be precast?

Pre-meeting at Hanson 8am - 2:00

State DOT visitors on site.
Lead Times & Start/Completion Dates:
- Lead time: more is needed
- Start date vs. on-site start date
- On-site start vs. completion dates - where do they land?
- Complete vs. Sustainably Comp.
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 ABC job.

- There’s always another project!
State of the Industry
2014 AASHTO HSC OBS 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.trbaфф103.com](http://www.trbaфф103.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

Call for Abstract – Extended Deadline: February 24th, 2017
Click HERE to Submit Abstract Online

2017 National Accelerated Bridge Construction Conference
December 7 and 8, 2017
Workshops - December 6, 2017
## Sacramento Wash Crossing at Oatman Highway

<table>
<thead>
<tr>
<th>Bid Amount</th>
<th>Contractor Name</th>
<th>Contractor Address</th>
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<tr>
<td>$1,957,740.00</td>
<td>DEPARTMENT</td>
<td>PHOENIX, AZ</td>
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<tr>
<td>$1,870,822.10</td>
<td>PULICE CONSTRUCTION, INC.</td>
<td>PHOENIX, AZ</td>
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<tr>
<td>$2,370,741.00</td>
<td>FNF CONSTRUCTION, INC.</td>
<td>TEMPE, AZ</td>
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<tr>
<td>$2,960,604.90</td>
<td>VASTCO, INC.</td>
<td>CHINO VALLEY, AZ</td>
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</table>

Workshop begins at 12:30pm

**What:** The Arizona Department of Transportation (ADOT) in partnership with Mohave County will construct a new bridge using Prefabricated Bridge Elements 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
Bonus Topic
Quantifying Safety from an ABC Perspective
Value of a Statistical Life + Work Zone Fatalities

The National Work Zone Safety Information Clearinghouse
THE WORLD'S LARGEST INTERNET RESOURCE

workzonesafety.org

CRASH DATA
- Work Zone Fatalities
- Occupational Injuries in Work Zones
- Motor Vehicle Accident Costs
- Guidelines for Crash Data Collection

Work Zone Fatalities

This page includes fatalities in roadway work zones as a result of motor vehicle crashes included in the Fatality Analysis Reporting System (FARS) maintained by the National Highway Traffic Safety Administration (NHTSA). The data is available by year and state. For work zones, visit our Occupational Injuries in Work Zones page.

Work Zone Fatalities by Year and State

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<tbody>
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<td>Count</td>
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</tbody>
</table>

U.S. Department of Transportation
Office of the Secretary Of Transportation

MEMORANDUM TO: SECRETARIAL OFFICERS MODAL ADMINISTRATORS

From: Kathryn Thomassen
General Counsel, x68152

Carlos Monje
Assistant Secretary for Policy, x68152

Subject: Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analyses – 2015 Adjustment

Departmental guidance on valuing reduction of fatalities and injuries by regulations or investments has been published periodically by this office since 1993. We issued a thorough 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.

Our 2013 revision indicated a VSL of $9.1 million in current dollars for analyses using a base year 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 increased VSL of $9.4 million for analyses prepared in 2015. Last year the VSL was $9.2 million. The procedure for adjusting VSL for changes in prices and real incomes is described on pages 6-7 of the guidance.

This guidance also includes a table of the relative values of preventing injuries of varied severity, unchanged since the 2013 guidance. We also prescribe a sensitivity analysis on 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 $3.2 million and $13.6 million.

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

cc: Regulations officers and liaison officers
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
<table>
<thead>
<tr>
<th>State</th>
<th>2013 Fatalites</th>
<th>Not in Work Zone</th>
<th>In Work Zone</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>2,949</td>
<td>51</td>
<td>3,000</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>273</td>
<td>3</td>
<td>276</td>
<td>1.1</td>
<td></td>
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<tr>
<td>Florida</td>
<td>2,338</td>
<td>69</td>
<td>2,407</td>
<td>2.9</td>
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<tr>
<td>Iowa</td>
<td>315</td>
<td>2</td>
<td>317</td>
<td>0.6</td>
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<tr>
<td>Massachusetts</td>
<td>324</td>
<td>2</td>
<td>326</td>
<td>0.6</td>
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<tr>
<td>Michigan</td>
<td>939</td>
<td>8</td>
<td>947</td>
<td>0.8</td>
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<tr>
<td>New York</td>
<td>1,189</td>
<td>10</td>
<td>1,199</td>
<td>0.8</td>
<td></td>
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<tr>
<td>Texas</td>
<td>3,278</td>
<td>104</td>
<td>3,382</td>
<td>3.1</td>
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<tr>
<td>Utah</td>
<td>215</td>
<td>5</td>
<td>220</td>
<td>2.3</td>
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<tr>
<td>Vermont</td>
<td>69</td>
<td>0</td>
<td>69</td>
<td>0.0</td>
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<tr>
<td>Wisconsin</td>
<td>533</td>
<td>10</td>
<td>543</td>
<td>1.8</td>
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<table>
<thead>
<tr>
<th>Leap</th>
<th>Fatality rate/month</th>
<th>~1% Fatality rate/month</th>
<th>9 months Conv.</th>
<th>3 weeks ABC</th>
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<tbody>
<tr>
<td>4.3</td>
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<td>0.38250</td>
<td>0.03188</td>
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<td>0.3</td>
<td>0.00250</td>
<td>0.02250</td>
<td>0.00188</td>
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<tr>
<td>5.8</td>
<td>0.05750</td>
<td>0.51750</td>
<td>0.04313</td>
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<tr>
<td>0.2</td>
<td>0.00167</td>
<td>0.01500</td>
<td>0.00125</td>
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<tr>
<td>0.2</td>
<td>0.00167</td>
<td>0.01500</td>
<td>0.00125</td>
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<tr>
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<td>0.00667</td>
<td>0.06000</td>
<td>0.00500</td>
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<td>0.8</td>
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<td>0.8</td>
<td>0.00833</td>
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<td>0.00625</td>
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</table>
### VSL in Work Zones

<table>
<thead>
<tr>
<th>2013 Fatalites</th>
<th>Difference</th>
<th>VSL $9.2M</th>
<th>Min. VSL $5.2M</th>
<th>Max VSL $13M</th>
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<tbody>
<tr>
<td>California</td>
<td>$3,225,750</td>
<td>$1,823,250</td>
<td>$4,558,125</td>
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<tr>
<td>Connecticut</td>
<td>$189,750</td>
<td>$107,250</td>
<td>$268,125</td>
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<tr>
<td>Florida</td>
<td>$4,364,250</td>
<td>$2,466,750</td>
<td>$6,166,875</td>
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<tr>
<td>Iowa</td>
<td>$126,500</td>
<td>$71,500</td>
<td>$178,750</td>
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<tr>
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<td>$178,750</td>
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<tr>
<td>Michigan</td>
<td>$506,000</td>
<td>$286,000</td>
<td>$715,000</td>
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<td>$632,500</td>
<td>$357,500</td>
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<td>$0</td>
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<td>$0</td>
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<td>Wisconsin</td>
<td>$632,500</td>
<td>$357,500</td>
<td>$893,750</td>
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~92% Safety Improvement
## Safety national perspective

<table>
<thead>
<tr>
<th>2013 Fatalites</th>
<th>Not in Work Zone</th>
<th>In Work Zone</th>
<th>Total</th>
<th>%</th>
<th>VSL $9.2M</th>
<th>Min. VSL $5.2M</th>
<th>Max VSL $13M</th>
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<tbody>
<tr>
<td>Number</td>
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<td>Number</td>
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</tr>
<tr>
<td>Total</td>
<td>32,140</td>
<td>579</td>
<td>32,719</td>
<td>1.8</td>
<td>$36,621,750</td>
<td>$20,699,250</td>
<td>$51,748,125</td>
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<tr>
<td>Average</td>
<td>630</td>
<td>11</td>
<td>642</td>
<td>1.8</td>
<td>$718,074</td>
<td>$405,868</td>
<td>$1,014,669</td>
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<table>
<thead>
<tr>
<th>Illinois</th>
<th>Total</th>
<th>Number</th>
<th>VSL $9.2M</th>
<th>Min. VSL $5.2M</th>
<th>Max VSL $13M</th>
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<tbody>
<tr>
<td></td>
<td>961</td>
<td>30</td>
<td>$1,897,500</td>
<td>$1,072,500</td>
<td>$2,681,250</td>
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</table>
Not Considered...

- Non fatal accidents/Injury
- Property damage
- On-site worker injury/reportables

$36m + \$(41 \text{ to } 176)m$

$77 \text{ to } $212M

Disutility Factors

<table>
<thead>
<tr>
<th>AIS Level</th>
<th>Severity</th>
<th>Fraction of VSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIS 1</td>
<td>Minor</td>
<td>0.003</td>
</tr>
<tr>
<td>AIS 2</td>
<td>Moderate</td>
<td>0.047</td>
</tr>
<tr>
<td>AIS 3</td>
<td>Serious</td>
<td>0.105</td>
</tr>
<tr>
<td>AIS 4</td>
<td>Severe</td>
<td>0.266</td>
</tr>
<tr>
<td>AIS 5</td>
<td>Critical</td>
<td>0.593</td>
</tr>
<tr>
<td>AIS 6</td>
<td>Unsurvivable</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Safety is our common thread, it is our No. 1 priority - one that we are all responsible for.
!!! Quiz Time !!!
Yes/No

Bridge Cost ≠ Project Cost ≠ Program Costs
Thank You!

FHWA

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