



# **Caltrans Accelerated Bridge Construction (ABC) Update**

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# “One Mission – One Vision” Enhance Mobility across California

- FHWA “Every Day Counts” Initiative
- Need for Accelerated Project Delivery (APD & ABC)
  - A. ABC reduces traveler delay
  - B. ABC delivers projects early & expedited capital improvement
  - C. Stimulate & Improve the state’s economy
- Minimize construction and reduce safety-related issues, environmental impacts
- Improve constructability, quality & performance.



## Past Projects

- **I-580 Connector Span Replace**  
Construction contract awarded on May 7 & completed May 24, 2007, less than 20 days
- **I-5 Truck Route UC- Repair**  
UC and Tunnel reopened 60 days after the inferno
- **I-40 Mustang Wash Bridge (Replace)**  
Precast Abutment Placement 28 days closure
- **SFOBB Yerba Buena Island Viaduct**  
Superstructure Roll-In Move- 3-day closure
- **Russian River Bridge- Emergency Replace**  
6-month construction
- **Hardscrabble Creek Bridge- Roll-in**  
New bridge built next to and just upstream of existing bridge on temporary abutments. Slid 48 feet into place- 8 hour construction window.



# ABC Strategic Plan

1. “Lessons” Learned Report and Survey
2. ABC Selection Criteria
3. Industry Engagement
4. Construction Specifications & Development
5. Technical Research & Development
6. Project Implementation



# ABC Implementation Strategy

- Incorporate Cost of Time into Project Delivery
  - Estimating User Delay Costs
  - User Delay Costs vs. Capital Construction Costs
- Programming
  - Early consideration of ABC (preliminary engineering - planning stage)
- Seismic Performance requirements
  - Research needed for connections (substructure/superstructure)
- Industry
  - “Cast-In-Place concrete” means and methods – Industry comfort
  - Ensure Constructability
  - Efficient Transportation and Erection



# Project Delivery Paradigm

## Product Performance Measure

- ABC selection depends on savings on total Cost  $TC = CC + IC$
- $CC$ = construction cost,  $IC$ = impact costs
- $IC$  is evaluated based on
  - ✓ Construction Impact Time (CIT) - impact duration
  - ✓ Construction Completion Time (CCT) - duration
- Use “Time” ~ related to costs\*
  - ✓ More research/study needed





# ABC Project Decision-Making

Established Decision Criteria used by other agencies

- FHWA Framework for PBES Decision Making
- Washington DOT ABC Decision Matrix
- Utah DOT ABC Decision Matrix

**Need to develop ABC Decision-making tools for Caltrans**



# Caltrans ABC Decision-Making

Phase I:

Structure Type Selection - ABC Solution Evaluation

Target Implementation to all bridge projects

- Safety, Functionality, Construction Cost (Constructability),  
New measure- “Time”
- Provide CIT and CCT
- Use Design Impact Questionnaire to determine needs for ABC





# ABC Solution Evaluation “Design Impact Questionnaire”

	No					Yes				
	1	2	3	4	5	1	2	3	4	5
<b>General</b>										
1. Is this an emergency bridge replacement?										
2. Is bridge on an emergency evacuation route or over railroad/waterway?									5	
3. Is there a funding requirement to accelerated project delivery?									1	
4. Is rapid recovery from or completion of future planned repair/replacement needed?										
5. Is the bridge construction a critical path of the total project?										
6. Are there significant economic benefits if construction is completed ahead of schedule?									5	
<b>Traffic</b>										
7. Bridge carries high ADT or ADTT?									4	
8. Bridge over existing high ADT or ADTT facility?										
9. Bridge construction significantly impact traffic? (Does it have high user-delay costs?)										
10. Can the bridge be closed during off-peak traffic periods?										
11. Will the traffic control plan be significantly impacted?										
<b>Construction</b>										
12. Do worker safety concerns at the site limit conventional methods? (e.g. adjacent power lines or over water?)										
13. Is the bridge location subject to construction time restrictions due to adverse economic impact?										
14. Does the site create problems for conventional methods of construction? (e.g. falsework, concrete delivery, etc.?)										



							No		Yes		
							1	2	3	4	5
<b>Utilities</b>											
15. Are there existing utilities/Railroad that impact the construction window?											
16. Are there existing utilities/Railroad that impact construction operations?											
<b>Environmental</b>											
17. Is the site environmentally sensitive area requiring minimum disruption? (e.g. wetlands, air quality, and noise?)											
18. Are there natural or endangered species at the bridge site? (Shorten construction window needed?)											
19. Local weather limit the time of year for construction?											
20. Is the bridge on or eligible for the National Register or Historic Places, or a designed landmark structure?											

If Total Scores < 55, then provide an ABC structure alternative/solution.



# Caltrans ABC Decision-Making

## Phase II:

### ABC Decision Making Tool- under development

- Pool-funded project- FHWA, Oregon DOT, Caltrans, Washington DOT, Montana DOT, etc.
- Develop an economic modeling and decision-making tool for ABC projects
- Provide a tool, which allow decision-makers to quantify the risks and uncertainties, to assess if ABC are “achievable and effective, and economically beneficial for specific bridge location



## ABC Decision-Making Tool

- Use of Analytical Hierarchy Process (AHP) survey scale: based on previous research and is well-developed, tested, and validated (e.g. Saaty, 1990)
- An AHP survey contains a series of pairwise comparisons between criteria located at each level of a decision hierarch
- Develop a decision-making tree tool

# AHP Survey Form

Please indicate the level of preference by choosing the most descriptive score (both value and direction) in the rubrics below.

## Level 1

	Extremely more important	Equally important	Extremely more important	
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# Oregon Elk Creek Project

- Validate models using data from previously-completed ABC projects
- Critical Factors: Site Constraints & Work Windows

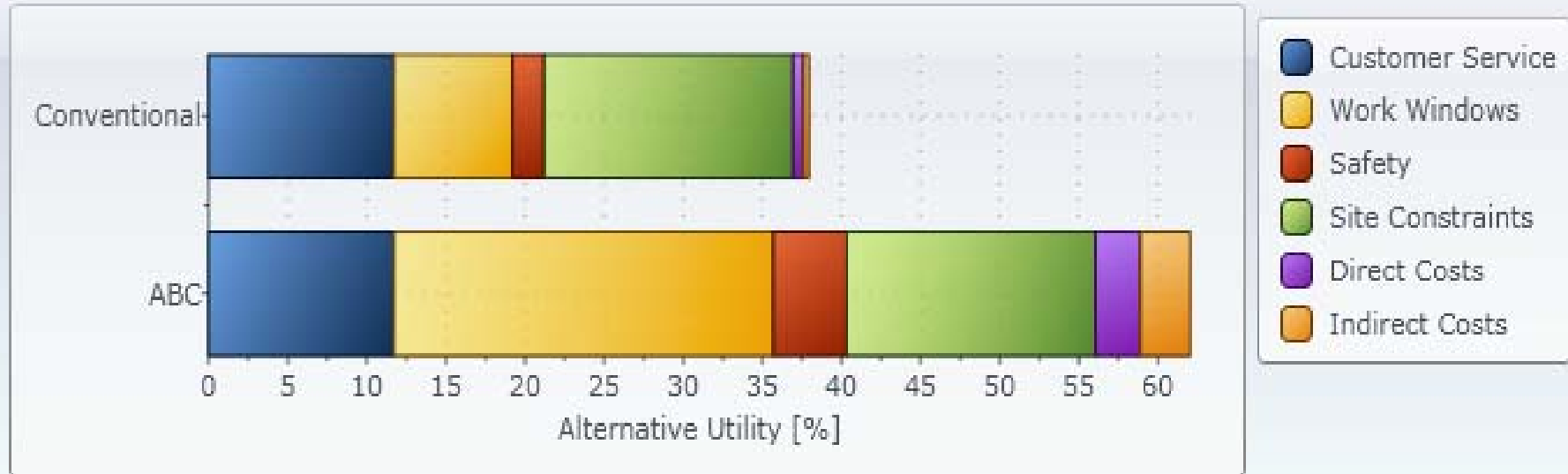


Chart Data

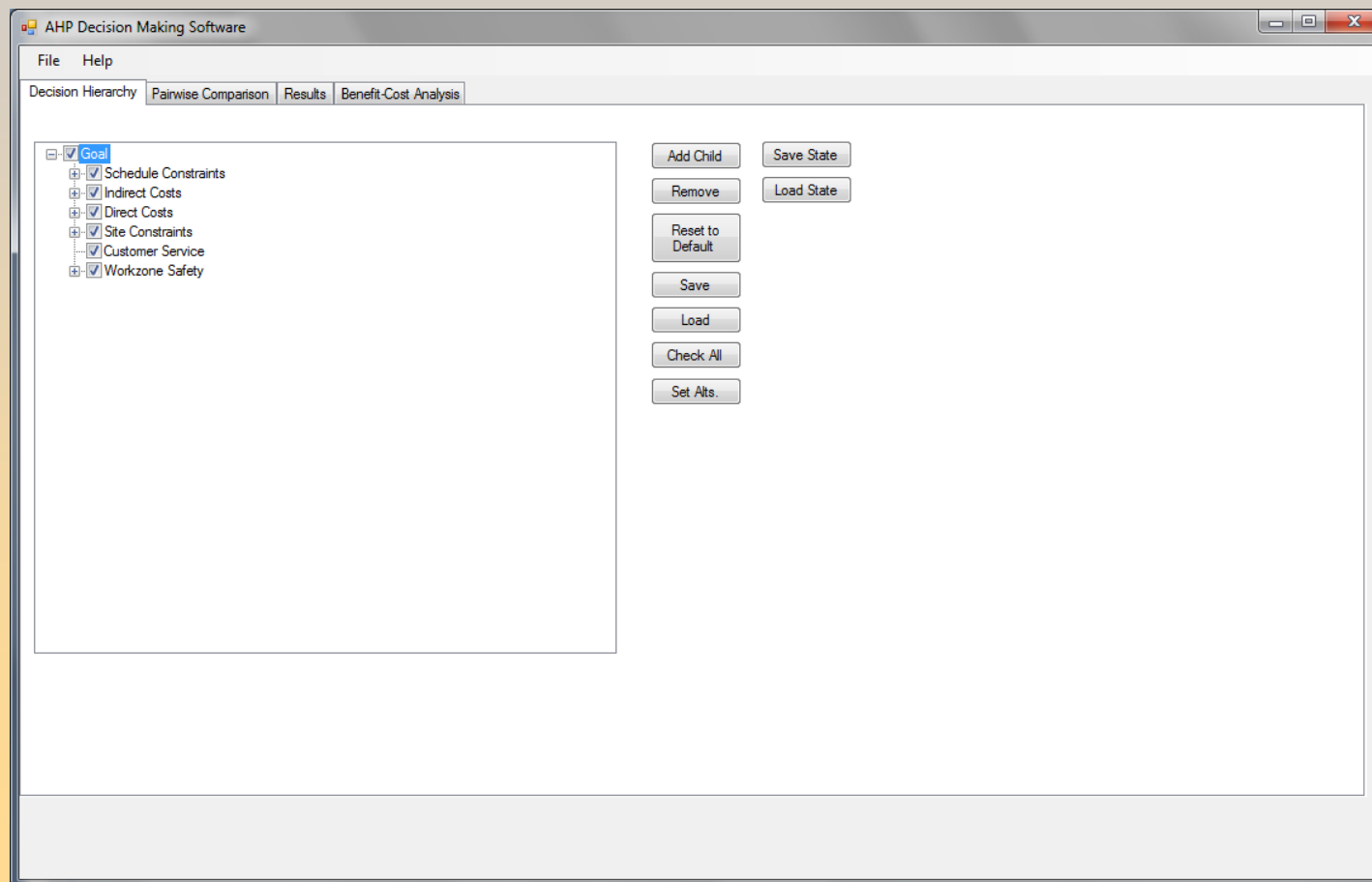
Alternative	Total	Customer_Service	Work_Windows	Safety	Site_Constraints	Direct_Costs	Indirect_Costs
ABC	62.050	11.730	23.970	4.640	15.730	2.830	3.150
Conventional	37.950	11.730	7.480	1.990	15.730	0.670	0.350





# ABC Decision Making Software

- Development Framework: MS Visual Studio .NET
- Platform: All Microsoft Windows Versions



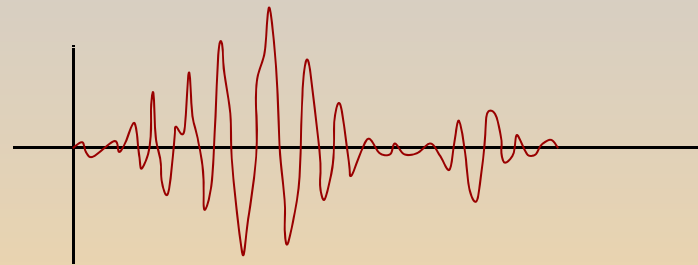


# Next Steps

- Finalize the pair-wise comparison survey list
- Test and validate models using data from previously-completed ABC projects- Caltrans and other states
- Create user's guide and training materials
- Final Study Report release in May, 2011.



# Innovation & Research



Seismic Research on ABC: Session #2



# Upcoming ABC Projects

- I-10 HOV Widen
  - Precast girders (PS&E: August, 2011)
- I-405 Temple Ave OC (Rehab)
  - Precast girder
  - Precast bent cap (potential)
- I-710 Bridge Widen Project
  - Precast girder
  - Precast bent cap (potential)

More details in Session #2



# ABC On-Line

Caltrans Division of Engineering Services - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites

Address [http://www.dot.ca.gov/hq/esc/Structure\\_Design/accel\\_bridge\\_construction/index.html](http://www.dot.ca.gov/hq/esc/Structure_Design/accel_bridge_construction/index.html) Go Links

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- Jobs

RELATED LINKS

- Organization Chart
- Caltrans Design Program (Highway Design)
- Caltrans Toll Bridge Program
- Structure Maintenance & Investigations
- Structure Construction
- Structure Design Support & Earthquake Engineering

Caltrans > Division of Engineering Services > Structure Design > Accelerated Bridge Construction

## Accelerated Bridge Construction

- [FHWA Seismic ABC Workshop Report](#)
- [ABC Lessons Learned](#)
- [Caltrans ABC Strategic Plan](#)

QUICK LINKS

- Accelerated Bridge Construction
- LRFD Information
- Engineering Services General Directory
- Structure Specifications (SSPs)
- Bridge Standard "XS" Detail Sheets
- Seismic Hazard Map
- Structural Detailing Standards
- Preliminary Investigations Forms Site
- Civil Engineering Scholarships

Start Paul Chung - In... Caltrans Divis... Microsoft Power... 7:46 AM

[http://www.dot.ca.gov/hq/esc/Structure\\_Design/accel\\_bridge\\_construction/](http://www.dot.ca.gov/hq/esc/Structure_Design/accel_bridge_construction/)





# ABC On-Line

- FHWA Seismic ABC Workshop Report
- Caltrans ABC Strategic Plan
- ABC Lessons Learned Report- CA Applications

Caltrans ABC Strategic Plan  
*Development of practice and policy for  
Future bridge projects*

*ABC- Advisory Council*

August 2008  
Version 1.1

August 2008

**Accelerated Bridge Construction  
Applications in California**  
*A Lessons Learned Report*

August 2008  
Version 1.1