Structures Accelerated Bridge Program Update 2012 - 2017

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Presentation Outline

• Overview of Accelerated Bridge Construction
• Overview of the Accelerated Bridge Program
• Examples of high profile ABC projects
  – Middlebury Sand Hill Bridge
  – Stowe
• ABP 2016 constructed projects
• Expedited Project Delivery
• ABP 2017 construction projects
• Projects in Design
• Performance Measures
• Year to date Statistics
• Program Highlights
• Important Links
Accelerated Bridge Construction (ABC)

ABC is bridge construction that uses design and construction methods to reduce the onsite construction time and mobility impacts that occur when building new bridges or replacing and rehabilitating existing bridges.

Precast Bridge Elements and Systems are structural components of a bridge that are built offsite, or adjacent to the existing bridge and are set into place. Setting these elements into place as opposed to constructing them in place greatly reduces the onsite construction time and mobility impact time.
Advantages of ABC

• Short term road closures to “install” Bridge components
  – Eliminates need for temporary bridge construction
    • Reducing impacts to:
      ✓ Environmental Resources
      ✓ Utilities
      ✓ Right-of-Way

• Reduced design costs
• Reduced design and construction durations
• Reduced traffic impacts
• Safer for workers and traveling public
Setting the Stage for the Accelerated Bridge Program (ABP)

- Significant increase in funding allocated to the Bridge Program
- Aging bridge population
- Tropical Storm Irene
- Legacy projects
- Accelerated Bridge Program created in 2012 and endorsed by Vermont’s Secretary of Transportation
The Accelerated Bridge Program

• The ABP is a program embedded within the Structures Design Section at VTrans

• Programmatic approach to delivering accelerated bridge construction projects
  – Consistent decision making (ABC or Road closures cannot be forced)

• Projects developed in the ABP for two reasons
  – Site constraints favor accelerated bridge construction (ABC)
    • Unsafe to construct project in phases or fit a temporary bridge
    • Environmentally sensitive areas
    • Complicated Utility Relocations
    • Right of Way complications
  – Project needs to be designed and developed quickly
    • Bridge in jeopardy of being closed
    • Bridge Unsafe
    • Bridge Failing
Delivering the Legacy Projects

- Middlebury Sand Hill (Historic Arch Bridge)
  - Project was at a stalemate and on the books for over 20 years
  - Bridge too Narrow and unstable for Phased construction
  - Temporary Bridge located in an environmentally sensitive area creating permitting issues (NEPA)
  - ROW needed for temporary bridge could not be procured
  - PE costs were at $550,000.00 and we had no solution
  - ABC solution endorsed by community in 2012 to include 45 day bridge closure
    - Eliminated Temporary bridge
    - Greatly reduced Right of Way acquisition
  - Bridge was under construction in 2014
  - Bridge opened to traffic in 40 days
- Stowe Bridge 2 on VT 108 (Intersection VT 100/Mountain Rd)
  - Tourist Town – Relies on access to resort and businesses nearly year round
  - No room for Temporary bridge
  - Project on the books for 27 years
  - ABC solution endorsed by community in 2012 to include 54 day bridge closure
  - Project Advertised in August 2014
    - Waterline Temporary Relocation constructed November 2014 in preparation for Bridge Closure to begin April 6, 2015
  - Bridge opened to traffic in 46 days
    - Contractor not allowed to work from Friday evening to Sunday morning during closure period
ABP Constructed projects - 2016

- 8 Projects were constructed totaling $13.7 million
- 42% of projects developed in Structures were delivered through the ABP
- 44% of projects developed in Structures were constructed using ABC
- All ABC projects met specified closure durations
- 47 Planned road closures since 2012
2016 Bridge Replacements:
Waitsfield – Bridge 177 on VT 100
Woodstock – Bridge 24 on VT 106
Weston – Bridge 98 on VT 100
Clarendon - Bridge 11 on Walker Mt Rd
Craftsbury – Bridge 4 on Creek Rd
Duxbury – Bridge 193 on VT 100

2016 Bridge Decks:
Brattleboro – Bridge 31 on Elliott St
Irasburg – Bridge 107N on I-91
Delivering Bridge Deck Projects

Brattleboro Before

Brattleboro After

Irasburg Before

Irasburg After
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Duxbury Culvert Replacement
Duxbury Culvert Replacement

• Expedited Project Delivery
  – Delivered project in 8 weeks (April 1\textsuperscript{st} – May 25\textsuperscript{th})

• Colocation proved advantageous
  – Utility Coordinator within structures
  – Hydraulics Engineer embedded in Structures
  – Right of Way section prepared documents, negotiated and cleared right of way in just 4 weeks

• Innovative Contracting
  – Simplified bidding process
  – Shortlisted three contractors
2016 construction Innovation

- Long curve girder bridge with poor hydraulic capacity
- Steel bridge beams cast integral with pier cap
  - Allows for better hydraulic conveyance without drastic roadway grade change
2016 Construction Innovation

- Ultra High Performance Concrete (UHPC)
- FHWA Every Day Counts (EDC) Initiative
- EDC 3 focused on UHPC as an option for connecting prefabricated bridge elements.
  - Waitsfield Bridge 177 on VT 100
    - Initially to connect precast deck slabs
    - Used to connect approach slab sections
ABP Projects in Construction - 2017

• 10 Projects totaling $14.5 million

• 50% of all projects developed in Structures were delivered through the ABP

• 59% of all projects developed in Structures will be constructed using ABC

• 15 road closures next summer

• 62 planned road closures for since 2012
2017 Bridge Replacements:
Barton Village – Bridge 20 on VT 100
Barton Village – Bridge 24 on VT 106
Chelsea – Bridge 9 on VT 110
Chelsea – Bridge 10 on VT 110
Guilford – Bridge 5 on US 5
St. Johnsbury – Bridge 6 on VT 2B
Richmond – Bridge 32 on US 2
Huntington – Bridge 8 on FAS 0211
Strafford – Bridge 9 on FAS 0177

2017 Bridge Decks:
Orwell – Bridge 4 on VT 73
2017 Innovation

- Ultra High Performance Concrete (UHPC)
- EDC - 4 focusses on implementation and is providing technical assistance and training for UHPC
  - Ludlow Bridge 25 on VT 103
    - Using to connect approach slabs
- Expedited Project delivery – Incorporating strategies from the C-19 study.
Summer 2018
• Johnson BR 1 & 2 on VT 100C
• Johnson BR 4 on VT 100C
• Poulney BR 2 on FAS 0138
• Woodstock Village BR 51 on US4

Summer 2019/2020
• Killington BR 33 on US4
• Cavendish BR 58 on TH 1
• Colchester BR’s 76 & 77 on I-89N and I-89S

Summer 2020
• Moretown BR 2 on VT 100B
ABP Project Delivery Performance Measures

• 2012 Goal - 80% projects delivered in 24 months
  – Problem fitting all projects into this model and meeting optimal advertising period (September – December)

• 2017 Goal - 80% projects delivered according to the schedule developed at start of design phase
  – Focusses on credible scheduling while still being aggressive
  – Schedules are developed to fit the project
    • Some projects may have hyper accelerated schedules 6 – 18 months
    • Other projects will have reasonably accelerated schedules 18 - 30 months.
  • Project Managers measured according ability to meet to schedule milestone dates
Accelerated Bridge Program by the Numbers

43 ABP projects have been delivered through 2017, representing

$77 million in construction costs (34% of Structure’s budget)

$84 Million
Construction costs for ABC Projects (45% Structure’s budget)
ABP = Reduced Engineering Costs

BRIDGE PROJECT AVERAGES

40% savings in Engineering costs

- Standardized drawings and specifications
- Standardized design details
- Builds on the success of past projects

PE

Conventional: $451,725
Accelerated: $236,182

CE

Conventional: $398,305
Accelerated: $250,634
ABP = Positive Effect on Resource Demands

BRIDGE PROJECT AVERAGES

70-75% savings in resource demands
- Less impact to resources
- Minor Alterations and “Block Out Approach” to minimize ROW impacts
- Environmentally responsible
- Team Co-organization

ROW: $59,115
Environmental: $13,174
Utilities: $15,579

$17,838
$3,424
$3,549
Success made possible by Meaningful Public Engagement
Forming community partnerships to garner support, expedite project delivery and increase public satisfaction
Customer Survey Results

- How satisfied were you with ABC?
  397 Responses from 9 projects

- How satisfied are you with the information you received about the bridge project?
  223 Responses from 9 projects

- Overall, how satisfied were you with how VTrans delivered this project?
  382 Responses from 9 projects

**How satisfied were you with ABC?**

- Very Satisfied: 85%
- Somewhat Satisfied: 9%
- Neither Satisfied nor Dissatisfied: 5%
- Somewhat Dissatisfied: 1%
- Very Dissatisfied: 0%

**Overall, how satisfied were you with how VTrans delivered this project?**

- Very Satisfied: 70%
- Somewhat Satisfied: 20%
- Neither Satisfied nor Dissatisfied: 10%
- Somewhat Dissatisfied: 0%
- Very Dissatisfied: 0%
Accelerated Bridge Program Highlights

• C19 Grant for Expedited Project Delivery
  – Awarded $250,000.00 grant to develop and implement expedited project delivery strategies
  – ABP Project Manager Jennifer Fitch presented at the TRB 2016 mid-year meeting in Utah
    (All expenses Paid by FHWA)

• T2 Technology Grant
  – ABP website has been developed and is now available through VTrans website

• National Conferences
  – International Interactive Symposium on UHPC
  – Every Day Counts – 4 Summit (UHPC)

• Published Articles
  – ABP Project Managers have published 5 articles highlighting Vermont’s experience with ABC in national engineering magazines

• Act 153
  – Local share reduced on town highway projects for bridge replacement projects that use road closures
  – Highly successful at propelling widespread adoption of ABC
  – 46 towns have elected to close roads to replace bridges
Important Links

Accelerated Bridge Program Web Page:
http://vtrans.vermont.gov/highway/structures-hydraulics/accelerated-bridge-program

Accelerated Bridge Construction Videos:
https://www.youtube.com/user/VTransTV

Planned Bridge Closures
http://vtrans.maps.arcgis.com/apps/webappviewer/index.html?appid=369106d8ddc34c1085760884c1fd7031

Public SharePoint Site (Project External Website)
https://outside.vermont.gov-agency/vtrans/external/Projects/Struct...