Precast Concrete, Prefabrication and Accelerated Bridge Construction (ABC) at MTO

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November 4, 2014
Accelerated Bridge Construction

West Region’s Experience

- Why do ABC?
- Whiteman Creek Bridge

- The Future
- GiGo Bridge
Why do we need ABC?

**Traditional**  

**Accelerated**
Why do we need ABC?

- Traffic delays affect the economy
- Work zone safety – shorter exposure
- Environmental impact – less idling
- Aging Infrastructure
Hwy 24 Whiteman Creek Bridge

Primary Goal: ABC

Secondary Goal: Enhance durability in an economical manner
Whiteman Creek Bridge - Background

Original Bridge – West Elevation

Highway 24 - Looking North
Whiteman Creek Bridge – New Design

New Bridge – Elevation View
Whiteman Creek Bridge – New Design

New Bridge – Section View

Longitudinal Joint
Whiteman Creek Bridge – Construction
Week 1
Whiteman Creek Bridge – Construction
Week 2
Whiteman Creek Bridge – Construction Week 3
Whiteman Creek Bridge – Construction
Week 3
Whiteman Creek Bridge – Construction Week 4
Whiteman Creek Bridge – Construction Week 4
Whiteman Creek Bridge – Construction
Week 4

Transverse Joint
Whiteman Creek Bridge – Construction Week 5
Whiteman Creek Bridge – Construction
Week 5
Whiteman Creek Bridge – Construction
Week 6
Whiteman Creek Bridge – Construction Week 7
Whiteman Creek Bridge – Completed
Whiteman Creek Bridge
Bridge Costs

• Bridge Cost = $1.88 Million
• Cost/m² = $3,250/m²
• Typical Cost/m² = $2,800/m²
• UHPC Volume = 36 m³
• UHPC Cost = $212,400 ($5,900/m³)
Whiteman Creek Bridge – Summary

- Highway closed 7 weeks
- GFRP Rebar = no corrosion
- UHPC = increased durability
- Bridge costs 15% higher
- Model project for the future?
Whiteman Creek Bridge – Load Test
Ultra High Performance Concrete (UHPC)

Behavior of Field-Cast Ultra-High Performance Concrete Bridge Deck Connections Under Cyclic and Static Structural Loading

November 2010
NTIS Accession No. PB2011-101995
FHWA Publication No. FHWA-HRT-11-023

UHPC Deck Joint Testing
The Future

- Heavy Lift (SPMT)
- Jack and Slide
- More Prefab
- GiGo Bridge
The Future
Heavy Lift (Island Park Bridge)
The Future
Jack & Slide (Grand River Bridge - Cayuga)
The Future
Jack & Slide (Grand River Bridge - Cayuga)
The Future
More Prefabrication (Indian Road Bridge)
The Future
More Prefabrication (Ottawa Street Bridge)

Prefabricated pier caps
The Future - GiGo Bridge

FHWA
- Get In; Get Out; Stay Out
- Every Day Counts

MTO
- Get in, Get out (GiGo) Bridge
Goals of GiGo Bridge

1. Bridges over freeways built in 45 days
2. Project constructed in less than four months
3. Minimize work on and over freeways
4. Project costs less than traditional staged construction
Hwy 401 Westminster Drive
How will we do it?

- Prefab most components in advance
- **Super Module units**
- Superior materials like UHPC
- Partnering with Designer and Contractor
Hwy 401 Westminster Drive
Super Modules

GiGo Bridge

WEST

350
2250
3500
LANE
3500
LANE
2250
350

PROFILE
CONTROL T/A

ASPHALT & WATERPROOFING
SYSTEM, 90mm TOTAL

2%

2%

UHFC CLOSURE
STRIP (TYP.)

1200 DP. STEEL BOX
GIRDER (TYP.)

CONC. PARAPET WALL
w/ RAILING (TYP.)

DECK DRIP
CHANNEL (TYP.)

SUPERSTRUCTURE MODULE
(DECK & GIRDER)
INSTALLED AS MODULAR
UNIT (TYP.)

1100
12200

(5)—SPACES AT 2000 = 10000

1100
Abutment
Temporary Foundations
Box Girder Installation
Supermodules
Concrete Deck Pour
Bridge Demolition
Precast Abutment & Wingwalls
Precast Abutment con’t.
Precast Pier cap
Supermodule Lift - WBL
Supermodule Lift – EBL
UHPC Closure Strips & Barriers
Open to Traffic
Highway 401/Westminster Drive Underpass
Tender Opening – September 2013

Prefabrication – Dec 2013 to May 2014

Bridge Construction:
- Demolish Bridge – July 5
- Open to Traffic – August 22.
Contractor: Facca Inc.
Total Contract Price: $3.9 million
Bridge Cost/m²: $3,500/m²
Incentive/Disincentive:
  - Incentive $10,000/day
  - Disincentive $50,000
  + $10,000/day
- Benefits

- Speed of construction
- Reduced traffic disruptions
- Lower C.A. costs
- Improved quality
- Enhanced safety.
Summary

- Precast concrete spearheaded NWR
- UHPC is superior in prefabrication
- Leads to ABC in the South
Any Questions?
GiGo Bridge – Precast Abutments
GiGo Bridge – Precast Pier Cap
Hwy 101 Moose Creek Bridge

Single Span Bridge with Precast Substructure and Precast Superstructure
Hwy 6 CPR Overhead

Precast Pier Caps
Hwy 401 Mull Road Underpass

Full width precast deck panels
The Future

More Prefabrication (Ottawa Street Bridge)

Prefabricated Pier Caps
GiGo Bridge

1st Project - 60 days

2nd Project - 45 days

New Thinking
Whiteman Creek Bridge – New Design

Abutment – Plan View

Abutment – Elevation View
Whiteman Creek Bridge – Construction

Week 4

Longitudinal Joint
The Future
Jack & Slide (Grand River Bridge - Cayuga)
Pile Driving