Dodge County GRS-IBS Showcase Agenda
Thursday, August 25th 2016
Juneau Community Center

8:00  Check-in, Coffee, and Conversation

8:30  Welcome and Logistics for the Day  WisDOT - Scot Becker and James Luebke

8:45  GRS-IBS Technology Overview
- WisDOT General ABC Update  WisDOT - Bill Dreher
- GRS-IBS Overview  FHWA - Jennifer Nicks
- GRS-IBS Construction  FHWA - Daniel Alzamora

9:30  Break

10:00  GRS-IBS Dodge County Projects
- Dodge County Perspective  Dodge County - Peter Thompson
- Design Considerations  Design Engineer– Kristofer Olson (Omnii)
- WisDOT Perspective  WisDOT – James Luebke
- Lessons Learned  Project Leader – Brad Abraham (R.A. Smith National, INC.)
- Q&A and Field Trip logistics  WisDOT – James Luebke

11:30  Lunch (provided)

12:30  Field Trip to Site (bus transportation provided)*
- Safety protection will be required (shoes, vests, and hard hats) and will not be provided.
- Site #1 CTH KW over Pratt Creek B-14-217 West Abutment (60% complete structure)
- Site #2 CTH S over Shaw Brook B-14-216 East Abutment (90% complete structure)

2:30  Q&A and Wrap-up Discussion
- Future uses of GRS-IBS
- Comments and questions about the project
- Closing Remarks

3:00  Adjourn
Brad A. Abraham
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Dodge County
GRS-IBS SHOWCASE
August 25th 2016

Today's Agenda
- GRS-IBS Overview
- Break
- Dodge County Sites
- Lunch
- Site Visit
- Wrap-up

Additional Items
- Breaks – slideshow, displays, talk to others…
- Site Visit – Active site (safety first)
- PDH’s emailed after the showcase
- See BOS website for presentations and additional resources

Some History…
**Dodge County**

- Design: 2014
- Data and Plans: 2015
- LET: 2/16
- Begin Work: 5/16

**WisDOT GRS-IBS Milestones**

- Chapter 7 WBM: 8/2012
- GRS Standards: 1/2013
- GRS Design Steps: 8/2015
- FHWA Aid Grant: 6/20/16
- PS Box Girders: 1/2016

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**Special Thanks!!!**

- Dodge County
- FHWA
- WisDOT
- Omni Associates
- UW TIC

- Joe Bakos
- Rory Rhinesmith
- Scot Becker
- Lynn Cloud
- Kris Olsen
- Dan Alizamora
- Judy Wilson
- David Esse
- Jeff Melville
- Dave Kopacz
- Mary Forlenza
- Brian Fields
- Michael Erickson
- Oscar Winger
- June Coleman
- Don Miller
- Jennifer Nicks
- Tanya Iverson
- Bill Dreher
- Peter Thompson
- Eric Heggelund
- Steve Pudlowski
- Bill Oliva
- Bob Arndorfer
- Najoua Ksontini
- David Hunt

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**Dodge County GRS-IBS Showcase**

- And...Thanks for your participation!!!

- 24 WisDOT
- 30 Consulting Firms
- 18 County
- And more...
Dodge County
GRS-IBS SHOWCASE
August 25th 2016
Dodge County
GRS–IBS SHOWCASE

William Dreher, PE
Structures Design Chief
WisDOT – Bureau of Structures

Why ABC in Wisconsin?

- It Is Our Mission!
  - Provide leadership in the development and operation of a safe and efficient transportation system.
  - Finding innovative and visionary ways to provide better products and services...

Why ABC Now?

- There is a Need & Opportunity!
  - Needs of our customers for less disruption and more safety.
  - The opportunity provided by our Partners at FHWA (Highways for Life, SHRP2, and EDC)
  - FHWA – Accelerated Innovation Deployment (AID) Grant – Today’s Showcase!

WisDOT’s ABC Goals

- Develop Accelerated Bridge Construction options to facilitate safe and efficient transportation systems that better serve the public.
  - Safer projects
  - Shorter and less disruptive impacts to the traveling public
  - Higher Quality
  - Potential cost savings
  - Opening up the field, more contractors may be able to build these types of bridges
WisDOT ABC Team

- The Team included:
  - Guidance – State Trans. Innovation Council (STIC)
  - Department Bridge, Geotech, and Contract Administration Experts
  - FHWA Resources and Support
  - Consultant, Contractor, and Fabricator Support

- The Objective
  - Develop the Policy, Guidance, Standards, and Provisions to implement ABC tools and solutions, and get out in front of projects to meet project needs.

Our Process of Development:

- Research – Development of Technologies
- Customize – Project/Site Specific Details and Specifications
- Standardize – Program & Corridor Approach
- Institutionalize – System-wide Policy & Applications
- Learn, Document, and Project to other Elements

WisDOT Perspective

- Lessons Learned
  - Development of Precast Abutment Standards
  - Refinement of GRS–IBS Super Structure Options
  - Precast Approach Slabs
  - UHPC Applications (Connections & Decks)
We would like to thank:

- FHWA – Accelerated Innovation Deployment (AID) Grant (Ewa Flum & Dan Alzamora)
- Dodge County Highway Dept. (Peter Thompson)
- WisDOT SW Region’s Local Program (Michael Erickson)
- And all of you for your interest in this technology

Questions?
What is GRS IBS?
- Accelerated construction technique
- Utilizes compacted granular fill and geosynthetic reinforcement in alternating layers.

GRS - Composite Material
- Concrete
  - Aggregate
  - Water
  - Cement
- GRS
  - Aggregate
  - Closely-spaced geosynthetics

GRS IBS - Composite Design
- Concrete Abutment
  - Steel reinforcement provides tensile strength
  - Spacing and sizing of reinforcement plays a role in strength and serviceability

Why Consider the GRS IBS?
- Lower costs
- Accelerated bridge construction
- Smooth transition eliminating the “bridge bump”
**Comparable Abutment Costs**

<table>
<thead>
<tr>
<th>GR S-IBS Abutments Costs in PA</th>
<th>Traditional Abutments 2012</th>
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<tbody>
<tr>
<td>$95.53/SF</td>
<td>$208.54/SF</td>
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**Traditional Abutments** (local 2012 project): $208.54/SF

**GRS-IBS Abutments**: $95.53/SF

**Potential Savings**: $113.01/SF

**54% Savings over traditional abutments!**

**Accelerated Bridge Construction**

- GRS IBS is quick and simple to build (weeks vs. months for conventional construction)
- If using PBES for the superstructure, a bridge can be replaced in about 4 weeks depending on the project complexity
- Design can be easily modified in the field

**Eliminating the bridge bump**

- The GRS IBS alleviates "the bump at the end of the bridge"
GRS IBS – Where should GRS IBS be considered?
- Water crossings (creeks, rivers, flood plains, tidal zones)
- Grade separations (at grade crossings of road, rail, trails)
- Low volume local roads (ADT less than 400)
- High volume and high loads (ADT in the thousands)
- Load combinations (Seismic, lateral, thermal, uplift)
- Unusual geometries (Skew, longitudinal grades, transverse grades)
- Superstructure types (Adjacent concrete boxes to steel girders with semi-integral abutment)
- Material selection (Facing, geosynthetic reinforcement, fill)

GRS IBS – Where should GRS IBS not be Considered?
- GRS IBS should not be considered at:
  - High water velocities?
  - Deep Scour?
  - Excessive Settlement?
- Obstacles or design considerations?

GRS IBS – Example Projects
- Different types of crossings
- Different types of superstructures
- Different roadway geometries
- Different types of facings
- Different types of fill materials
- Different types of geosynthetics
- Different designers, from in-house to consultant
- Different construction delivery method, in-house to contracted

DE – Chesapeake City Road over Guthrie Run (2013)

FL – CR 107 over Lanceford Creek Nassau County (2014)

HI – Saddle Road Bridge (2012)
Designed for PGA x Fpga, ground acceleration (PGA=0.6g, Fpga=1.0)

Image source: FHWA
Taken October 2014, 2 years after construction
IL - Great Western Trail over Grace St. (2011)
Use of stone columns to improve foundation soils

LA - Maree Michael Canal, Vermillion Parish
(2015)

MA - SR 7A over Housatonic RR (2014)

MD - Allegany County (2014)

ME - Knox County Beach Bridge (2013)

MI - Keefer Rd. (2014)
PR - Yauco PR2 (2014)

SC - Airline Rd, Anderson County (2014)

SD - 8th Street Bridge, Custer (2014)

WA, Cheney Plaza Bridge (2013)

WW - VA Hospital, Clarksburg (2013)

Questions and Comments
Block Corners

Fill Placement

Fill Compaction

Fill Compaction

Abutment Construction

Top of wall details

• Clear Space: The distance between the top of the wall face and the bottom of the superstructure

3" min or 2% of wall height
• Set Back: The distance between the back of the facing block and the front of the beam seat
Placement of superstructure

Approach Construction

Rip Rap Installation

QUESTIONS?
EDC Web Site
www.fhwa.dot.gov/everydaycounts

Taking effective, proven and market-ready technologies and getting them into widespread use
Dodge County
CTH KW & S
GRS-IBS Bridge Design

August 25, 2016

Design Process
- Data Gathering
- Hydrologic & Hydraulic Modeling
- Subsurface Investigation
- Planning Meeting/Agency Coordination
- Preliminary Design
- Permitting/Reports
- Final Design & PS&E

Data Gathering
- Manual Reviews
  - WisDOT Bridge Manual Chapter 7 – Accelerated Bridge Construction
  - FHWA GRS-IBS Interim Implementation Guide

Data Gathering
1. 4.2.2 Application
   In some cases, GRS-IBS shallows may not be suitable for a particular bridge location and
   installation. In such cases, alternative solutions for a bridge shallower than the minimum
   depth for a GRS-IBS shallower may be considered. The alternatives shall be
   investigated and analyzed to determine the best option for the project. The design shall be
   reviewed by a qualified structural engineer and a qualified materials professional to ensure
   compliance with the requirements for GRS-IBS shallows.
H & H Modeling

- Velocity
  - CTH KW

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<td>OVERTOPPING FREQUENCY</td>
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H & H Modeling

- Scour – 200 yr event
  - CTH KW

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H & H Modeling

- Scour – 200 yr event
  - CTH S

H & H Modeling

- Geomorphology – CTH KW
Subsurface Investigation

- Soil Borings – CTH S

Design - Constructability

- Controlling Water During Abutment Construction
Design - Details

- **GRS-IBS Abutments**

Design - Details

- **GRS-IBS Abutments**

Design - Details

- **GRS-IBS Abutments**

Design - Details

- **Precast Prestressed Concrete (PPC) Box Beams**
Dodge County
WisDOT Perspective
August 25th 2016

GRS History (2011 – Current)
- FHWA - Every Day Counts (EDC1, EDC2, & EDC3)
- Demonstration and AID Grants
- Actively participating and promoting GRS Technology
- New tool and not for every location

GRS Abutments

Chippewa County
- Concrete slab cast on GRS
- No approach slab used
- Existing timber piles support false work

Chippewa County
- Reduced Construction Time
- Less Complex Construction Methods

8/29/2016
Fabric

- GRS Abutments (vs. Chippewa Project)
  - Similar SPV and Plans
  - Reinforcement Strength: 30% reduction (2% strain/min.)
  - Cofferdam Bid Item
  - Project Showcase

Superstructure

- Completed Flat Slab
- Re-Work Prestressed Box Girders

Dodge County

- GRS Abutments
- Similar SPV and Plans
- Reinforcement Strength: 30% reduction (2% strain/min.)
- Cofferdam Bid Item
- Project Showcase

Other Projects...Iron County

- PS Box Girders
- A1 Abutments
- Composite Deck
### Costs

#### Total Costs

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<th>Bridge Area (SF)</th>
<th>Total Costs</th>
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#### Superstructure Costs

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#### Substructure Costs

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### Future Works

- Monitor Structures
- Continue to stay connected
- Address Lessons Learned
  - Identify or rule out potential candidates
  - Improve Design Guidance
  - Construction
GRS-IBS
SHAW BROOK & PRATT CREEK

LESSONS LEARNED

THE PLAYERS
• CONTRACTOR: JANKIE GENERAL CONTRACTORS
• PROJECT LEADER: BRAD ABRAHAM – RA SMITH NATIONAL, INC.
• WisDOT LOCAL PROGRAM MANAGEMENT CONSULTANT: TERI SCHOPP - DAAR
• BLOCK SUPPLIER: ROCHESTER CONCRETE PRODUCTS
• GIRDER/BEAM SUPPLIER: SPANCITE

CONSTRUCTION PROGRESS SO FAR
• SHAW BROOK BRIDGE (CTH S)
  • BOTH ABUTMENTS @ 90% COMPLETE
  • GIRDERS ARE SET AND GROUTED

CONSTRUCTION PROGRESS SO FAR
• PRATT CREEK (CTH KW)
  • WEST ABUTMENT IS 75% COMPLETE
  • EAST ABUTMENT IS UNDER CONSTRUCTION
**REINFORCED SOIL FOUNDATION (RSF)**

- Used 18" of 3" dense graded base for additional support
- Used 6" of ¾" dense graded base to allow for easier leveling of the RSF

**BLOCK WALL CONSTRUCTION**

- Setting the starter blocks
  - Correct layout
  - Full blocks in the corners
  - Calculating the location using the block supplier wall design
  - Water
  - Battering – utilizing a leveling material
  - ¼" of material allowed per spec

- 90 degree corners vs. rounded corners

- Fabric
  - Type of fabric
  - Placement of fabric
  - Keeping the blocks level
  - Overlapping in the corners
  - Height of fabric adding up over the courses
  - Covering the voids — in both granular and concrete backfill
  - Placement of fabric in the correct direction
BLOCK WALL CONSTRUCTION

- Backfilling
  - Using open graded stone
  - Lightweight compaction
  - Over-excavation behind the layers of fabric
  - Face of wall
  - Strips of fabric at the back of the blocks to seal the voids (concrete)

- Bearing closure
  - Non-weight bearing
  - Easier than trimming blocks to fit
  - Leaving it ¼" low to prevent the girders from rubbing on it
  - Incorporating reinforcement (addendum #1)
  - Using a corner block

GIRDERS

- Gravel and fabric has to be leveled to a set elevation
- Post tension duct seal washers had to be trimmed

GROUT/DECK/OVERLAY

- Investigate the use of a different material in the tensioning pockets
- Epoxy sealer
- Grade E
  - Is there another material that can be used
    - Asphalt overlay
    - Alternate grades of concrete depending on project specific items
OTHER ITEMS

- Using steel beam guard posts within the GRS-IBS limits
  - Must punch through the fabric
- Using steel sign posts within the GRS-IBS limits
  - Must punch through the fabric
  - Holes for wood posts
- How do these two items affect the GRS-IBS system?

THOUGHTS/TAKEAWAYS

- The right site and conditions will make the project easier
- Being able to work on both abutments at once
- Rounded corners are the better option
- Understand what the incidentals are for the item
- Consider requiring comprehensive details from the wall designer
- Take the question out of the design process – make requirements singular
- Communication is key throughout the entire process

QUESTIONS?
GRS-IBS SHOWCASE
Q&A and Field Trip

Field Trip
- 11:30 Lunch
- 12:30 Buses Leave
- Visit Site #1 – 30 mins +/-
  - Brief site description
  - Time to observe and discuss
  - Q&A
- Visit Site #2
- 2:30 Buses Return
- Active Site….SAFETY

Questions So Far?

Field Trip
Two Structures (Site #1 and #2)
- Four GRS Abutments
- Prestressed Box Girders (17”)
- 2” Concrete Overlay
- Type W Railings

Juneau
Field Trip

Field Trip Questions?

Lunch will be served soon
GRS-IBS SHOWCASE
WisDOT Futures Uses

GRS Abutments
WisDOT Future
» Several Interested Counties (GRS or PS Box Girders)
» WisDOT Lessons Learned (Dodge County)
» Additional Prestressed Box Girder Projects
» FHWA Coordination and Updates

County Sites

Open Rail (under development)
Grade Separations
Multiuse Paths

Misc. or Buried Structures

Showcase Questions?
- GRS-IBS Overview
- Dodge County Sites
- Site Visit

Again....
Special Thanks!!!
- Dodge County
- FHWA
- WisDOT
- Omni Associates
- Joe Balice
- Rory Rhinesmith
- Scot Becker
- Lynn Cloud
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- David Hunt
Dodge County GRS-IBS Showcase

- Email certificates of attendance with PDHs
- Downloadable information

- And...Thanks for your participation!!!