ACCELERATED BRIDGE CONSTRUCTION
GEOSYNTHETIC REINFORCED SOIL (GRS)
INTEGRATED BRIDGE SYSTEMS (IBS)

KEEFER HWY
OVER
SEBEWA CREEK

By: Paul Spitzley, County Highway Engineer
Overview

- Project background
- Selecting a GRS-IBS design
- Geotechnical research and design
- Final design and layout
Background: Existing Bridge

- Over the Sebewa Creek
- Single 34’ span, Steel beams, corrugated steel deck, and vertical concrete abutments
- HMA Surface
Background: Existing Condition

- Rust
- Scaling
- Heavy section loss
Project Background: Users

- All Season Route
- Agricultural, sand, and gravel route
- Overweight/oversize permit applicants
- ADT 393 vehicles with 8% commercial
Background: Bridge Funding

- Applied for local bridge funds in 2010
  - **Rehabilitation estimated at $338,500**
- Local Bridge Program approved the project in fall of 2010
- Further review of existing abutments found that replacement was necessary instead of rehabilitation
  - **Replacement estimate $668,000**
  - **$329,500 over original estimate**
Selection of GRS-IBS

- FHWA - Every Day Counts Initiative
  Identify and deploy innovation aimed at shortening project delivery

- GRS-IBS is one of these innovations
  - GRS: Engineered fill closely spaced alternating layers of compacted granular fill material and geosynthetic reinforcement
  - IBS: a fast, cost-effective method of bridge support that blends the roadway into the superstructure
Jointless (continuous asphalt pavement)

Beam Seat/Bearing Area

Secondary Reinforcement ("load shedding" layers beneath beam seat - 4 inch spacing)

Facing Block (frictionally connected)

Channel Rock Protection

GRS Abutment (geotextile reinforcement 8 inch spacing)

Reinforced Soil Foundation (encapsulated with geotextile)

GRS Approach ("geotextile wrapped layers at beam ends form smooth road transition")

Blended Approach (GRS transitions into pavement section)
Selection of GRS-IBS

- **GRS-IBS Site Recommendations**
  - Single span (140’ max.) & abut. height (30’ max.)
    - 40’ clear span
    - 12’ abut. height prop.
  - Low velocity stream
    - Sebewa Creek vel. < 5.0 fps in 100 year storm
  - Low water table
    - Ground water present within abutment backfill
SME performed the geotechnical evaluation

Support from MDOT

Their Findings:

Ground water 1’-2’ above bottom of abutment

Bearing Soils were only slightly above the minimum subsoil bearing resistance required to support the proposed GRS Abutments when tested for global stability
SME’s Recommendation:

- Leave existing abutments in place, construct berms on each end as necessary, and submersible pump dewatering
- Two of the GRS abutment reinforcement layers be extended an additional 10’ in length beyond the other layers (25’ from abut.)

  *Factor of Safety > 1.54 for global stability*
Final Design

- Designed by Williams and Works
- 50’ prestressed conc. box beams (side-by-side)
  - 39’ to 41’ clear span with 5’ beam seats
- HMA deck
- Precast curb and guardrail anchorage onto fascia beams
- Articulated concrete block system in stream bed

Progress Schedule
- July 7th to August 15th OR 6 weeks