OHM Advancing Communities®

MIDLAND COUNTY ROAD COMMISSION

GRS-IBS In Midland

6 years of Lessons Learned

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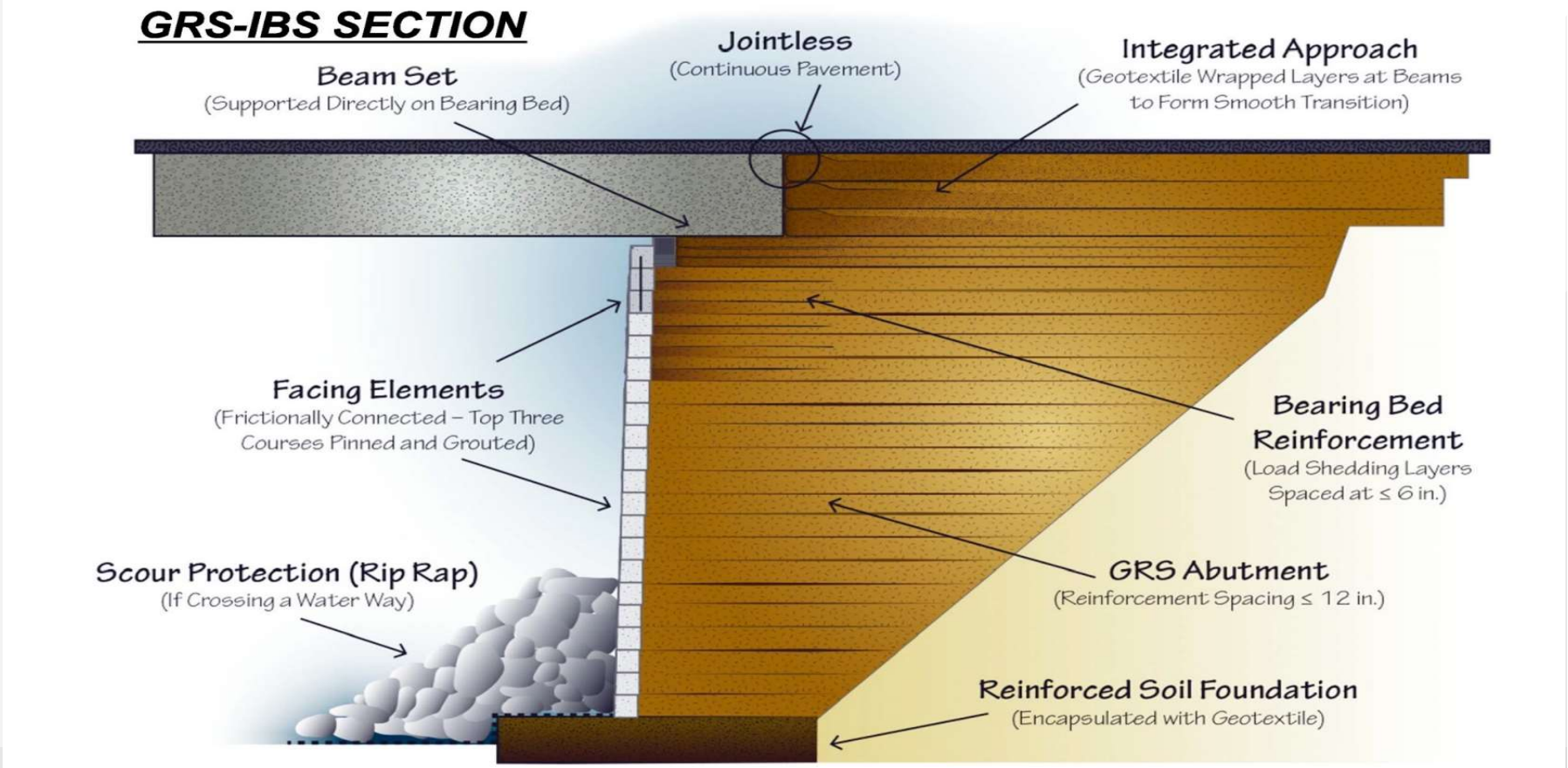
WHAT IS GRS-IBS?

QUICK REFRESHER



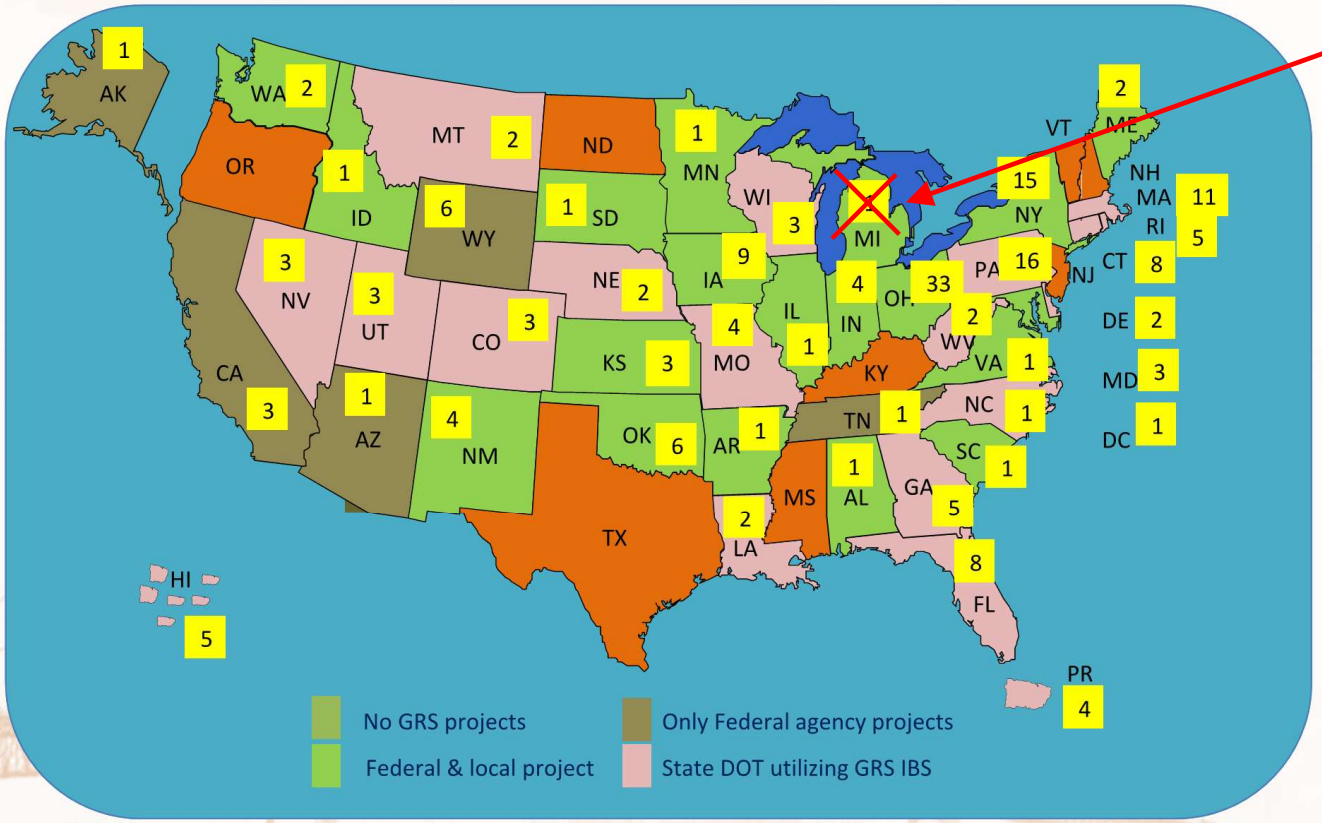
SO….WHERE ARE WE AT?

- How many in audience have worked on a GRS-IBS bridge in Michigan?

- How many have even considered this technology as an option?

GRS IBS – Implementation Progress

190 Bridges nationally in 43 states including PR and DC - September 2014



From: Chris Johnecheck, PE, 2015 Bridge Conference Presentation

By end of 2019 – 26 built????

3 more in 2020?

Last report I could find from 2018 estimated over 200 bridges nationally!

It is estimated that over ¾ of bridges needing replacement could consider GRS-IBS!

IT IS ALL ABOUT MORE FOR LESS

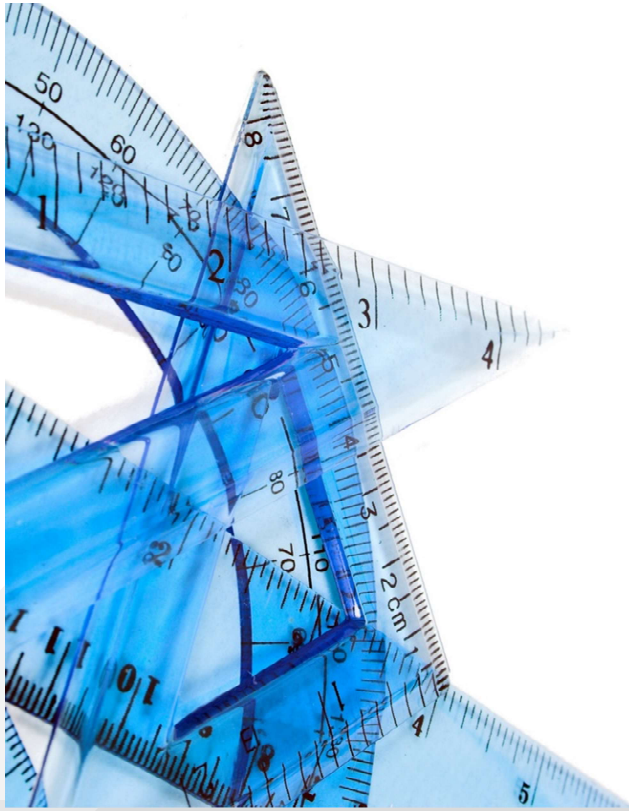
- **$$$** - Estimated $350K saved per bridge – adds up to **$9,000,000 for 26 bridges in 5 years!!!**
- **Time** – "Every Day Counts!" average time saved is 3 weeks per bridge – adds up to **78 weeks of construction time!!**
- **Flexibility –** Easily modified to fit individual sites, natural bottom, avoid utility conflicts, single spans from 20 to 140 ft. (starting to see multi-span…)
- **Constructability** – 9 of the bridges have been built by the 3 different county forces, with 2 more planned for 2020. *Additional average savings of $200,000 each…that is another $1,800,000 saved!*

SO… WHAT IS HOLDING US BACK?

- **Fear of new technology?**
- **Concern about Scour?**
- **Types of Facing Materials?**
- **Lack of Contractors?**
- **Longevity?**

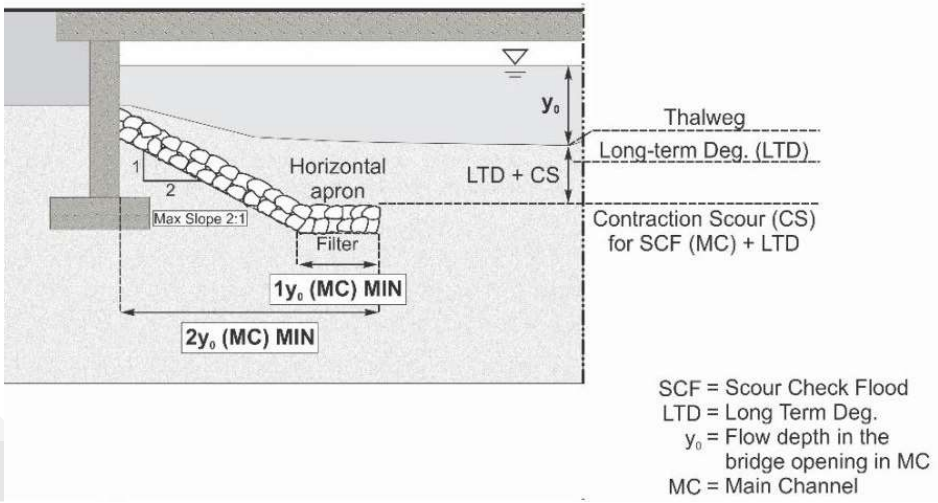
CONSIDERATIONS - Technology

- **Part of FHWA's Everyday Counts Initiative since 2010 – first one built in 2005**
- **New FHWA Spreadsheet that follows LRFD methodology**
- **Not new any more…**



CONSIDERATIONS - Scour

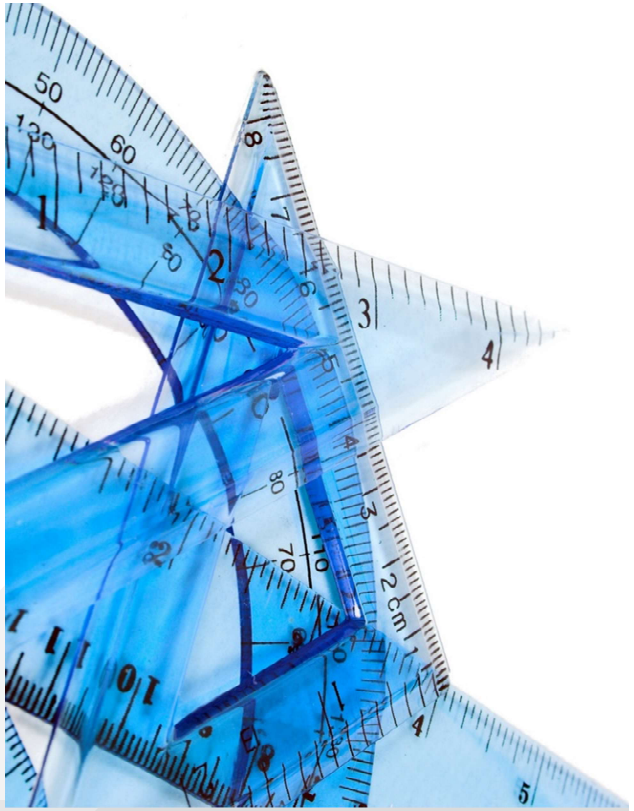
- **Locating the RSF**
  - **Typically place top at estimated scour**
  - **New FHWA TechBrief (12/18) – *Changes this***
- **Counter Measures – riprap, sheet piling, depth of RSF, ???**
- **Monitoring**



CONSIDERATIONS – Flood Events

CONSIDERATIONS – Facing Options

- **MDOT has updated Special Provision that limits the use of precast block units to:**
  - **Modular Block Unit –**
    - **Redi-Rock**
    - **Recon Retaining Wall Systems**
  - **Segmental Block Unit -**
    - **Allan Block**
    - **Keystone Retaining Wall System**
  - **Very different types of block…**



- **Large block vs. smaller block**
- **Equipment vs. Labor**
- **How does it impact beam lengths?**

Image Source : Allan Block

CONSIDERATIONS - Facing Options

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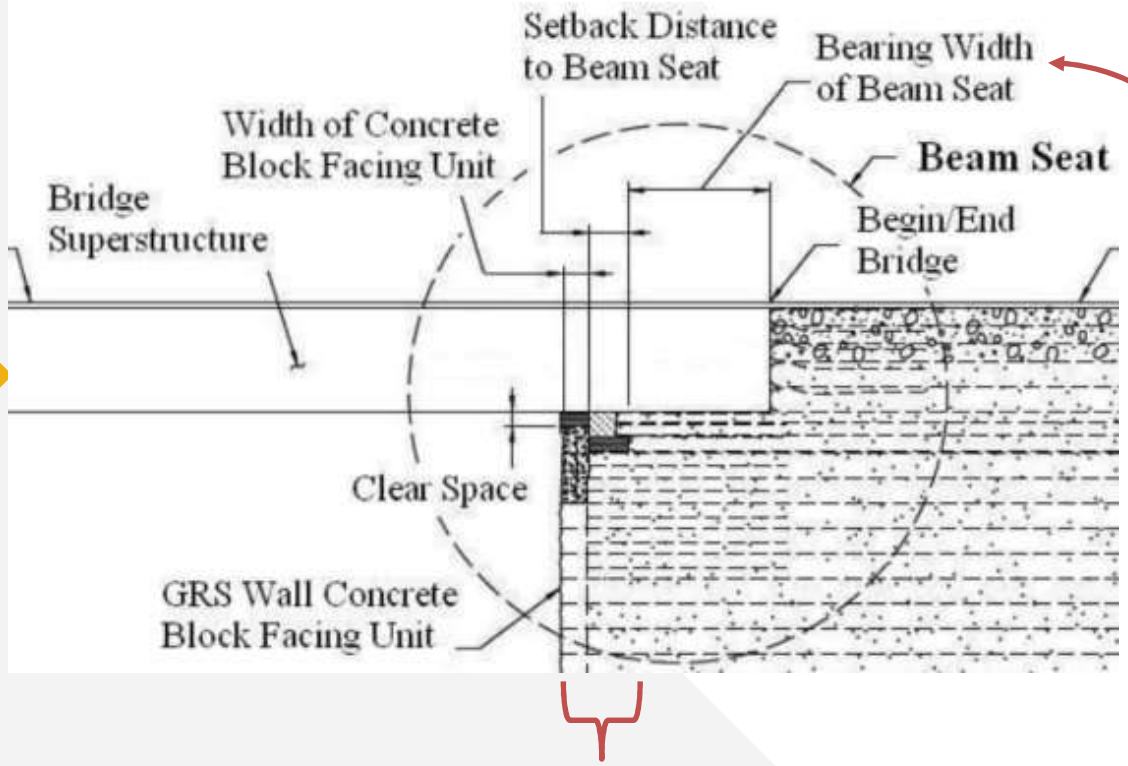
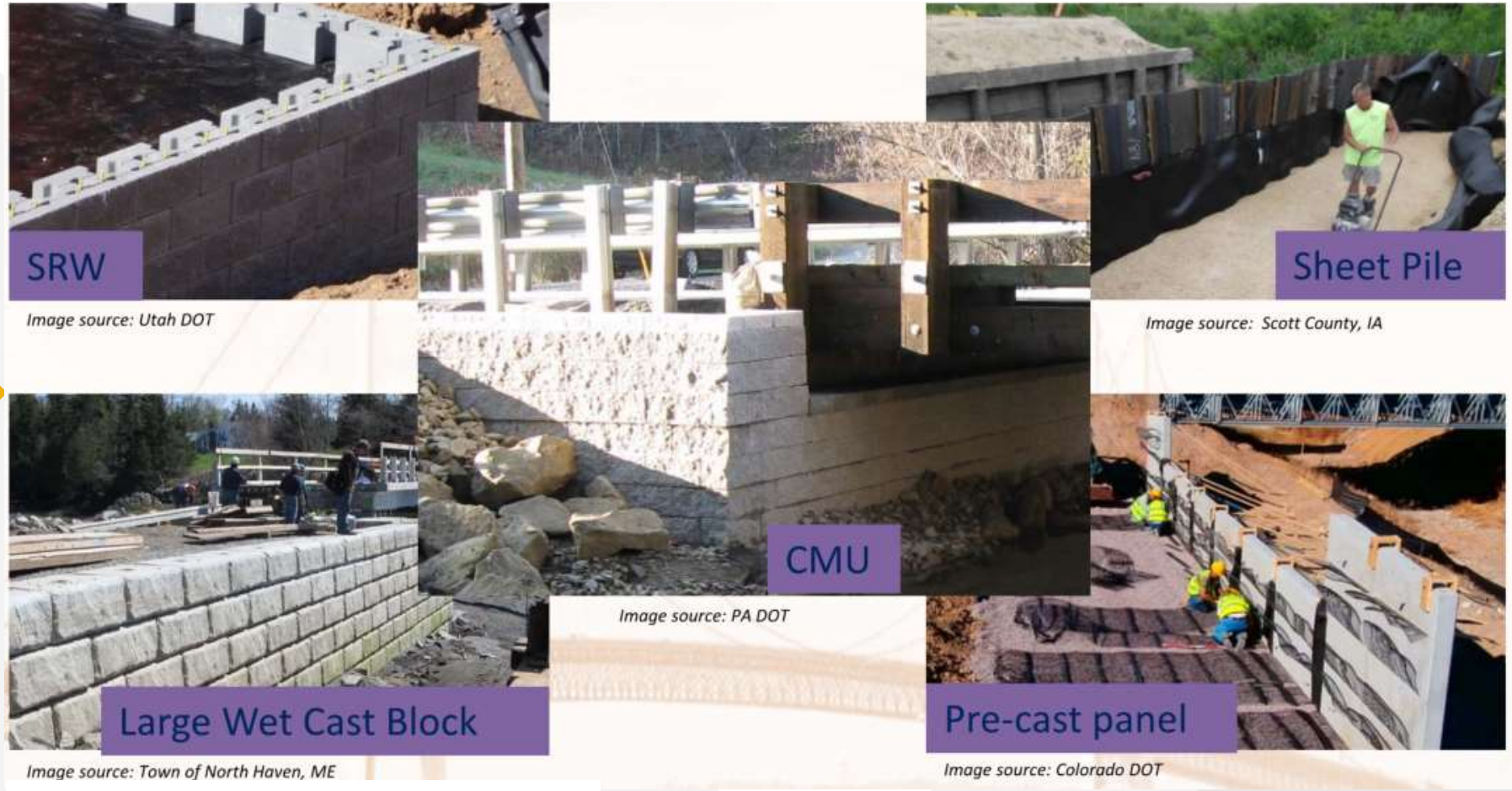


Bearing width is a function services loading.

Width of facing directly impacts beam lengths

Lots of impacts if during construction

Beams have to "span" the block and setback



From: Chris Johnecheck, PE, 2015 Bridge Conference Presentation

CONSIDERATIONS - Facing Options

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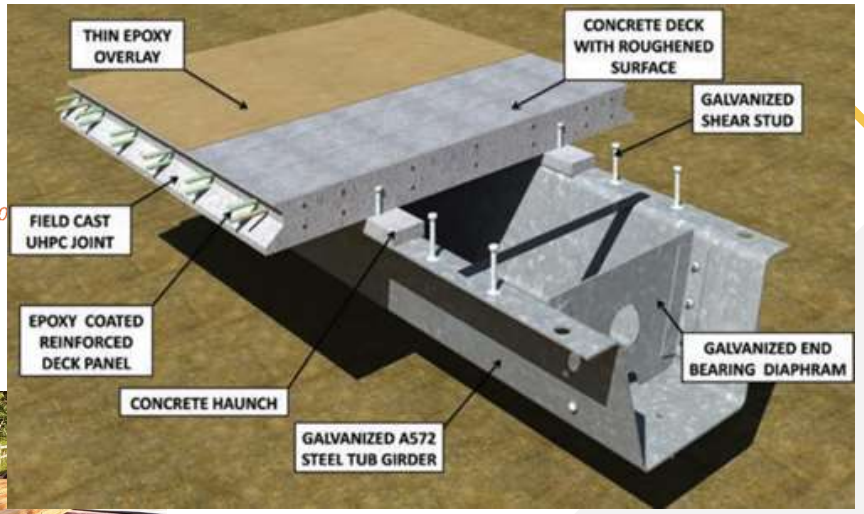
CONSIDERATIONS - Contractors

- **At least 6 different “Bridge” contractors**
- **Local Bid and MDOT/LAP Bid**
- **At least 3 different Road Commissions have self built**

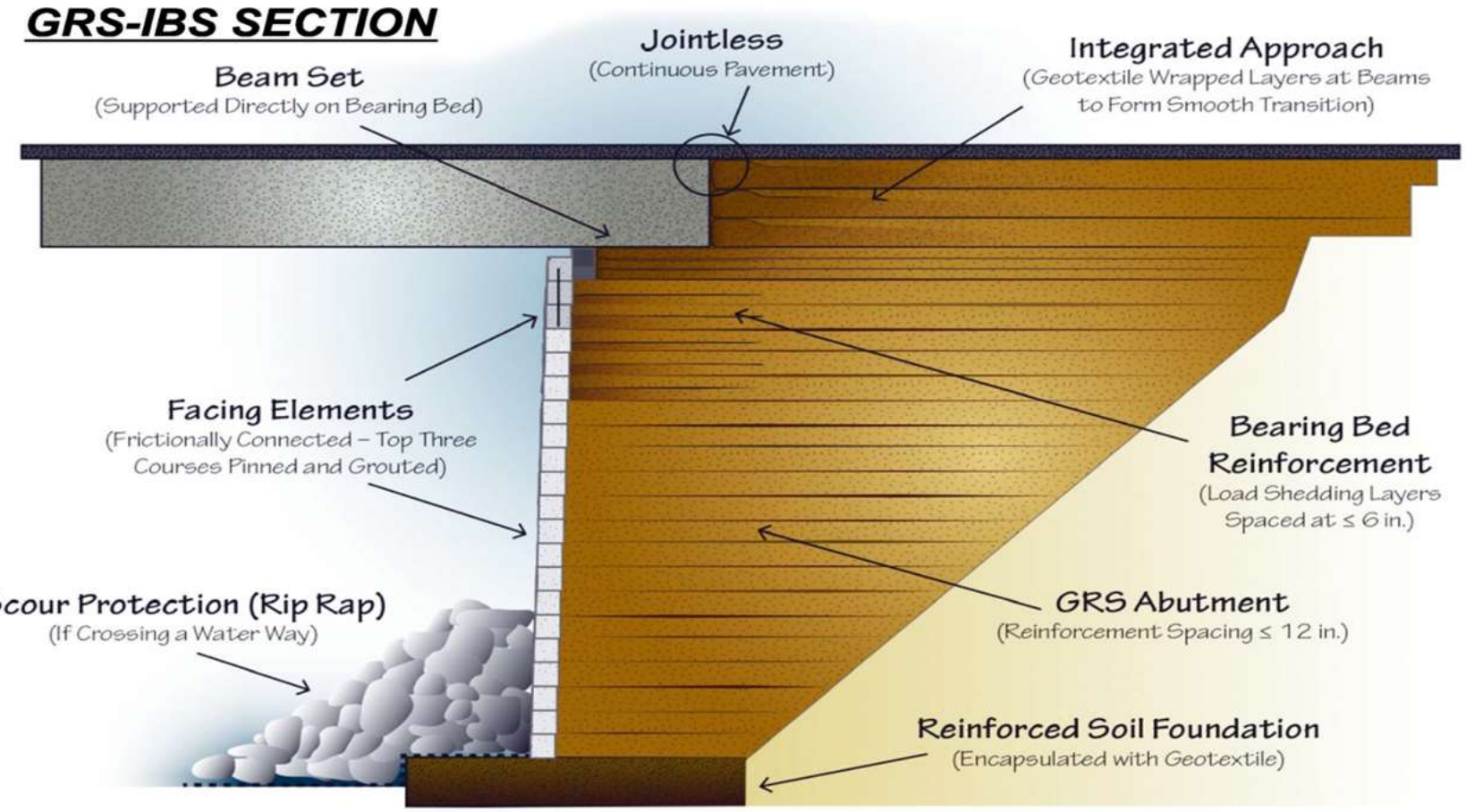
CONSIDERATIONS - Longevity

- **Geosynthetics have 100-year design life**
- **Facing is cosmetic**
- **No bridge bump, reduced impact**
- **Oldest structure built in 2005**
- **Technique dates to the Great Wall of China…**

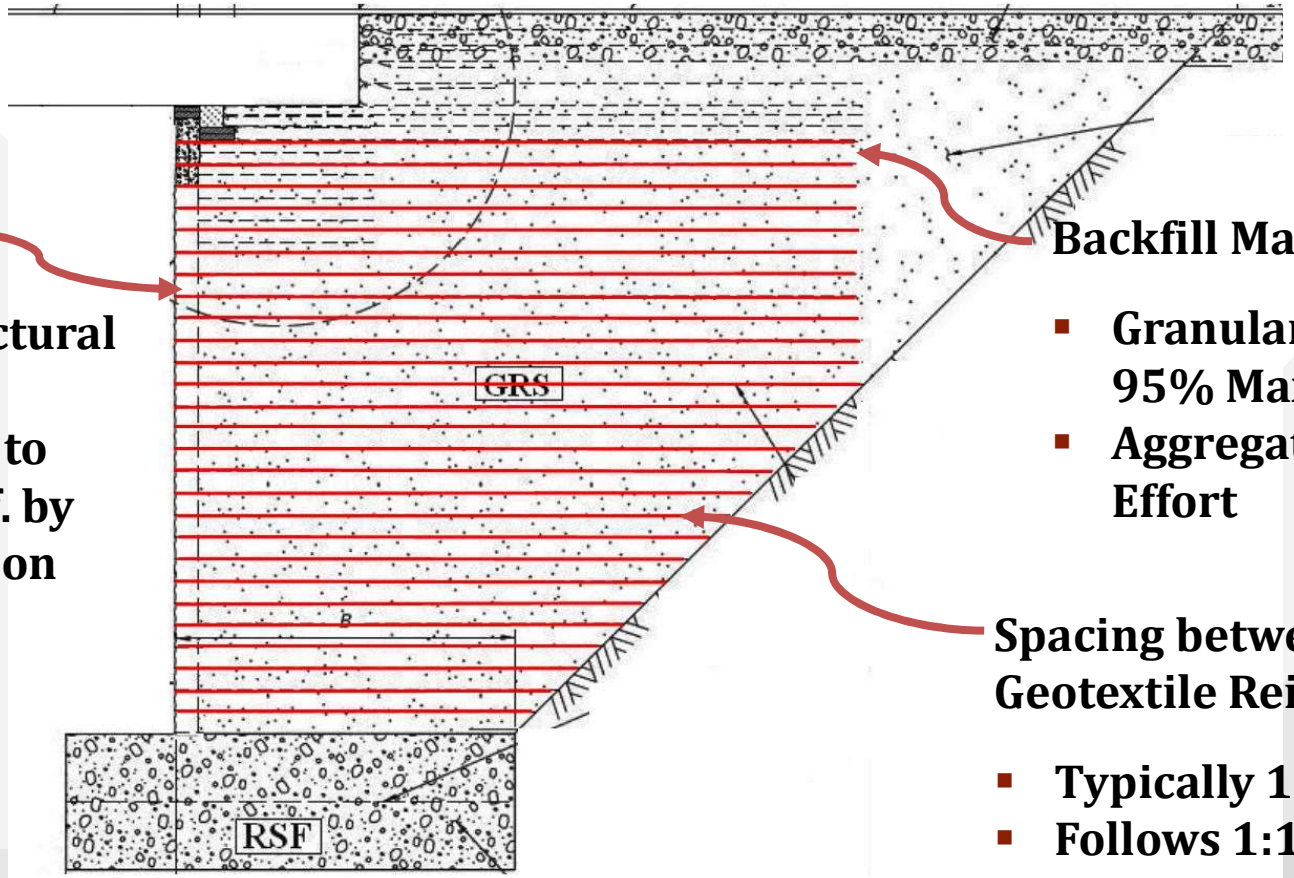


CONSIDERATIONS – Superstructure

KEY DESIGN ELEMENTS



ELEMENTS - GRS "Mass"



Facing

- **NOT Structural**
- **Tied to reinf. by friction**

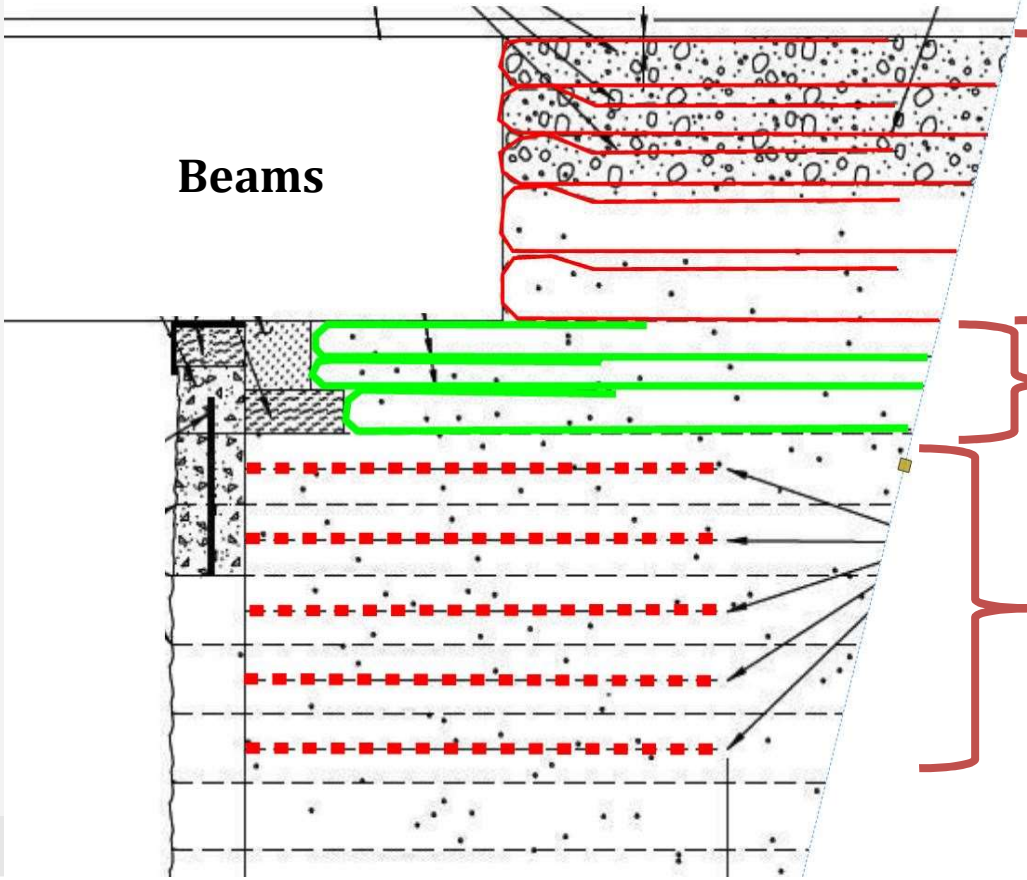
Backfill Material

- **Granular or Native = 95% Max.**
- **Aggregate = Uniform Effort**

Spacing between Geotextile Reinforcement

- **Typically 12" or less**
- **Follows 1:1 cut slope**

ELEMENTS - Beam Bearing



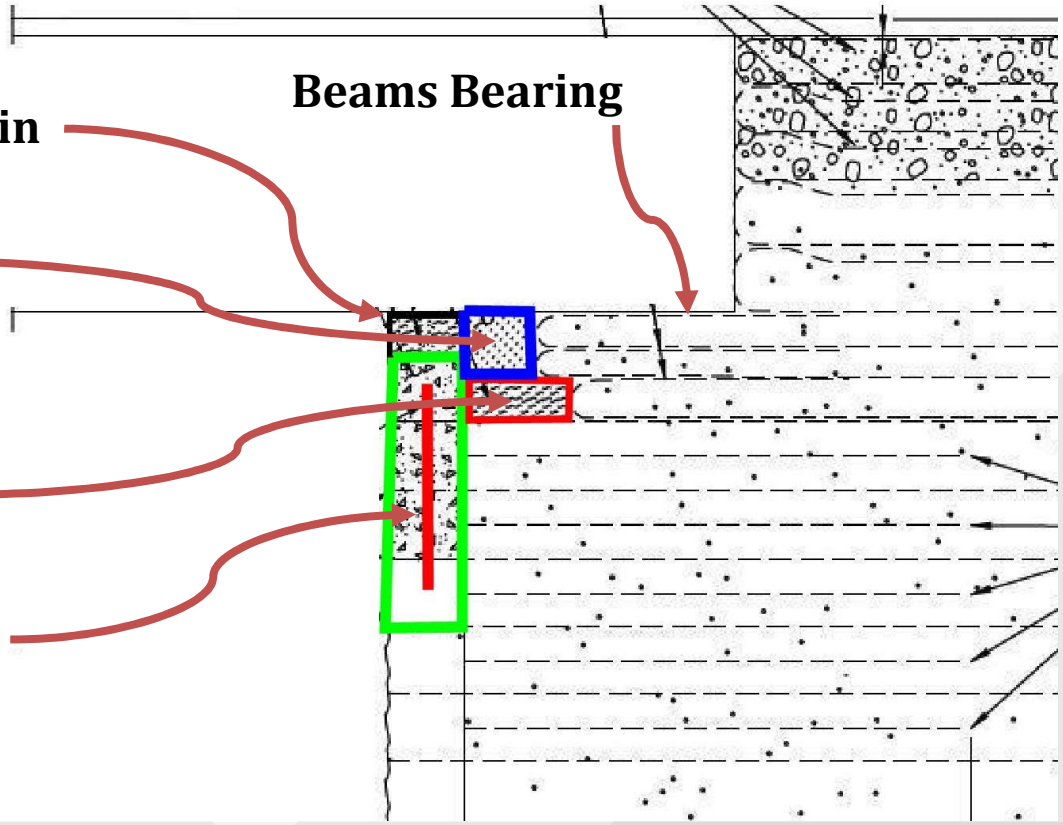
Integrated Approach Reinforcement

Beam Seat (wrapped tails)

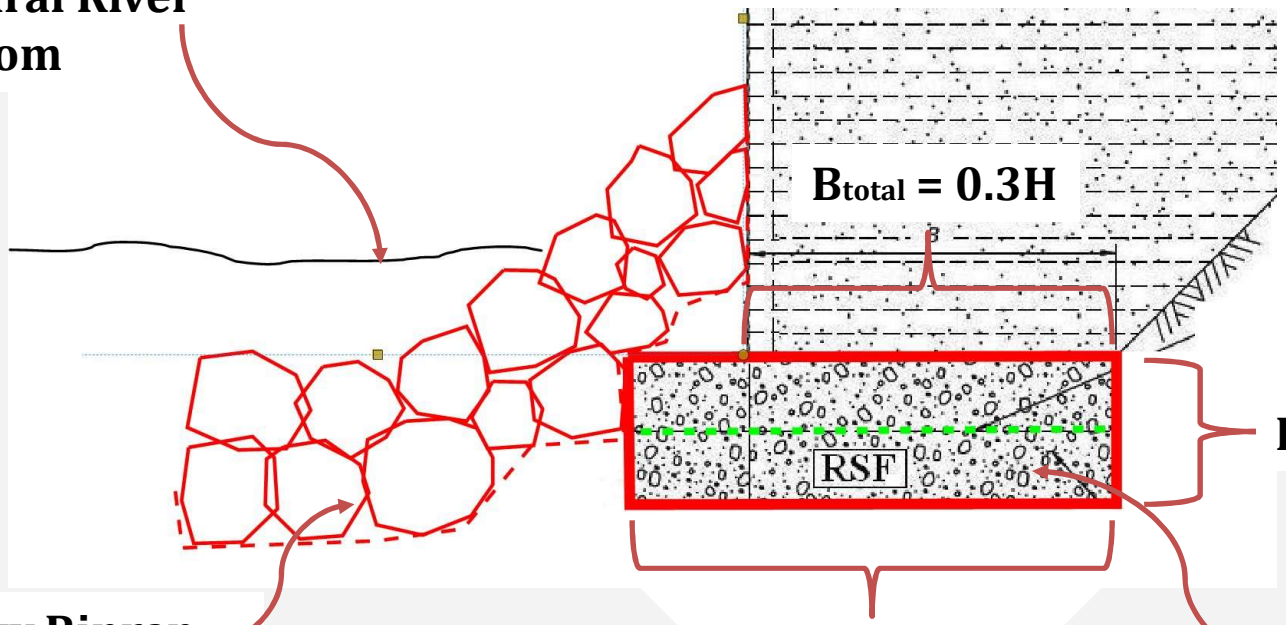
Bearing Bed Reinforcement

- **½ Reinforcement spacing**

ELEMENTS - Beam Bearing

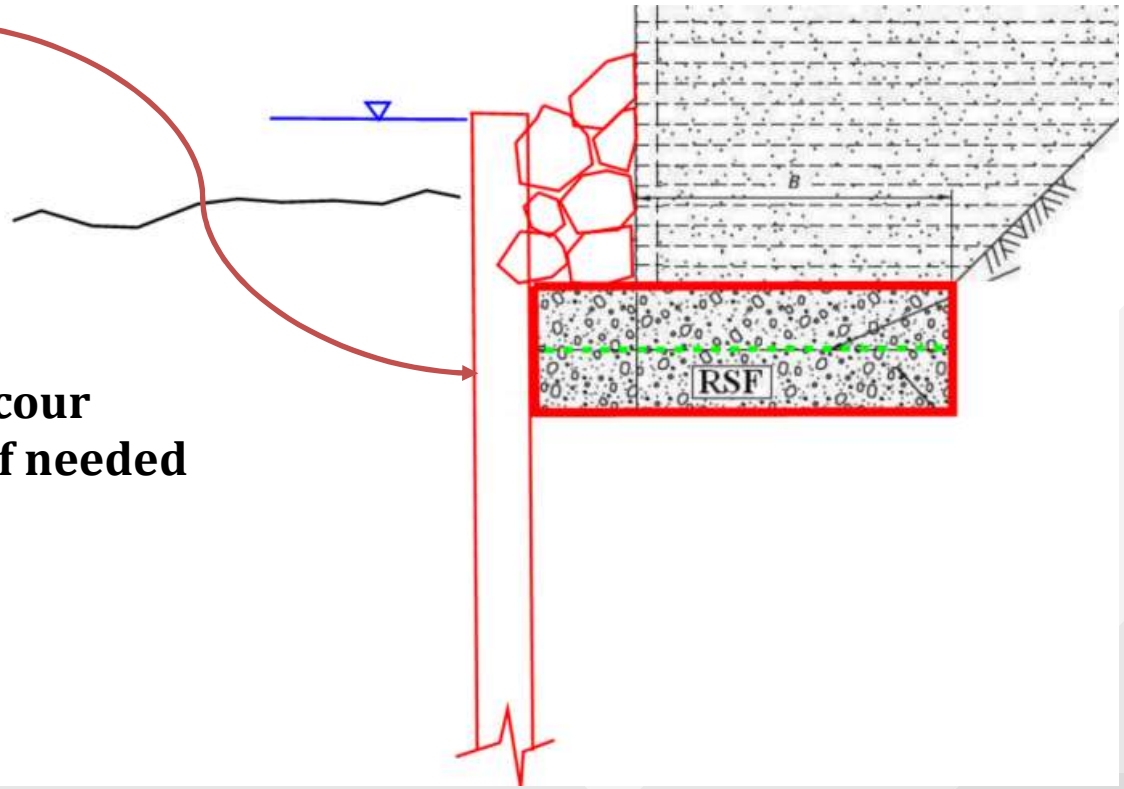


ELEMENTS - RSF



ELEMENTS - RSF

Permanent Sheet Piling



Increased scour protection if needed

CONSIDERATIONS - Soils

- **Existing “Bearing Soils”**
  - **Stiff Clays/Silts**
  - **Compact Granular**
  - **Loose Granular**
- **Backfill Materials**
  - **Granular Free Draining**
  - **Aggregate**
  - **Native**

LESSONS LEARNED

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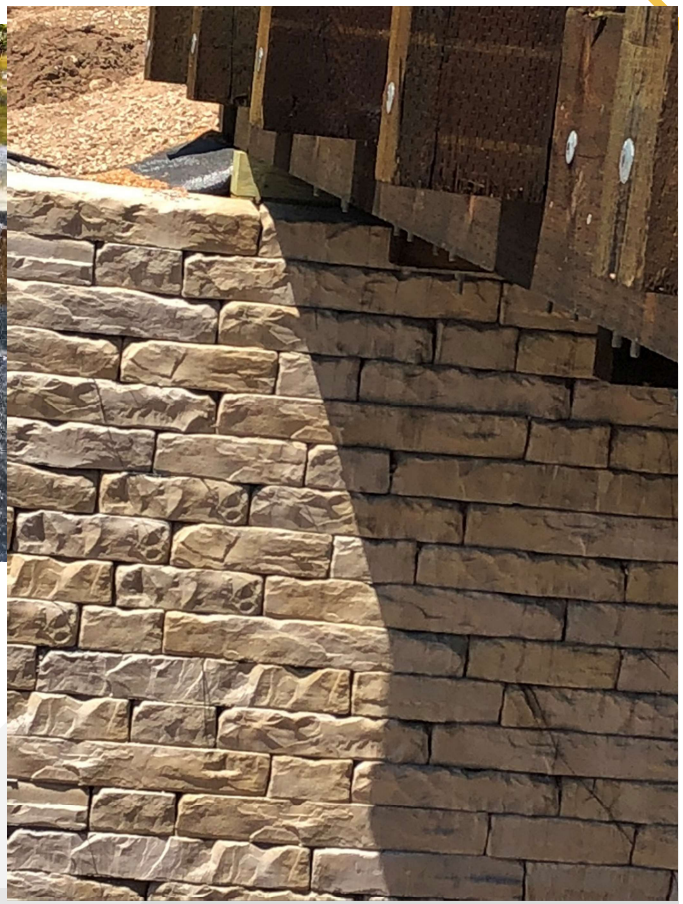
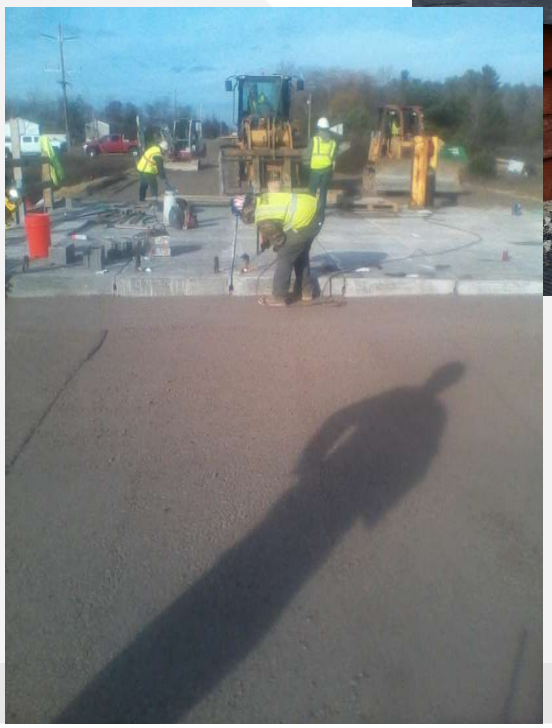


Image Source : Allan Block

LESSONS LEARNED



LESSONS LEARNED

Sidewall and Backwall for “spread” beams

LESSONS LEARNED

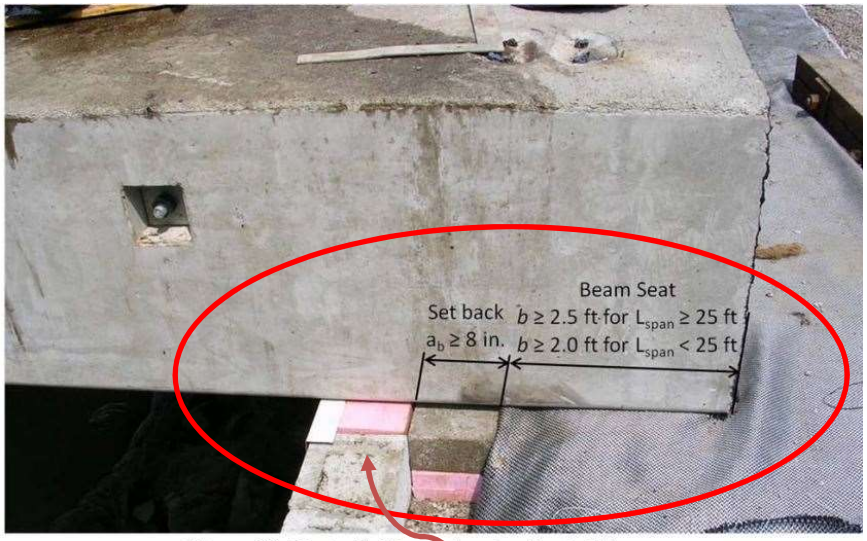
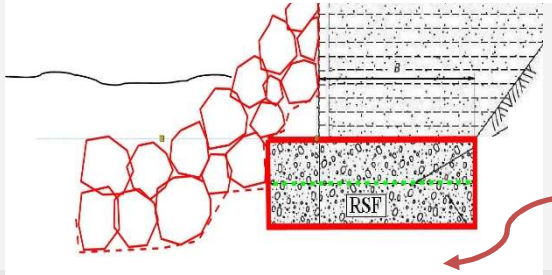


Figure 10. Photo. Bridge seat and setback distances.



Face thickness & Bearing area

Over-excavate

Geotextile strength

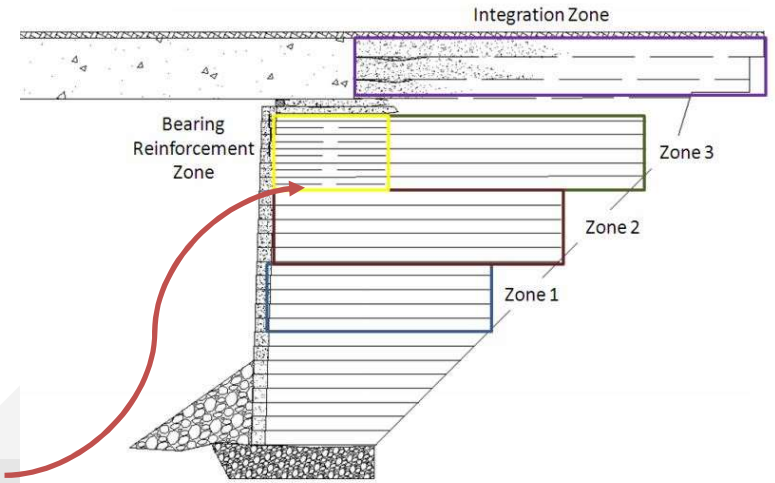


Figure 13. Illustration. Reinforcement schedule for a GRS abutment.

WHAT IS THE FUTURE?

Figure 3. Construction of U.S. 301 Trail Bridge with multi-span GRS-IBS in Zephyrhills, Florida.

ACM Freeway Loop – Willow Run

Figure 4. Completed two-span GRS-IBS bridge in Knox County Beach, Maine.