Ohio Geotechnical Consultant Workshop

IDEA Retaining Wall Evaluation Program, Alternate MSEW Design Methods, GRS Update

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June 7, 2017
IDEA Retaining Wall Evaluation Program

- Overall goal of the IDEA program is to encourage innovations in ERS
- Current elements will focus on MSE and other ERS applications
- New program intended to provide streamlined, cost-effective and transparent reviews.
- Address concerns with HITEC
History of HITEC -

- HITEC started in 1994
- HITEC program provided an evaluation process for what at the time was considered new technology, for instance MSE walls.
- HITEC served a purpose in providing a platform for users to look at various systems to see how well they followed AASHTO and FHWA.
- In recent years, HITEC has not been utilized as much due to:
  - Long review duration,
  - High and unpredictable costs for technical review,
  - Limited number of reviewers
  - Misuse of reviews as an approval process (by owners, designers, and wall system suppliers)
IDEA program will:

• Allow for different review options:
  1. Full review of a new system
  2. Updates to existing system review
  3. Maintenance program on a given cycle

• Incorporate the NTPEP for geosynthetics

• Utilize a web-based application, review, and catalog processes

• Broaden the pool of reviewers
IDEA Program

To address schedule and cost issues:

• IDEA is not meant to be a research project
  • IDEA is a process to provide an independent evaluation of research and development already conducted and ready for deployment.

• Although the base line is AASHTO and FHWA this process allows for the evaluation of innovations that do not necessarily meet current guidance. Allowing owners to consider the evaluation report in their approval process of innovations.

• For a system that already has an evaluation report any change or innovation only needs to be reviewed based on its impact to the performance of the evaluated system.
IDEA Program

To address schedule and cost issues:

• The planned review period will be 12 weeks of review team time for a full review
• The evaluation will be broken into 4 phases.
  • Pre-Submittal review
  • Submittal check
  • Initial submittal review
  • Final Submittal review
• The applicant can choose to withdraw the application at any time.
IDEA Program

Example innovations that could be addressed include:

- Corrosion/durability advances
- Reinforcement spacing/configuration
- Connection details
- Facing details
- Extensibility of reinforcing elements (design/construction)
- Drainage
- Others?
Program Administration by ASCE Geo-Institute

- The Geo-Institute will administer the program
- Geo-Institute dedicated staff member
- Evaluation Review Panel –
  - New GI Committee (IDEA Evaluation Committee) that reports directly to the GI Board of Governors
- Dedicated GI Board Member as liaison to committee
- Engage the ERS and Geosynthetics Technical Committees for other ERS types
- Review Team – consisting of ERS practitioners and one academic will be selected from the committee by the Committee Chair with input from the Lead Consultant.
QUESTIONS ON IDEA PROGRAM

• We are getting ready to put one system through the process as a pilot –
  • Vista A Wall from Big R Bridge
• The G-I is preparing the administration of IDEA and we should be doing the pilot this summer.
• FHWA will be sending out a memo to the state DOTs to start adjusting their specifications to accommodate these changes.
• IDEA will be replacing HITEC this year.
Alternate MSE wall Design Methods
AASHTO T-15 committee established an MSE wall task force

• The goal for the task force was to assist the T-15 technical committee in identifying, prioritizing, evaluating, and implementing technical revisions to Section 11.10

• In addition, the task force will develop a strategy for addressing recognized gaps in the design specifications and incorporating aspects of recently published research.

The task force developed numerous ballot items to be voted on by the full committee.

One of the recommendations was to evaluate new design methodologies being considered.
Alternate MSE Wall Design Methods

Current design methods in AASHTO/FHWA:
• Simplified method
• Coherent gravity Method

New design methods being considered:
• Simplified stiffness method
• Limit equilibrium design method
AASHTO/FHWA Existing design methods –

Simplified method and the Coherent gravity Methods

• Both use lateral earth pressure theories to evaluate the loads on the reinforcement.

• In both cases they use a lateral earth pressure coefficient that is calibrated to the stiffness of the reinforcement material resulting in definitions for inextensible and extensible reinforcement.
  • Definition of extensibility is based on the strain level of the reinforcement at failure relative to the strain level of the soil at failure.

• These methods are fairly accurate for inextensible reinforcement but significantly over predict the loads for extensible reinforcements in some cases by 300%.
Simplified Stiffness Method

- Developed and recently updated by Tony Allen and Richard Bathurst.
- Design method also based on lateral earth pressure
- Design method accounts for contributions from:
  - Stiffness of facing
  - Stiffness reinforcement
- For geosynthetic reinforcement the load is based on the stiffness of the reinforcement with a maximum allowable strain of 2.5%.
  - One can reduce the load in the reinforcement by using a less stiff reinforcement type which increases deformations
  - Reduce deformations by selecting a stiffer reinforcement which increases the load on the reinforcement
Simplified stiffness Method

This method compared to existing methods:

- For inextensible reinforcement produces similar reinforcement requirements and distribution
- For extensible reinforcement the requirements depend on the acceptable strain level but could reduce the amount of reinforcement by 40 to 70 percent.

The results of the simplified stiffness method more closely match the results of the instrumented structures.
Limit Equilibrium Method (LEM) -

- Instead of using lateral earth pressure theory this method uses LEMs such as Bishop or others and global stability programs to predict the loads on the reinforcement.

- Design method can account for:
  - facing strength,
  - reinforcement of different lengths,
  - Soil profiles that are not homogeneous including water
  - more complex geometry and loading conditions

- This method does not reduce the total reinforcement requirement but redistributes the loads. The reinforcement loads are evenly distributed among the layers.

- If accounting for facing strength then the reinforcement loads are closer to the stiffness method.
Alternate design methods

Practical aspects of selecting a design method:

- Complexity
- Design tools
- Required reinforcement
- Distribution of reinforcement
- Efficiency and Cost
- Impact on Construction
- Impact on Performance
QUESTIONS ON
ALTERNATE DESIGN METHODS
Update on GRS IBS implementation
GRS IBS update

• Around 250 GRS IBS projects constructed and many others in design
• More than 30 bridges in the state of OH.
• Structures in 43 out of 50 states plus DC and PR.
• Wide range of site conditions
• Wide range of structures types
• EDC is done for GRS IBS but we are still supporting as technical assistance and training
• Increased use of shallow foundations on reinforced soils
• Increased use of geosynthetics option for MSE walls
CO – I 70 over Smith Road (2015)
CT – I-84 Off-Ramp in Manchester (2016)
CT – Manchester Bike Trail over Camp Meeting Rd (2016)

Will include a 172 ft steel truss superstructure when completed.
HI – Saddle Road Bridge (2012)

Designed for $\text{PGA} \times F_{pga}$ ground acceleration ($\text{PGA}=0.6\text{g}$ $F_{pga}=1.0$)

Taken October 2014, 2 years after construction
IA – Catt Bridge on 215 st over Nash Creek, Buchanan County, (2016)
ID – Turner Road over Penstock (2016)
IN – Hamilton County (2015)
MA – SR 7A over Housatonic RR (2014)
NM – NM 419 MILE POST 27.5 Bridge (2015)
NY – CR 47 over Trout Brook
St. Lawrence County (2013)
RI – East Shore Expressway Bridge No 475 & McCormick Quarry Bridge No 476 (2016)
WY – Sand Creek Rd (2016)
QUESTIONS ON GRS IBS