Managing North Carolina's MSE Wall Assets through Design, Construction and Performance

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Early Earth Reinforcement Systems
Early Asset Management

Modern Earth Reinforcement Systems

- Precast Panels, Steel Reinforcements
- Segmental Blocks, Steel or Geosynthetic Reinforcements
- Welded Wire Baskets, Steel or Geosynthetic Reinforcements
Modern Asset Management

FHWA says ...

"Transportation Asset Management is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle."

MSE-focused definition ...

Transportation Asset Management is a strategic and systematic process of designing, building, operating, maintaining, upgrading, and expanding physical assets (MSE walls) throughout their lifecycle.

Some NC MSE Wall Assets

- I-40 
  McDowell Co.
- Triangle Expwy, Durham
- Light Rail, Charlotte
- I-277 @ Mint & Morehead, Charlotte
Transportation Corridors Contain Many Geotechnical Assets

For Asset Management, Design Matters
Components of an MSE Wall Asset

**Design**
- Stability: Sliding, overturning, bearing capacity, settlement, overall stability*
- Strength: Reinforcements, connections
- Durability: Reinforcements, facing
- **Drainage:** Direct water away from wall face, foundation

*Site conditions are owner's responsibility

**Specifications**
- Typically based on AASHTO
- Covers backfill, construction procedures

**QA/QC**
- Construction inspection (conformance to specs)

Components: *Drainage, Storm Water*
Component: *Durability*

- Reinforcement Durability
  - Electrical, chemical
  - Installation Damage
- Facing Durability
  - Joints, bearing materials
  - Drainage, freeze-thaw
- Site "Durability"
  - Drainage, erosion
  - Accidents, spills

Components: *Plans and Specs*

- To construct a high quality asset, need high quality plans and specs
  - Thorough
  - Detailed
  - Accurate
- *Followed by thorough inspection*
### Component: *Construction Inspection* (for long-lasting results)

- **Control of materials**
  - Panels, reinforcements, joint materials
  - Backfill – grain size, moisture, electrochemistry
- **Control of processes**
  - Wall erection – plumbness, alignment, finish details
  - Backfill placement and compaction
  - Drainage systems/runoff control
  - Barrier/coping
- **Record-keeping** – facilitates monitoring

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### Construction Inspection

- Trained inspectors who understand MSE walls and what's important

*CONSIDER THIS:*
NHI training course # 132080: Inspection of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes
Site/Foundation Preparation

Foundations – Critical Wall Details
Construction Practice – Panel Facing

Construction Practice – Connecting Steel Reinforcements

Asset Management: Build It Right … Care For It Right
Drainage – MSE

Drainage – Roadway
Backfill Selection is Critical

Clay backfill = poor friction and drainage

Good friction and drainage come from granular backfill

Excellent Compaction for Long Life

Good Compaction Produces
- Overall stability
- Deformation control
- Drainage and runoff control
One Last MSE Component: Planning for Asset Management

- As-built drawings
- Condition assessments (post-construction inspection)
- Maintenance plans
  - Drainage/siltation, erosion, vegetation, other
- Ability to address unforeseen situations
  - Wall identity, characteristics database
  - Monitoring stations (metal reinforcements)

Plan to Manage Assets (rather than retrofit them)
MSE Asset Management is about *Maximizing Performance*

- Many components of MSE walls; most buried
- Key components to consider: design, specs, materials, construction, inspection (QA/QC)
- Managing an MSE wall asset *starts* with design, *continues* through the full structure life
- MSE wall assets lend themselves to monitoring, condition assessment, in-place repair

*Build it Right … Care For It Right!*