The Science of Responsible Temporary Wetland Access for Energy Infrastructure and Other Heavy Equipment Access

Before Construction

During Construction

After Construction
(4 months later)

PROTECT & CONSERVE

NEW TECHNOLOGIES TO PROTECT NATURAL RESOURCES

SAFELY

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Typical Access

Goal for typical wetland access?

- Avoid getting stuck
- Avoid penalties, mitigation, restoration
- Avoid injury

Photo Credit: State Archives of Florida, Florida Memory, www.floridamemory.com/fpc/memory/PhotographicCollection/chris/graphics/smx0106-280pxB.jpg
Photographer: Small, John Kunkel, 1869-1938

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What is typical when access to wetlands is required?

- Often use standard wood mat or timber mat
- Mats laid end to end for access
- “Stacked & Packed”
- Restoration and/or Mitigation as needed

Photo Credit: State Archives of Florida, Florida Memory, http://floridamemory.com/items/show/62263
Photographer: Whitehead, H.E. 1936

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Typical Access Traditional Mats

Standard 3 ply mat, 2 x 8 boards bolted or nailed together, each layer perpendicular to adjacent layers.

Crane or timber mat, standard 8”x 4’ x 16’, most often constructed of solid oak, mixed hardwoods, or fir; bolted; same thickness, inconsistent timber sizing.

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Typical Access Traditional

Composite mats
Connections
“pumping”
Deflection mandates restoration
“Stack em’ & Pack em’ ”

The Effect

- Safety Concern
- Mat performance in question
  - No published load rating
  - No proof load testing
- Stacking
  - Installation & removal of mats difficult
  - Damage to root systems
  - Changes in wetland hydrology
  - Changes to wetland topography
  - High risk to vegetation

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Result from Typical Access

- Damage to wetland clearly visible 5 years after typical access practices
- Soil compaction has altered the hydrology and vegetation

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Result from Typical Access

- Damage to wetland clearly visible a few years after typical access practices
- Soil compaction and root destruction has opened the wetland to invasive species

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Results/Case Study

- Wetland in southern region US
- Damaged by poor matting choice (left < 1 yr)
- EWAS on right

Damaged Wetland 1 year later

EWAS

Shortly after mats removed

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Restoration Effectiveness?

Meta analysis study on >600 wetlands (80% in the US), some restored over 100 years ago.

"Once you degrade a wetland, it doesn't recover its normal assemblage of plants or its rich stores of organic soil carbon, which both affect natural cycles of water and nutrients, for many years,"…"Even after 100 years, the restored wetland is still different from what was there before, and it may never recover."

"Restored wetlands contained about 23 percent less carbon than untouched wetlands, while the variety of native plants was 26 percent lower, on average, after 50 to 100 years of restoration"

"On average, restored wetlands are 25 percent less productive than natural wetlands"

In a New York wetland, "after 55 years, barely 50 percent of the organic matter had accumulated on average in all these wetlands" compared to what was there before.

References from http://newscenter.berkeley.edu/2012/01/24/study-shows-restored-wetlands-rarely-equal-condition-of-original-wetlands/

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Section 404 of the CWA Program

Basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded.

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There is a better way to approach access...

We believe in an environment first approach that is SAFE.

EARTHSAFE®
MINIMUM IMPACT. MAXIMUM ACCESS.

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Video 1 - https://www.youtube.com/watch?v=OSXnW0iKcHA

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What is the EarthSafe Solution?

Earthsafe Access

- Strategy is to protect environment/wetland
- Use emtek® mats to value engineer an appropriate solution for each job site.
- emtek® mats can support calculations for psi, deflection, shear, modulus of elasticity and other critical values.
- Process is to lay a **system of mats** in an effort to protect while also allowing for effective load distribution.
- Monitor for recovery.

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How does emtek® work?

3 Basic Types of Matting Systems

*variations within each system

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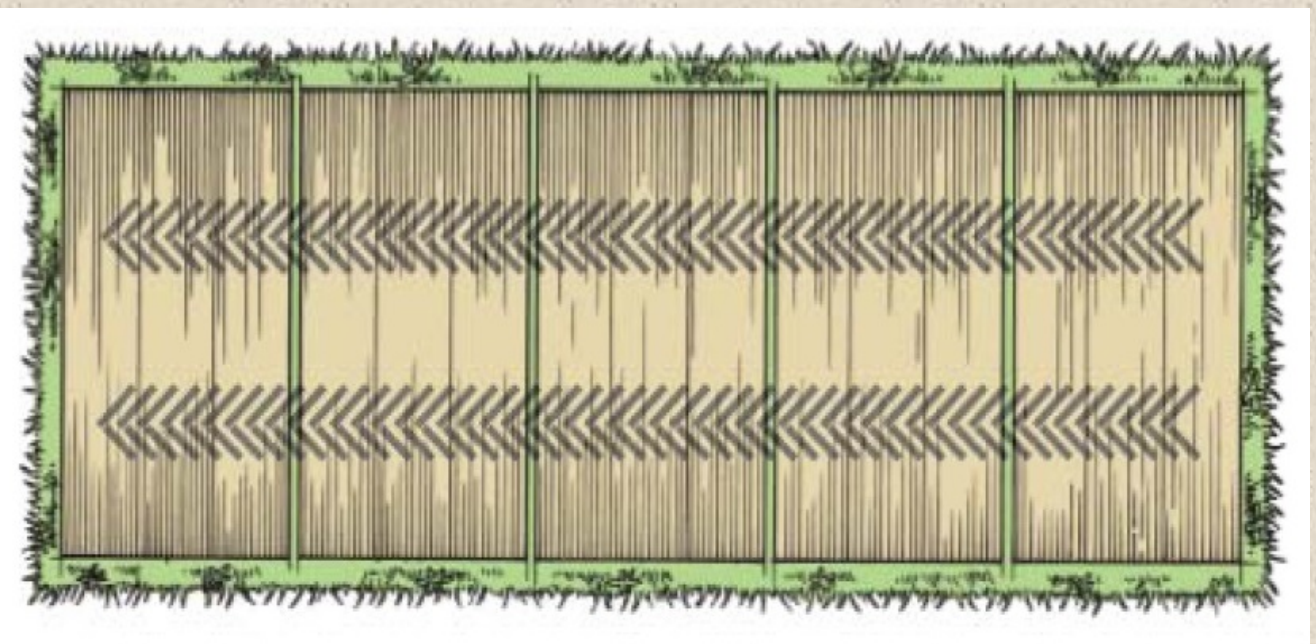
emtek® Access Type I



Typically found on job sites where ground conditions are generally uniform and mat can lay flat on the ground. Laid perpendicular to traffic and mat length determines the width of access road.

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Emtek Access Type I

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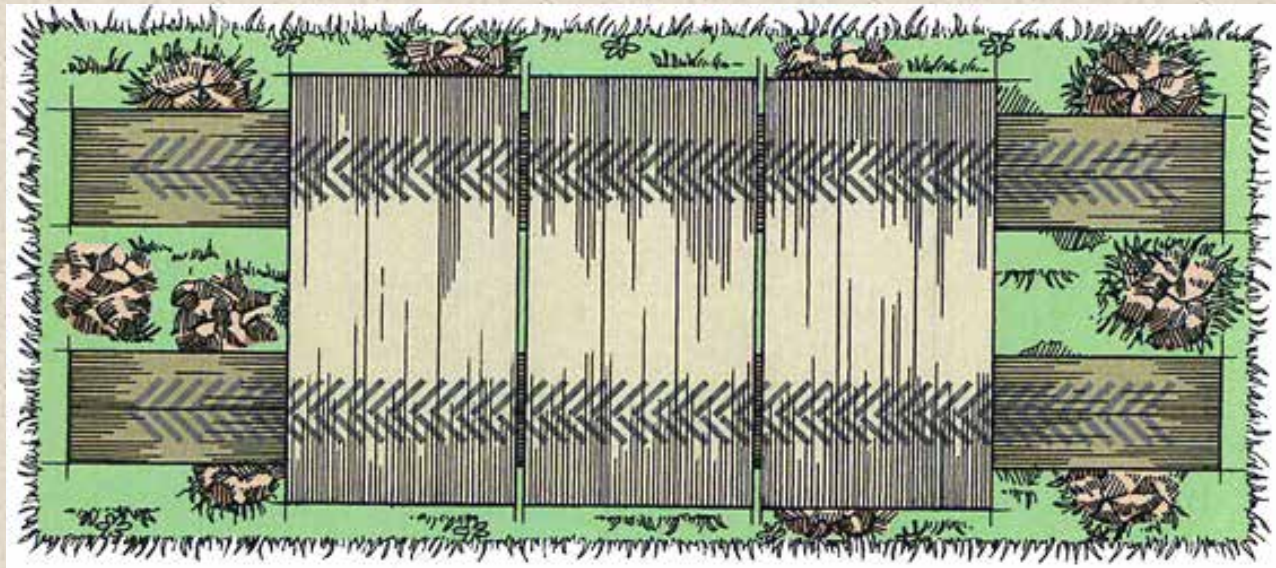
Emtek Access Type II



Used in areas that have non-uniform site conditions. High and low spots typically one to two feet apart and varying soil strength. Made up of 2 components: **stringers** (ground layer) and **decking** (work surface layer). The stringers bridge across terrain variations and the decking provides a solid road surface. Often used in areas where soil conditions within 20' spans are driving up mat thickness.

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New South's emtek® Type II System: Stringers

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New South's emtek® Type II System: Stringers and Decking

Installed Stringers for Type II

Work surface decking installed over stringers

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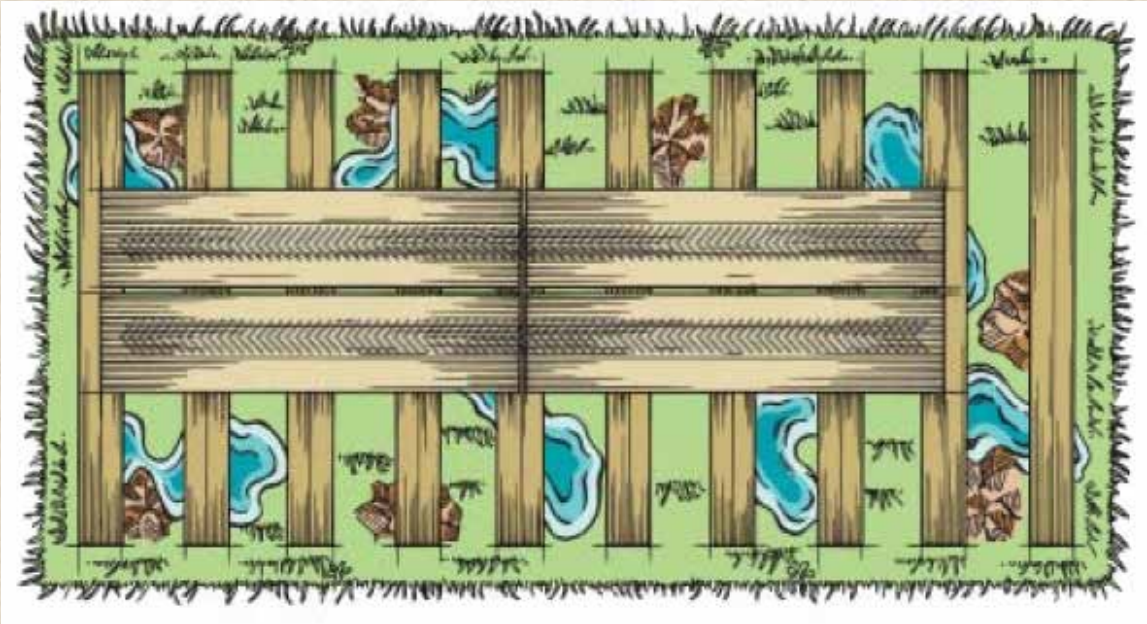
Earthsafe emtek® Access Type III



Used in areas that have extremely poor soil conditions. Typically difficult to walk and accessing the area requires hip-waders. Made up of 2 components, **bars** (ground contact layer) and **runners** (work surface layer). The bars run perpendicular to the access way, and cover a large area to distribute loads to each side of the access. The runners then lay parallel to the access and distribute the load to the front and back. Used in areas where single layer mats would generally submerge under equipment loads.

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New South's emtek® Type III System:
Access Road in Wetland

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New South's Wetland Access Capabilities.
Example 2: Bear Creek Marsh, Wisconsin
During Construction and 4 Months After

New South
Access & Environmental Solutions

New South's Wetland Access Capabilities.
Example 3. Monticello, FL

Video 2
https://www.youtube.com/watch?v=qLme85Gw2DU

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emtek® Type III High Float Road Example 5.

The *High Floatation Road* is an adaption of the emtek® Type III system. This system is used in open water applications. Sectional *floats* are used beneath the *bars* to simulate the support usually provided by soil and vegetation. Each system is engineered for job-specific requirements.

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emtek® Type III High Float Road

http://www.newsouthmat.com/emtek-high-floatation-road/

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emtek® Benefits

- Provide safest access
- Ultimate in low impact
- Mats designed to protect surface below without compromising worker safety
- 100% removal upon completion of job
- Fewer truck loads to ship
- Made with industry by-products
- No change in wetland topography
- No change in hydrology
- No damage to root systems

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Safety
composite vs emtek®

Stacked, Floating
(until loaded)
Unsafe

Video 3
https://www.youtube.com/watch?v=ocKOxktiY9Y

High & Dry Surface
(when loaded)

Video 4
https://www.youtube.com/watch?v=mS_TXwYBV0w

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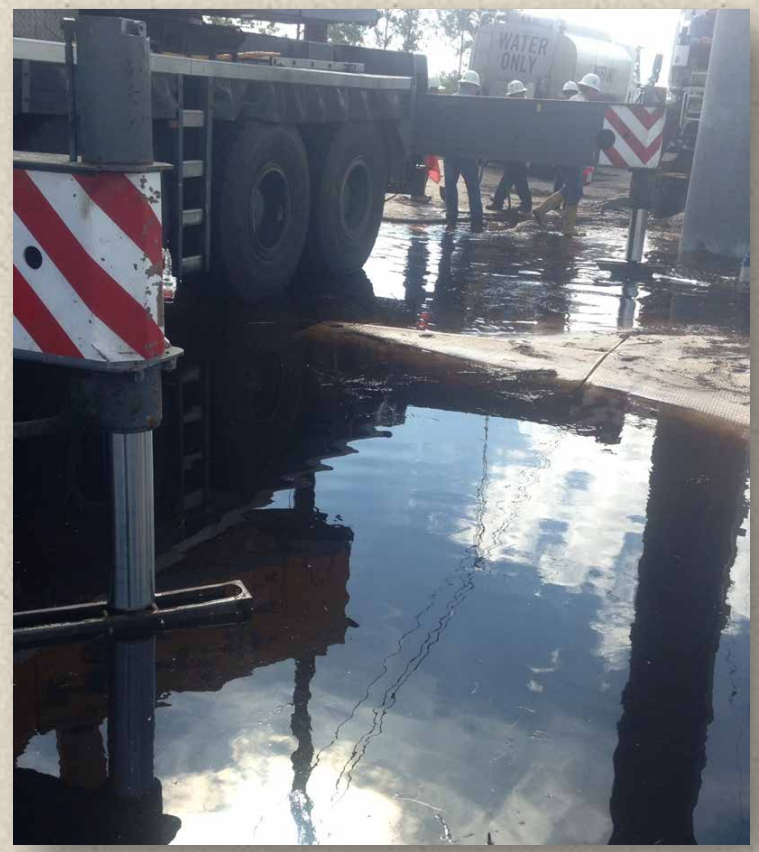
Safety/Risks



According to the U.S. Department of Labor, workplace injuries and illnesses among utilities resulting in days away from work occur at an average annual rate of 4.2 cases per 100 full-time employees.

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Safety/Risks/Incident

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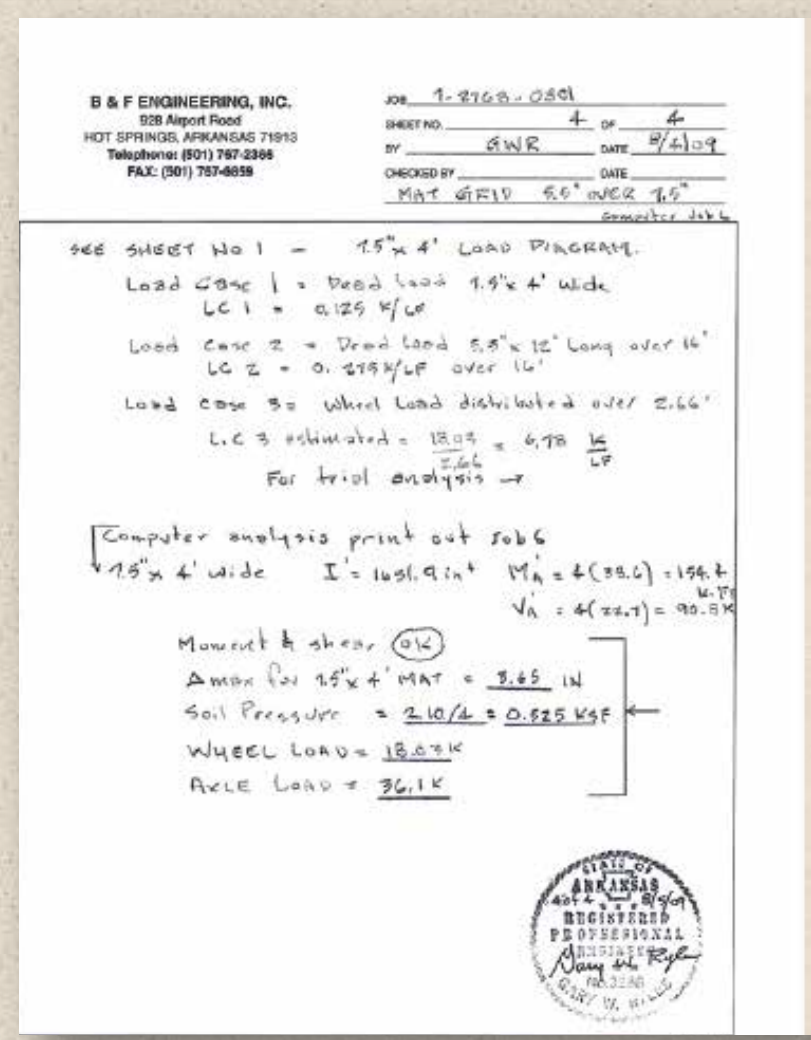
Design



B & F ENGINEERING, INC.
928 Airport Road
HOT SPRINGS, ARKANSAS 71913
Telephone: (501) 767-2366
FAX: (501) 767-6659

JOB 1-2768-0501
SHEET NO. 4 OF 4
BY GWR DATE 8/4/09
CHECKED BY DATE
MAT GRID 5.5" OVER 1.5"
Computer Job 6

SEE SHEET No 1 – 1.5" x 4' LOAD DIAGRAM.

Load Case 1 = Dead Load 1.5" x 4' wide
LC 1 = 0.125 K/LF

Load Case 2 = Dead Load 5.5" x 12" Long over 16"
LC 2 = 0.275 K/LF over 16'

Load Case 3 = Wheel Load distributed over 2.66'

L.C 3 estimated = 18.03 / 2.66 = 6.78 K/LF

For trial analysis →

Computer analysis print out Job 6
1.5" x 4' wide I' = 1651.9 in⁴ $M_A' = 4(38.6) = 154.4$ K-ft
$V_A' = 4(22.7) = 90.8$ K

Moment & shear (OK)
Δmax for 1.5" x 4' MAT = 3.65 IN
Soil Pressure = 2.10/4 = 0.525 KSF
WHEEL LOAD = 18.03 K
AXLE LOAD = 36.1 K

STATE OF ARKANSAS 4074 8/4/09 REGISTERED PROFESSIONAL ENGINEER GARY W. WILLIS

- Design components to withstand loading (max 4psi downward pressure)
- Detailed design properties are available
- System distributes the weight over a large area
- Does not impede flow of water

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The Process

I. Initiate

Make contact with regional representative close to you.

- Site visits and walk-downs
- Pre-bid and pre-construction meetings
- Matting budget preparation
- Proposals

II. Planning

- Analysis
- Mat selection and access plan
- Estimating
- Proposals

III. Operations

- Installation, intermediate moving, and removal of access
- Trained and experienced project manager on each project
- Safety programming

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Expectations

- Understand that one mat will not solve all problems
- Understand that typical matting does not work for all access
- Understand that typical matting often destroys sensitive areas
- We will continue to deliver access with a worker safe - environment first approach.
- We are most effective when timing is less urgent
- Allow us an opportunity to understand the project, walk the job site, survey the conditions and suggest a solution
- Consider All In Costs not just “unit pricing”

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emtek Benefits

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Questions

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