Elliot Pugh
September 10, 2019
Presentation Overview

**Ballast Systems**
- Product Options
- Challenges

**Exposed Geomembrane Covers**
- Applications
- Product Selection
- Prefabrication
Presentation Overview

Ballast Systems
• Product Options
• Challenges

Exposed Geomembrane Covers
• Applications
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• Prefabrication
Exposed Reinforced Geomembrane Applications

- Cell Rain Covers
- Temporary/Interim Caps
- Stockpile Covers
Cell Rain Covers

- Reduce/Eliminate the Generation of Leachate/Contact Water
- Erosion Control
- UV Protection to Underlying Geosynthetics
- Improve Run-off Water Quality
Cell Rain Covers

- 10 acre open lined area x 27,154 gallons/inch of rain/acre x 53.71 inch/year = 14,584,413.40 gallons annually

- Average disposal cost of $.06/gallon and hauling costs of $.06/gallon = $.12/gallon

- 14,584,413.40 gallons x $.12= $1,750,129.61 annual leachate treatment cost

- 10 acre rain cover supplied and installed= $217,800.00
Temporary Caps

- Same Benefits of a Final Closure
- Eliminate Leachate Generation
- Control Erosion and Dust
- Reduce Maintenance
Stockpile Covers

- Protect Bulk Stockpiled Materials
- Control Erosion and Dust Migration
- Reduce Pile Maintenance
Custom Fabricated Panels

- Factory built panels provide higher seam quality due to a controlled environment during production.
- Factory seams eliminate factors such as dust, dirt, water, and wind from the equation.
Fabricated Geomembranes

- **RPE**
  - Reinforced Polyethylene

- **RPP**
  - Reinforced Polypropylene

Reinforcement increases tear and puncture resistance, reduces thermal expansion and contraction and gives the material a longer service life.
HDPE vs. RPE & RPP Panels

- HDPE has a high coefficient of thermal expansion undesirable piping systems
- Reduce safety risk, increase performance, reduce costs with RPE & RPP prefabrication
Exposed geomembrane covers can be extremely susceptible to loadings generated by wind:
Wind Loading

Cross Winds

Wind Uplift or Negative Pressure
Traditional Ballast Methods
Rope and Sandbags

Safety – Ballast system weighs 325 lbs/roll = 6,560 SF. To cover that same area with sandbags it would take 131 sandbags (5’ x 10’ grid, 30 lbs each) = 3,930 lbs
Ballasting Exposed Covers

Traditional methods withstand the wind uplift force through a downward force used to pin/hold down the liner.
Geotextile Testing

- Regular MQC and Third Party QA Testing
- Long-Term UV Testing (15 months)
  - 55 year half-life
  - 90 year service life
- Dynamic Wind Testing Up to 110mph
  - No damage
  - 75% reduction in geomembrane uplift

![Nominal Product Values Table]

**Drop-In Specs Available**
Geotextile Testing Cont’d

- Run-off Testing
- Manning’s Coefficient Testing
  - $n = 0.029$
- Manning’s Coefficient for Grass
  - $n = 0.03$ to $0.04$
Knitted Geotextile Cover

- **Material** – Knitted UV Stabilized HDPE Geotextile

- **Roll size** - 10ft long x 1.5ft diameter

- **Panel Size** – 328ft long x 20ft wide

- Panels sewn via prayer seam using a 277 polyester bonded thread (minimum)

- PTFE thread is recommended for 7+ year applications
Seaming Details Cont’d

TYPICAL BALLAST COVER
NOT TO SCALE

TYPICAL PRAYER SEAM
NOT TO SCALE
Anchor Details

Anchor Trench

NOT TO SCALE

2'

Knitted Geotextile

GEOMEMBRANE

ANCHOR TRENCH BACK FILLED WITH SUITABLE BACKFILL

SLOPE TERMINATION

NOT TO SCALE

Knitted Geotextile

COVER GEOMEMBRANE

SEND FLOOD PROOF

CHANNEL GEOMEMBRANE

THE ANCHOR TRENCH

THE ANCHOR TRENCH
Reusability
Solid Waste Landfill {Before} 50,000 SF Temp Cap
Solid Waste Landfill {After} 50,000 SF Temp Cap
Solid Waste Landfill
300,000 SF Temp/Final Cap
Solid Waste Landfill
500,000 SF Cell Rain Cover
Solid Waste Landfill
300,000 SF Spray Curtain
Solid Waste Landfill
1,500,000 SF Temporary Cap
Power Plant
VE Basin Ballast

Primary & Holding Basins

Secondary Basins
VE - Toe of Slope Termination
Toe of Slope Termination
Power Plant
VE Basin Ballast
Power Plant
3,800,000 SF VE Basin Ballast
Temporary Landfill Covers

- Industry trend to temporary covers
  - Reduce/eliminate leachate production
  - Control erosion
  - Improve gas quality
  - Reduce site maintenance

- Protect your investment
  - Analyze Prefabrication Options
  - Select a ballast system which best fits your application
Contact Information

**Elliot Pugh**
Sales Manager
Wind Defender, LLC
elliot@wind-defender.com

**Timothy D. Stark Ph.D., P.E.**
Professor of Civil & Environmental Engineering
University of Illinois at Urbana-Champaign
Technical Director
Fabricated Geomembrane Institute
tstark@Illinois.edu

**Jen Miller, M.S.**
Coordinator
Fabricated Geomembrane Institute
University of Illinois at Urbana-Champaign
fabricatedgeomembrane@gmail.com
Lightweight Aggregates for Civil Engineering Applications

Tuesday, October 15, 2019 at Noon CDT
Free to Industry Professionals
1.0 PDH

Presenters:
Archie Filshill & Theresa Andrejack Loux
AeroAggregates LLC
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