RESEARCH PROJECT 0-5517

Beneficial Use of Scrap Tire Bales in Highway Projects

RESEARCH PROJECT 0-5517

History

BALED TIRES for a TEXAS HIGHWAY SLOPE REPAIR

Purpose of this Project

- Texas Legislature's desire to recycle scrap tires
- Richard's duty as the District Construction & Maintenance Recycling Coordinator
- Desire to try new & innovative things with non-standard materials

Background

- March 2001 - approached by a local tire-baling firm
- March 2001 - researched bale usage in New York State, Chautauqua County road reconstruction
- Summer 2001 - requested District staff approval to use as a slope-repair experiment

Background (cont'd)

- Late summer 2001 - selected a site
- Fall 2001 - worked on bale acquisitions
- December 2001 - acquired TxDOT Commission approval to accept 240 donated bales
- January 2002 - TNRCC approval to bale
- February 2002 - baling by Encore Systems

Background (cont'd)

- March 2002 - placement of bales starts
- July 2002 - purchased 120 additional bales
- August 2002 - finished the final slope repair with 320 total bales placed
- Current - vegetation growing back to prevent erosion of slope soil

Slope to be Repaired

Geotechnical Considerations

- Poor soil quality
- Groundwater intrusion creating slides
- Alternative “wall” repair construction
- Permanent repair

Geotechnical Considerations

Tire bale alternative

First Tires being Placed into the Vertical Tire Baler

Hooking Bale Tie Wires

Horizontally Baled Tires

Vertically Baled Tires

Foundation Preparation

Transporting Tire Bales

Slope Repair Operation

Tire Bales Placed

Slope Repair after First Layer

Groundwater Drainage Through Bales

Second Layer Placement

Second Layer Coverage and Final Sloping

Third Layer

Placing Cover for Final Layer

Completed Slope

Final Slope Repair

Geotechnical Preliminary Findings

ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/tbfreport.pdf

- Lower unit weight with the tires
- Factor of Safety doubles and triples from slope stability calculations
- Resistance to shear forces and sliding resistance
- Much less likely for repeat slope failures

Conclusions

- Successful!
- An acceptable repair alternative in clays
- Uses a recyclable material to create a viable engineering product
- Demonstrates active pursuit of the Legislature's request

Implementation Project 5-9023

Validate the Effectiveness of

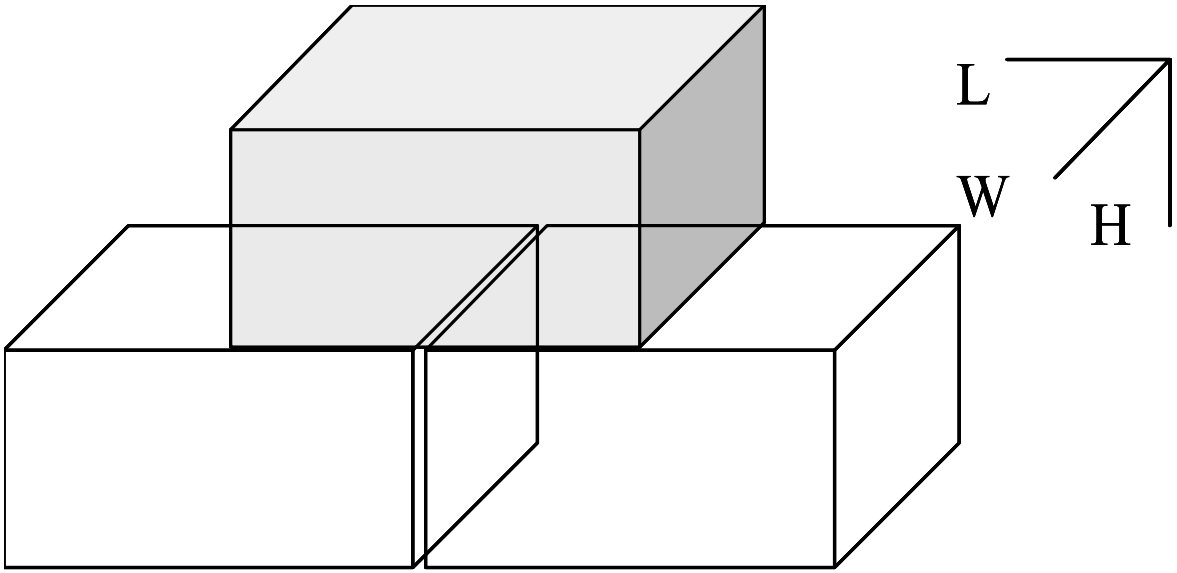
Tire Bale Use in Slope Repairs and Embankment Construction

Implementation Project 5-9023

- ✓ Tire bale testing
- ✓ Design of monitoring program
- ✓ Instrumentation procurement
- ✓ Field inspection
- ✓ Analytical evaluation
- ✓ Reporting

Implementation Project 5-9023

Direct Shear Testing



Tire Bale Arrangement for Direct Shear Testing

Implementation Project 5-9023

<u>Bale Properties</u>

- Dimensions ≈ 5'L x 5'W x 2.5'H
- Weight ≈ 2,000 lbs. or 1 ton
- Volume ≈ 2 CY
- Specific Gravity ≈ 1.10
- Unit Weights ≈ 37 pcf (dry) / 47 pcf (wet)
  ≈ 5.5 pcf (submerged)
- Cohesion (c) ≈ 32 pcf
- Angle of Internal Friction (ø) ≈ 36°

RESEARCH PROJECT 0-5517

Proposed Tasks

- Analytical
- Material characterization
- Product specification

TxDOT Tire Bale Experience

Online information

- Tire-Bale Slope Repair Evaluation
  www.dot.state.tx.us/gsd/recycle/tirebales.htm
- Geotechnical Investigation and Analyses
  ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/tbfreport.pdf