RESEARCH PROJECT
0-5517
Beneficial Use of Scrap Tire Bales in Highway Projects
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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
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
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
Final Slope Repair
Geotechnical Preliminary Findings


- 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
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Validate the Effectiveness of Tire Bale Use in Slope Repairs and Embankment Construction
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- Tire bale testing
- Design of monitoring program
- Instrumentation procurement
- Field inspection
- Analytical evaluation
- Reporting
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Direct Shear Testing

Tire Bale Arrangement for Direct Shear Testing
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Bale Properties

- 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 (φ) ≈ 36°
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Proposed Tasks

- Analytical
- Material characterization
- Product specification
Online information

- Tire-Bale Slope Repair Evaluation
  www.dot.state.tx.us/gsd/recycle/tirebales.htm

- Geotechnical Investigation and Analyses