



Joint Rapid Airfield Construction

Assessment of Improved Pulverizer Technology

**Eileen M. Vélez-Vega
Geotechnical and Structures Laboratory
Airfields and Pavements Branch**

FY03 - \$157K

FY04 - \$200K

FY05- \$195K

Project Description

Objective

- ▶ *Evaluate the performance of different rotor types on various materials for stabilization, while meeting the dimension requirements to be transportable on a C-130 aircraft.*
- ▶ *Evaluate the performance and mixing capabilities/requirements of the CMI/Terex RS-325 pulverizer.*
- ▶ *Facilitate a full understanding of the RS-325 capabilities of mixing soil with different emulsions, and other stabilizing agents with silty sand soils.*

Scope

- **Construct a test section at WES to evaluate the performance of the CMI/Terex RS-325 pulverizer by mixing liquid, and powder stabilizing agents.**
 - ▶ *Report will sever as a User Manual for the Soldiers*

- (FY03) by Patrick McCaffrey

- Evaluate the performance of different rotor types on various materials

- ▶ Materials used for evaluation

- CH (*heavy clay, buckshot*)
- ML (*low plasticity clay*)
- SP (*poorly graded sand*)

- ▶ Types of pulverizers / mixers

- Tine type mixer
- Soil stabilization type
- Combination

Tine Type: Seaman Travel Mixer



Soil Stabilization Rotor: Caterpillar SS-250



Combination Rotor: Bomag MPH 364

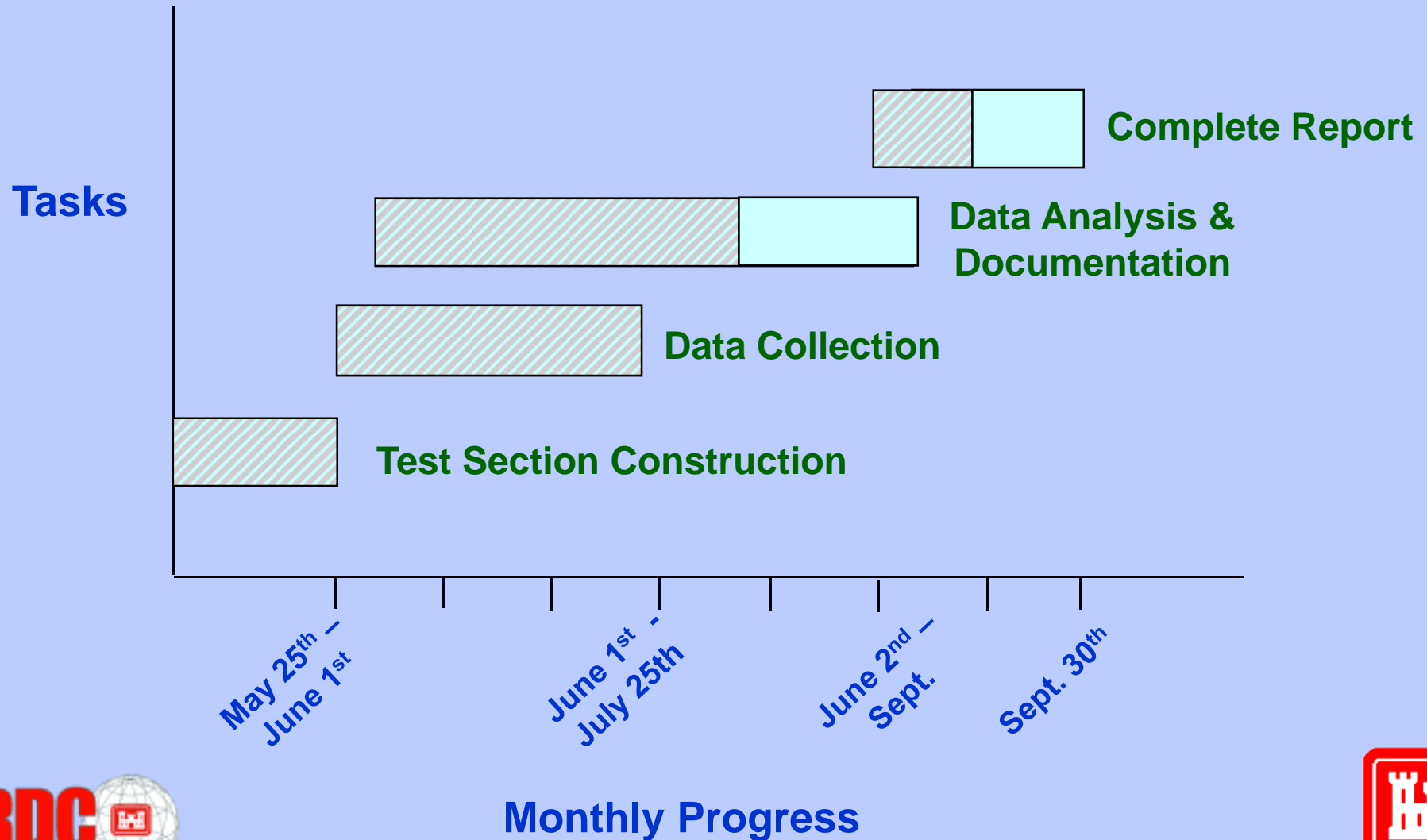


- Purchase the CMI/Terex RS-325 Reclaimer/Stabilizer “Pulverizer”
- Participate in FY 04 Demonstration in Ft. Bragg
 - ▶ Conduct training for troops
- Constructed test section to evaluate the Pulverizer
 - ▶ **Type of Material:**
 - Silty Sand (SM)
 - ▶ **Locations:**
 - » Snake Pit Area
 - » Hangar 4
 - ▶ **Stabilizing agents:**
 - » 0.4 % Fibers
 - » 3% Liquid Polymer
 - » 3% Portland Cement
 - » Combination Cement + Polymer
 - » Combination Polymer + Fibers
- Develop a user manual for the troops on how to efficiently employ the machine in the field.

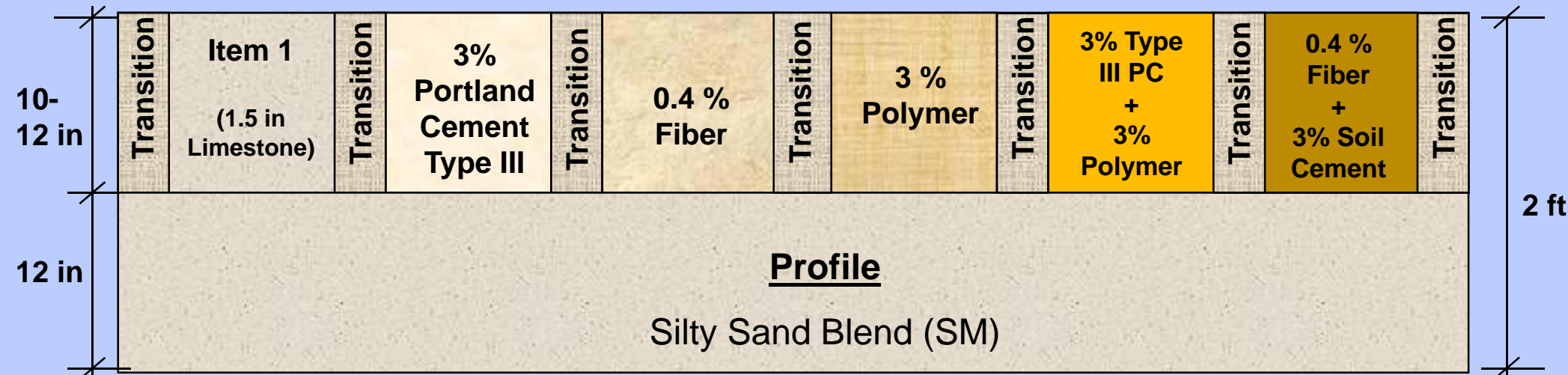
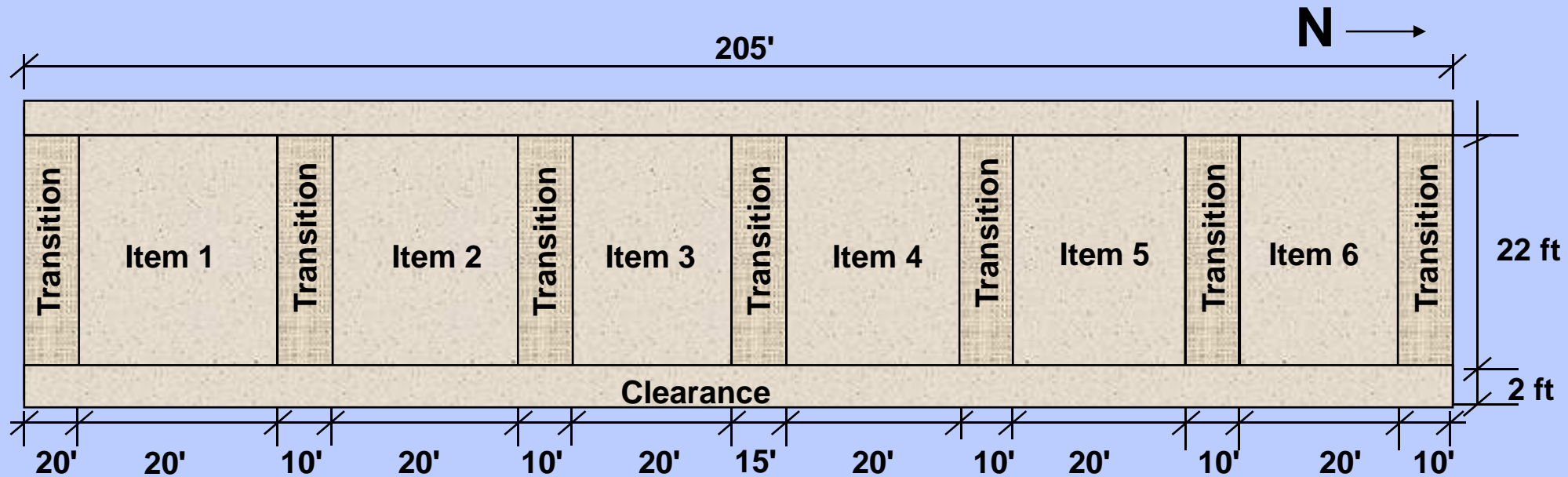


CMI/Terex RS-325

FY 05 Project Progress Chart



Test Section Description



Testing and Data Collection

- **Item 1: Crushed Limestone**
 - Spread 1.5 inches of limestone over the item.
- **Item 2: 3% PC Type III**
 - Spread 17 bags of PC Type III over the entire area.
- **Item 3: 0.4% Fibers**
 - Spread 11 bags of 2 in. fibrillated fibers over the item.
- **Item 4: 3% Polymer**
 - Mix Polymer with water in a ratio of 1:1.1
 - Apply color dye to the mixture.
 - Inject with the Pulverizer liquid proportioning system and mix.
- **Item 5: 3% Polymer + 3% PC Type III**
 - Combined procedures of Items 2 and 4.
- **Item 6: 3% Polymer and 0.4% Fibers**
 - Combined procedures of Items 3 and 4.



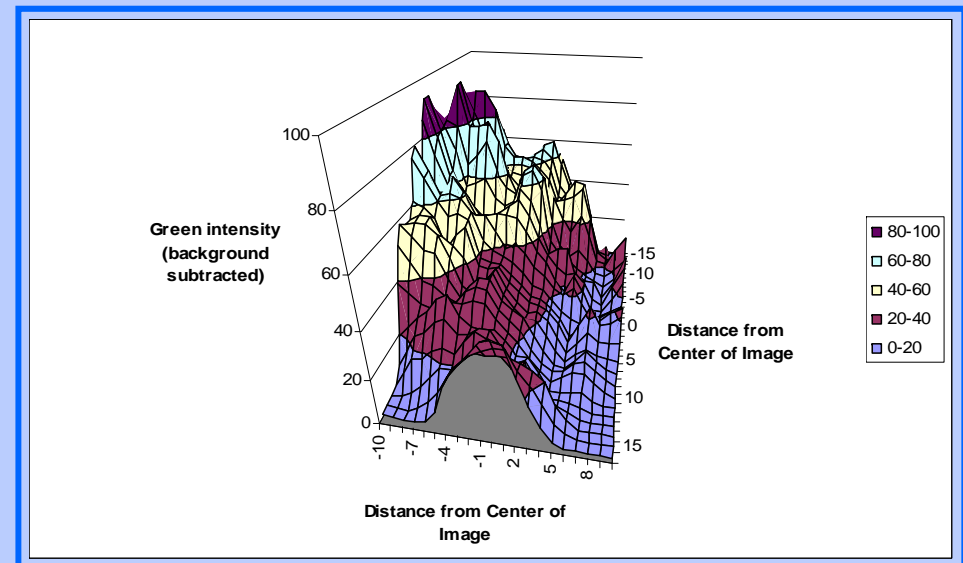
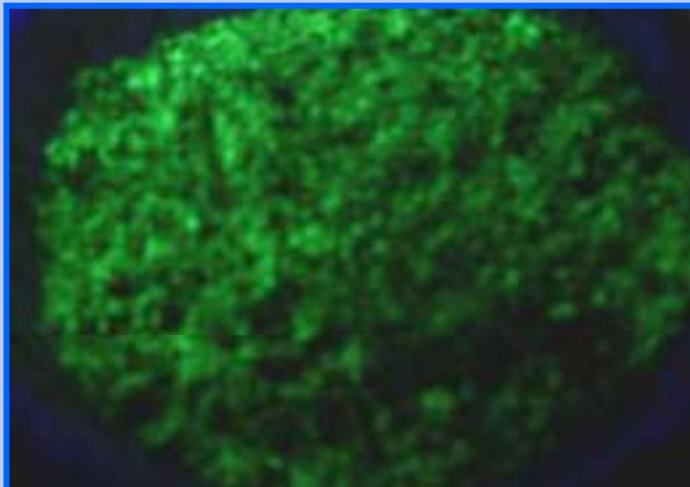
- **Sampling:**
 - 4000 gr. Samples from:
 - ▶ **Top 3 inches**
 - ▶ **3-6 inches**
 - ▶ **9-12 inches**
- **Mixing Speeds:**
 - 20 ft/min
 - 45 ft/min

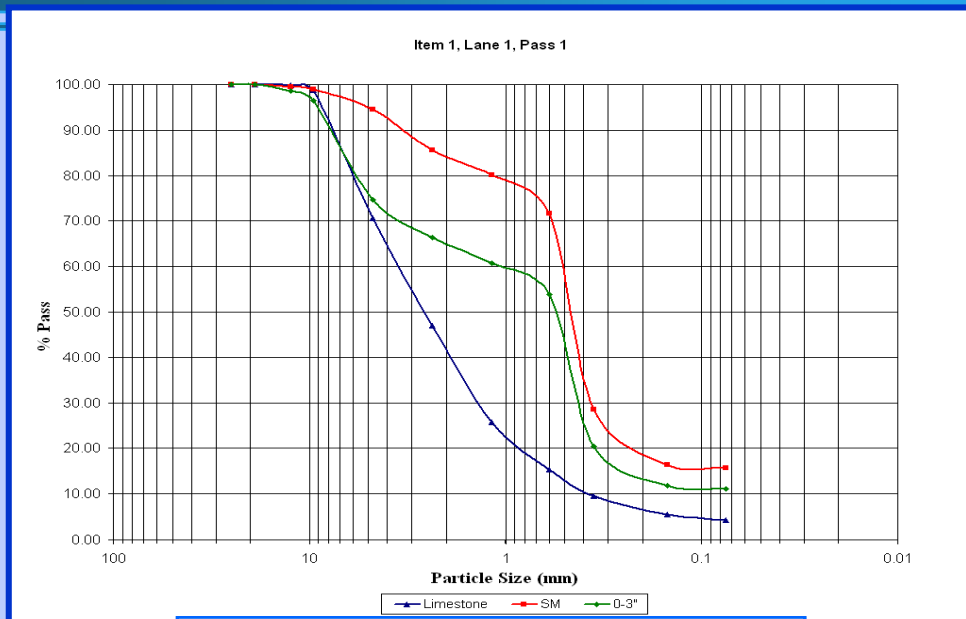
Testing and Data Collection



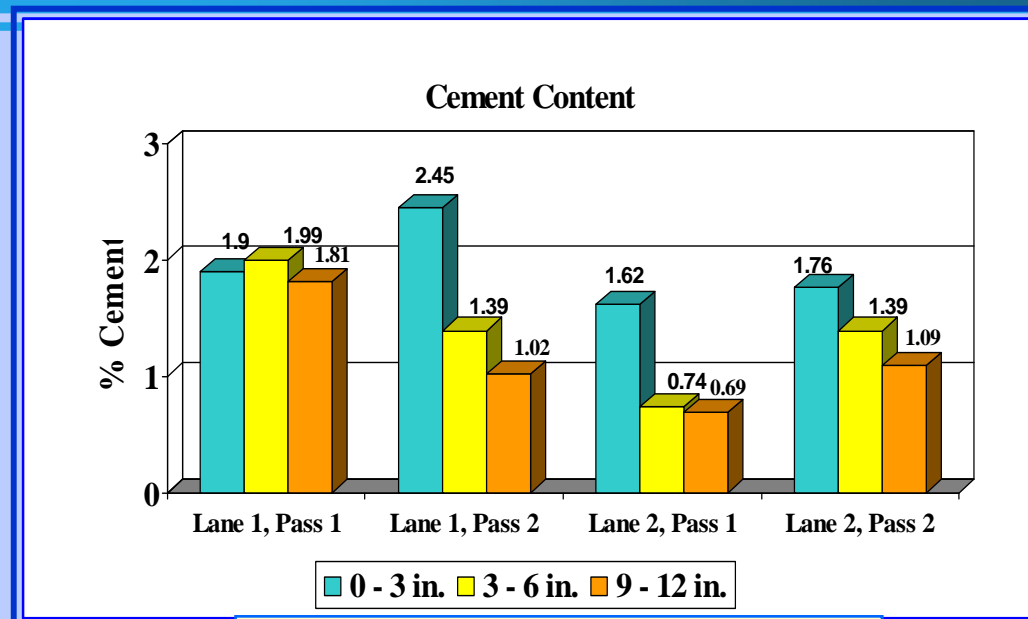
Testing and Data Collection

- **Data Analysis “Wet Items” 4, 5, 6:**
 - Measure the amount of fluorescence (dye) in each sample:
 - ▶ Take pictures of the sample under two fluorescent lamps.
 - ▶ Analyze pictures with CANVAS 9 software to quantify light emissions (fluorescence) and correlate to moisture content.
 - Compare moisture content of the samples with targeted moisture content (8.5%).

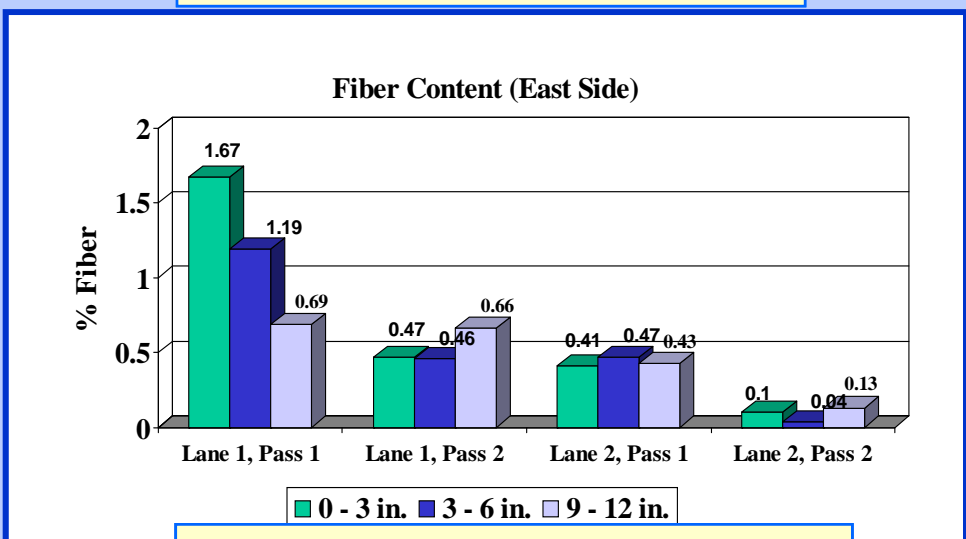




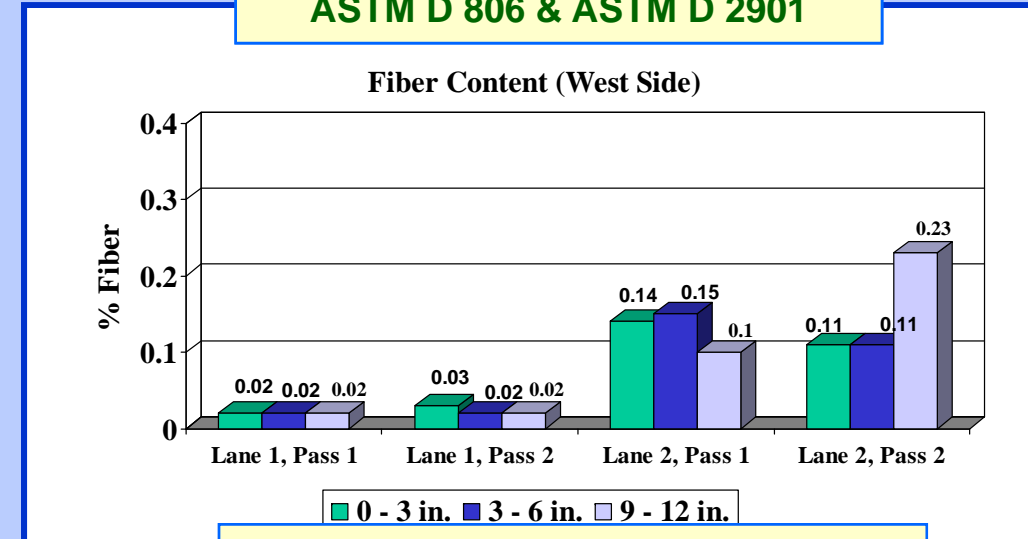
Item 1: 1.5 in Limestone



**Item 2: 3% Portland Cement
ASTM D 806 & ASTM D 2901**



Item 3: 0.4 % Fibers (East Side)



Item 3: 0.4 % Fibers (West Side)

Problems encountered



Item 2 & 5: 3% PC Type III



Item 3 & 6: 0.4% Fibers

Conclusions/Recommendations

- The CMI/Terex RS-325 Pulverizer does a good job of distributing the stabilizers over depth, but not over the area of the item.
- A better option could be to stabilize the soil in two layers of 6 inches.
- The Pulverizer does a more effective job when liquid stabilizers are injected through the liquid proportioning system.
- Solid stabilizers are dragged by the rubber flap in the Pulverizer drum. Removing the rubber flap will avoid material drag when cutting more than 6-8 inches.
- Making a second pass with the Pulverizer in the opposite direction would overlap the test items, and result in better material distribution.
- Speed of the Pulverizer is an important factor at the moment of stabilization.



- **Test Bed/Transition Medium:**
 - FY 04 JRAC C-130 Demonstration at Ft Bragg
 - FY 07 JRAC C-17 Demonstration
 - In-depth analysis and monitoring of the mixing requirements for the CMI/Terex RS-325.
 - ▶ **Two reports**
 - » **FY03 – Pulverizer Selection Criteria**
Patrick McCaffrey & Eileen M Vélez-Vega
 - » **FY05 – Pulverizer Test Section**
E. Vélez-Vega, Osvaldo Vargas & Quint Mason
 - **User Manual for the Soldiers to use in the field operations**
 - ▶ **Accurate stabilizer application rate, and improved equipment operation**





Joint Rapid Airfield Construction

