


Crack Attenuating Mixes

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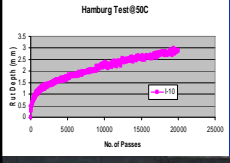
- Background
- RBL Applications
- CAM projects in Texas
- Current Mix design Approach

Balancing Rutting and Reflection Cracking Requirements



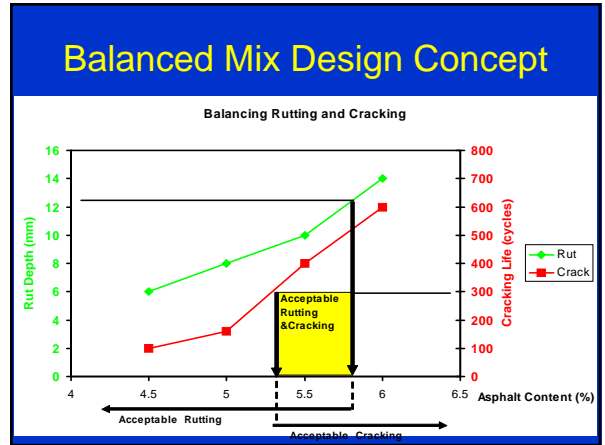
Rutting test Standard prep Reflection Cracking test

IH-10 Type C (3/4 inch top size) (PG76-22L), 4.4%AC

| Properties | Result | Target |
|--|--------|--------|
| Cracking (overlay tester cycles to failure) | 2 | >300 |
| Rutting (Hamburg cycles to 0.5 inch rut) | >20K | >20K |

Rut resistance mix (4 in thick) placed on IH 10 in 2002 very heavy traffic
Reflection cracking in 2005



Balancing rutting and reflection cracking Tentative Design Criteria (2003)

| | Dense and Performance Mixes | RBL/CAM |
|---|-----------------------------|---------|
| Cracking (Cycles to failure in overlay test) | >300 | >750 |
| Rutting Hamburg* (Cycles to 0.5 inch rut) | >20K | >20K |

Specimens molded to 93% density
Criteria based on binder grade (> 10 K for 64-22)

Houston's RBL Spec (2003)

(Designed under TxDOT Item 344 SP D – RBL)

- Screenings Mix Type F approx (40%) and Screenings (60%) (no natural sand) **Class A aggregates recommended**
 - Sieve % Passing
 - 3/8 100
 - #4 90 min
 - #10 55 min
 - #40min 20 min
 - #200 8 max
- Target AC content 7.0 to 8.5%
- Target lab density 98% at Ndes = 50 gyrations
- Minimum 750 cycles to failure in overlay tester
- Passes Hamburg criteria
- Max thickness 3 inches (RBL + Type D (or PFC))

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Cost Analysis

| Project | Roadway | Completed | RBL (\$/Ton) | TY D (\$/Ton) | Comments |
|------------------|---------|-----------|----------------|----------------|----------|
| 0050-05-064 | BU 290 | July '04 | 60.48 | 37.00 | |
| 1006-02-025 | FM 529 | Feb '05 | 93.24 | 52.20 | |
| 2941-02-043 | FM 2920 | Jan '06 | 56.00 | | w/PFC |
| 0500-03-518 | IH 45 | Oct '06 | 55.00 | 48.00 | w/PFC |
| 0500-01-130 | IH 45 | Nov '06 | 68.00 | | w/PFC |
| 1685-05-085 | SH 6 | Current | 72.00 | 66.00 | |
| 1685-05-086 | SH 6 | Current | 98.00 | 93.00 | |
| AVG. COST | | | \$72.00 | \$59.00 | |

↑ 25%

SPECIAL SPECIFICATION 3138 CRACK ATTENUATING MIX (CAM)

- Placed as 1 inch wearing surface
- Surface Aggregate Class A only
- Design
 - Superpave Gyratory Compactor
 - 98% density
 - 50 gyrations
 - Hamburg Requirement
 - Overlay Tester Tx Method 248F 750 passes
- Construction Issues
 - Placement temperature
 - Compaction recommendations, etc

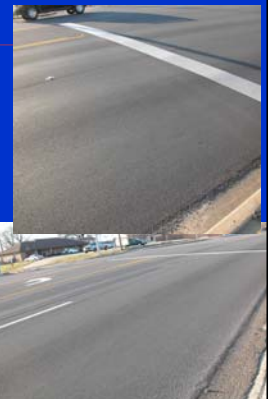
Existing use of CAM as Surface Layer

- Atlanta (Miles Garrison) 2 projects
- Bryan (Darlene – IH 45 Entrance ramps)
- Houston (IH 45 for 1 year)
- Childress (US 83 – Ron Hatcher)



Business US 82 in Texarkana

- 4 lanes, 0.6 miles long
- TxDOT Type F (Hybrid) overlay; 7.8%PG 70-22S +sandstone
- HWTT = 6.78 mm & OT = 900+ cycles
- ≅ 1" thick HMA overlay
- Severely flushed surface
- No major surface distresses after over 3 yrs of service
- [Field SN = 36 \(bold line @ 40 mph\)](#)



Field Demonstration Projects

- Designs completed for Lufkin and Fort Worth - implementation studies underway
 - Placement Summer 07
- Under Design (local aggregates)
 - San Antonio nominated a project on US 90 near Uvalde (trap rock)
 - Austin US 281 Marble Falls (sandstone)
 - Laredo 3 projects (gravel)


1" Thin overlay sections summer 07 (Project complete)

Pumphrey Street, Fort Worth





Surface Preparation

Sounding bar used to mark problem areas
Loose concrete removed and patched with Type D hot Mix

Mix Designs

| | |
|--|--|
| <ul style="list-style-type: none"> • Mill Creek Granite • 55% F Rock 55 % + 45% screening • PG 64-22 with 3% SBR Polymer • OAC 6.8% for 3.5% AV • Anti-strip 1% Liquid • Hamburg 10.5mm @ 20K (@ 7% air voids) • Overlay Tester > 1200 | <ul style="list-style-type: none"> • Mill Creek Granite • 55% F Rock 55 % + 45% screening • PG 64-22 plus 7% Crumb Rubber • OAC 6.8% for 3.5% AV • No anti-strip • Hamburg 9.5 mm @ 20K (@ 4% air voids) • Overlay Tester > 1200 |
|--|--|

Pumphrey Drive Placement




Emulsion Tack coat
Dumped directly into Paver
Only Non-vibratory steel wheel used for compaction

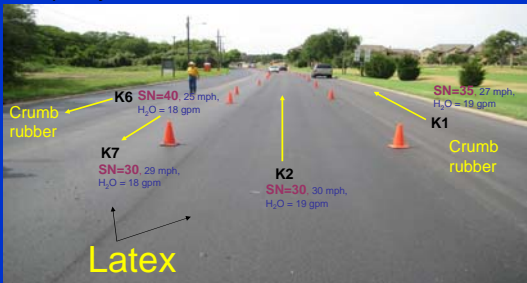
Pumphrey Drive Placement




No major construction issues Mix bonded very well to concrete

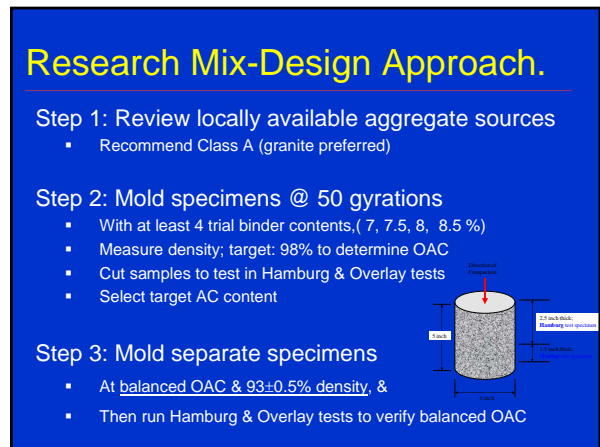
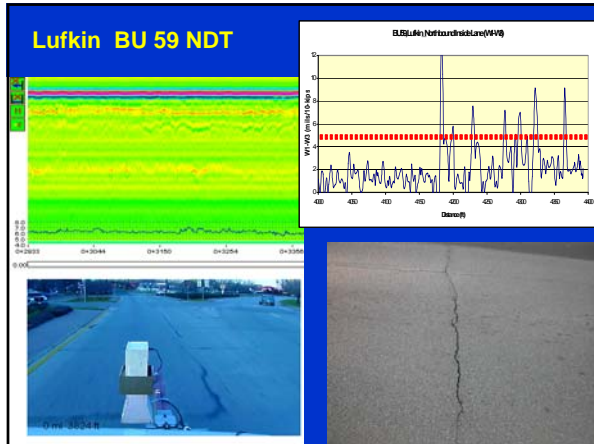
Field Skid Measurements..

Pumphrey street in Fort Worth

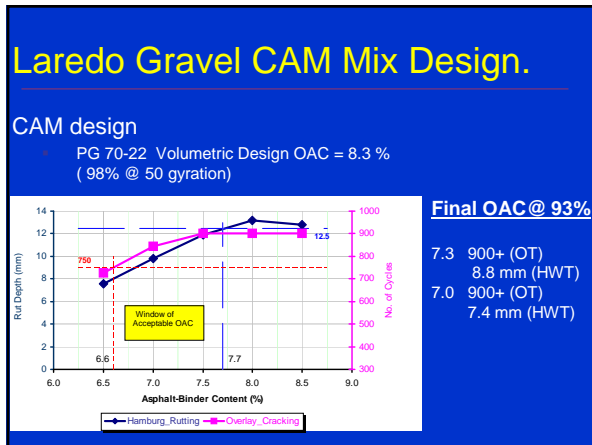
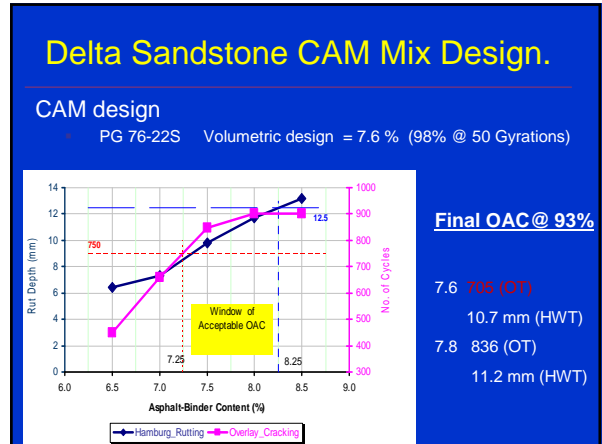
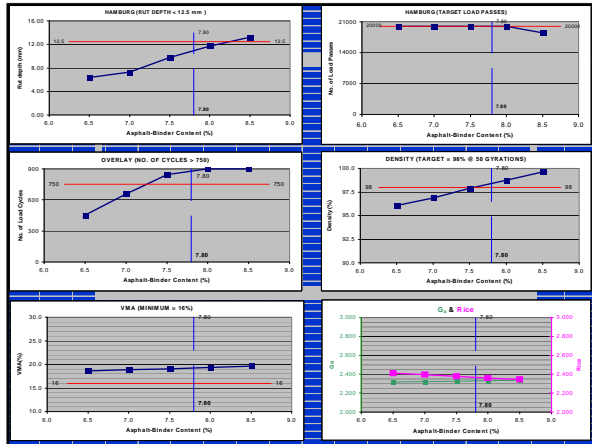


1) Crumb rubber = 6.8%PG 64-22 + 7% rubber + Class A granites

2) Latex = 6.8%PG 64-22 + 3% latex + 1% Akzo + Class A granites



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• CAM Early days Time will tell

Questions

