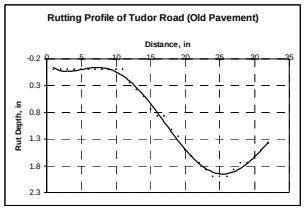

ANALYSIS OF RUTTING FOR ANCHORAGE PAVEMENTS

Research Team

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PURPOSE

Understand Rutting Mechanisms and Recommend Methods to Reduce Rutting in Anchorage.

Causes of Rutting

- Abrasion
- Deformation of Unbound Layers
- Plastic Deformation

Abrasion

- Caused by Tire Wear Especially Studded Tires
- Methods to Reduce
  - Reduce or Eliminate Studs
  - Hard Aggregates
  - Asphalt Modifiers or Additives
- Aggressively Studied By DOT&PF

Deformation of Unbound Layers

- Shown not to be a problem in Anchorage

Plastic Deformation

- Causes
  - Soft Asphalt Cement
  - Temperature
  - Low Air Voids (High Asphalt Content)
  - Improper Gradation
  - Rounded Sand
  - Improper Compaction

Reducing Plastic Deformation

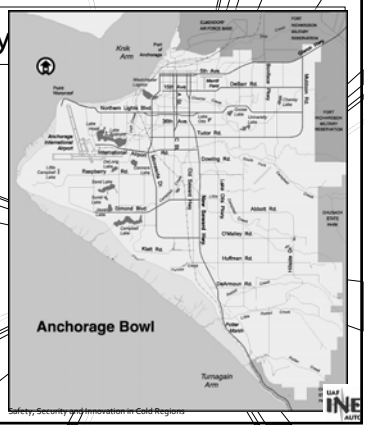
- Increase AC Stiffness
- Modifiers or Additives
- Keep Voids Between 2.5 and 5%
- Crushed Fines
- Proper Gradation
- Proper Compaction (Between 92 and 98% MTD)

AUTC Chose to Focus on Plastic Deformation to Compliment DOT&PF Ongoing Work

Methodology

- Field Study
  - Measure Rutting on Representative Highways
  - Test Properties of Recovered Samples
- Laboratory Study
  - Investigate Aggregate Properties
  - Investigate AC Properties
  - Compare Performance DOT&PF Mixes with New Mixes

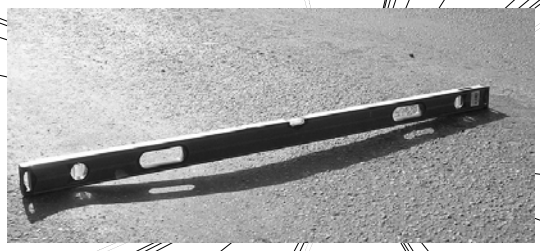
Field Study



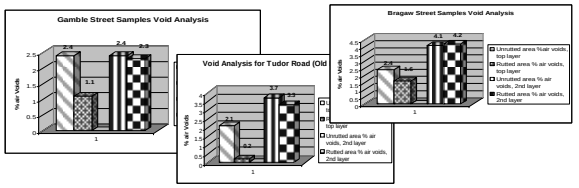
Selected Sites

- Inbound Glen Highway at Muldoon exit
- Diamond Blvd. at Old Seward
- Tudor Road at Bragaw
- Gamble Street at 13th Ave.
- Benson at Seward Hwy.
- Bragaw at 6th Ave.
- C-Street at 8th Ave

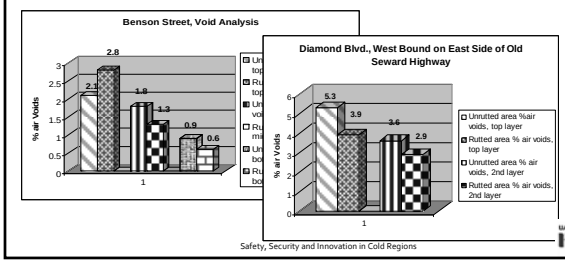
Summary of Observations



Wheel path voids were consistently lower than 3% and below 1.5% for many dense graded Mixes

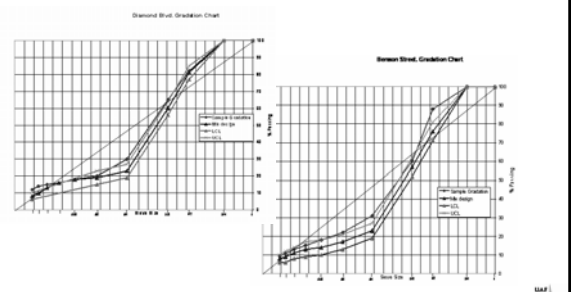


Wheel path voids increased in wheel path for SMA's except for Diamond.

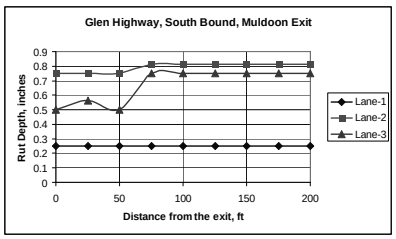


Flushing observed in some pavements especially on Tudor, Bragaw and Gamble

Gradations of all overlays finer than mix design.



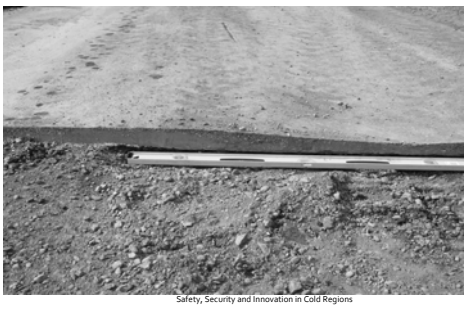
Rut depths tended to be greater near intersections.



Glenn highway exhibited stripping between layers.

PlusRide mix on C-Street performing well even though voids are between 1.7 and 2% after 20 years.

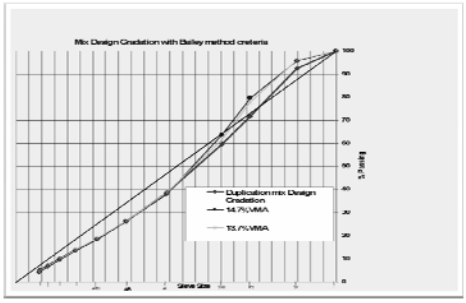
Pavement cut in Tudor showed no base deformation.



Laboratory Investigation

- Investigates impact of AC Grade
- Investigates impact of gradation using Bailey Method
- Performance tested by both Georgia Wheel Test and Simple Performance Test

Comparison of Bailey and New Tudor Mix Design



Results of GLWT

Cycles	Temp (deg. C)	New Tudor (mm)	64-28 (mm)
1000	40	.45	.35
4000	40	.50	.38
8000	40	.48	.38
1000	58	.65	.29
4000	58	.53	.45
8000	58	.71	.49

Simple Performance Test Results

Mix Design	E*/sin f
2005 Tudor Road (Tesoro 52-28)	8829
70-28 (Bailey)	7844
64-28 (Bailey Method)	4998

Rut Resistance by Test

Volumetric (Superpave)	GLWT	Simple Performance
70-28	64-28	2005 Tudor Road
64-28	2005 Tudor Road	70-28
2005 Tudor Road		64-28 (Bailey)

Summary of Findings

- Except 2005 Tudor Road overlay all sites had low air voids
- All intersections studied showed evidence of plastic deformation.
- Flushing was observed at Gamble, Tudor and Bragaw
- No evidence of base deformation
- Finer gradation observed in recovered gradations

Recommendations

- Take a closer look at the Type V mix used in the 2005 Tudor Road overlay.
- Consider the use of PG 70-28 in intersections
- Evaluate the use of the Bailey Method
- Consider the use of the Simple Performance test in developing mix design specifications