

## SEAUPG Conference Oklahoma City, OK December 6-8

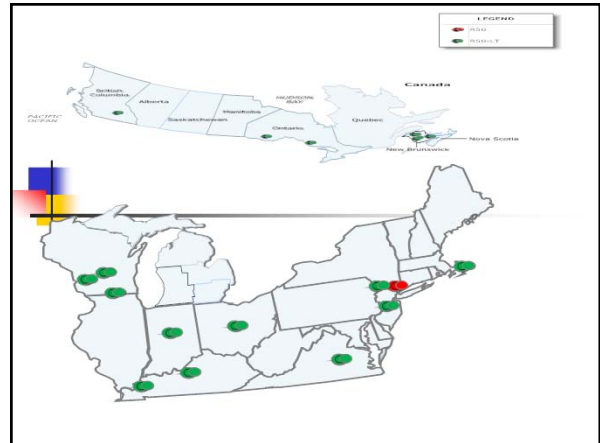
Chase Construction Products  
Doug Zuberer  
(508) 341-4961  
dzuberer@chasecorp.com

## Acknowledgments

- Dongre Testing Laboratories
- The Asphalt Institute
- University of Illinois
- PRI Asphalt Technologies
- John D'Angelo for JNR study
- Supervision and control conducted by Dr. Geoffrey Rowe PhD, PE Abatech

## Water-proofing bridge decks

- Asphalt has been used on bridge decks for over 100 years with a view to providing water-proofing properties
- Lower temperature Rosphalt introduced 2010 paving season with over 10,000 tons successfully installed.



## What is R50-LT

- "Dry Mix" additive added directly at the Asphalt Plant
- Has been primarily used for
  - Waterproofing/Wearing Course
  - Heavy Traffic Intersections
  - Airports/taxiways
  - Race tracks
  - Truck Loading Docks
- Other potential use
- Many states using PG76-22 as a Thin-Film overlay. R50-LT used at lower dose has potential of increasing performance 3.5 time.

## Objectives for a performance material

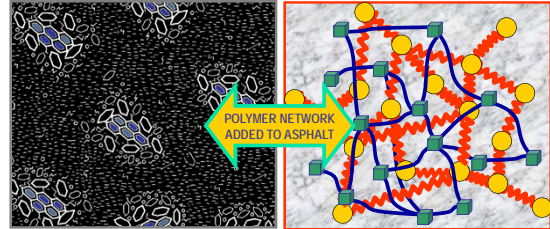
- Performance
  - Skid resistance
  - Waterproofing
  - Smooth ride quality
  - Resistance to fatigue
  - Deformation resistance
  - Durability
  - Long life
- Attributes
  - Quick installation
  - Ease of application
  - Low cost compared to other materials
  - Use of conventional equipment

## Why thermo-plastic modifiers

- Have structure at lower temperatures associated with deck temperatures during service that are similar to visco-elastic solid – no, or little deformation
- Polymers designed to enable processing by all conventional HMA plants and equipment
- Cost of installation low compared to alternate products
- Selection of products allows a very long fatigue life to be obtained, low stiffness and very flexible material

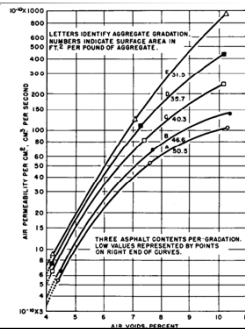
## Complex modification

Asphalt binder behaves as a visco-elastic liquid at all temperatures  
Thermo-plastic (visco-elastic solid) polymers provide structure at pavement temperatures while careful selection of **plastic** properties in system design allow for **plastic flow** at placement temperatures

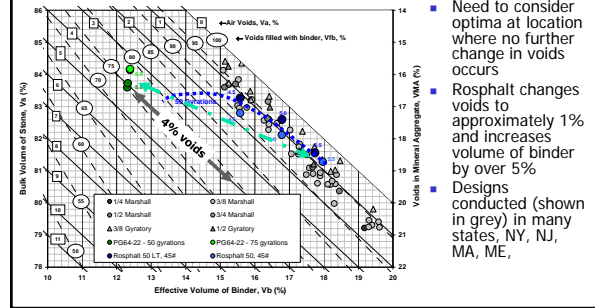


## Hydraulic conductivity

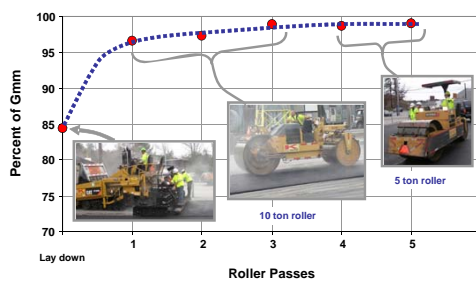
- Long been known that permeability (or conductivity) is related to mixture volumetrics (for example Goode and Lufsey, 1965)
- Below



## Volumetric design

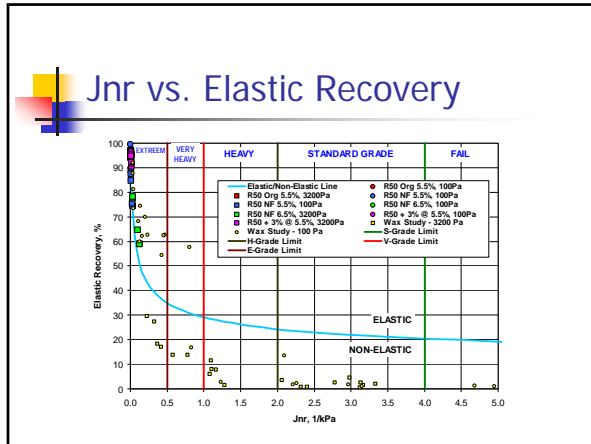


## Density development, field



## Volumetrics and workability

- LT gets density more quickly
- Optima binder for Rosphalt process is point at which mastic skeleton is optimized
- Located at location where voids cease to reduce
- Density development on site consistent with laboratory work



### Comparative effect of modification on PG64-22 at two concentration levels

- If the binder performance at 70°C is compared to an unmodified system the relative deformation performance is 0 to 2%

Performance measure	Stress level	PG6422	5.5% + Rosphalt	5.6% + Rosphalt LT	4.5% Rosphalt LT
Permanent Strain, %	100 Pa	543.08	1.02	0.10	0.79
	3200 Pa	20144.00	49.32	95.71	374.01
Percent of PG64-22	100 Pa	na	0.2%	0.6%	0.1%
	3200 Pa	na	0.2%	0.5%	1.9%

- It should be noted that aggregate structure has changed so that a significant part of the stress is carried by the binder/fine aggregate mastic and consequently the final mix behavior will not completely represent this ratio
- Mix testing performed to assess final behavior of composite mixture

### Fatigue and flexibility - understanding of needs

- Measurements of strains in deck with loaded truck tends to be less than 600 microstrain
- Complex FE analysis studies performed in some locations
- Most specifications in USA adopt 750 microstrain – seems reasonable compared to other analysis

### Fatigue testing

- Fatigue testing conducted by Asphalt Institute
- Testing conducted on design mixes

