

*Rubberized Asphalt
&
Stress Absorbing Membrane Interlay*

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Materials / Products: Crumb Rubber Uses

- Rubberized Asphalt
- Rubber in Concrete
- New Tires
- Molded Goods
- Sport Fields
- Mulch and

City of Mullins Playgrounds



Park Playground



High School Sport Field



Miracle League Baseball Field



Previous Research (Rubber)

- Size of rubber effects
- Effects of source of binder
- Effects of RAP
- Effects of WMA
- Effects of percentages of CRM
- Effects of types of rubber
- Development of Specs
- Field Projects

Putting the Rubber into the Road

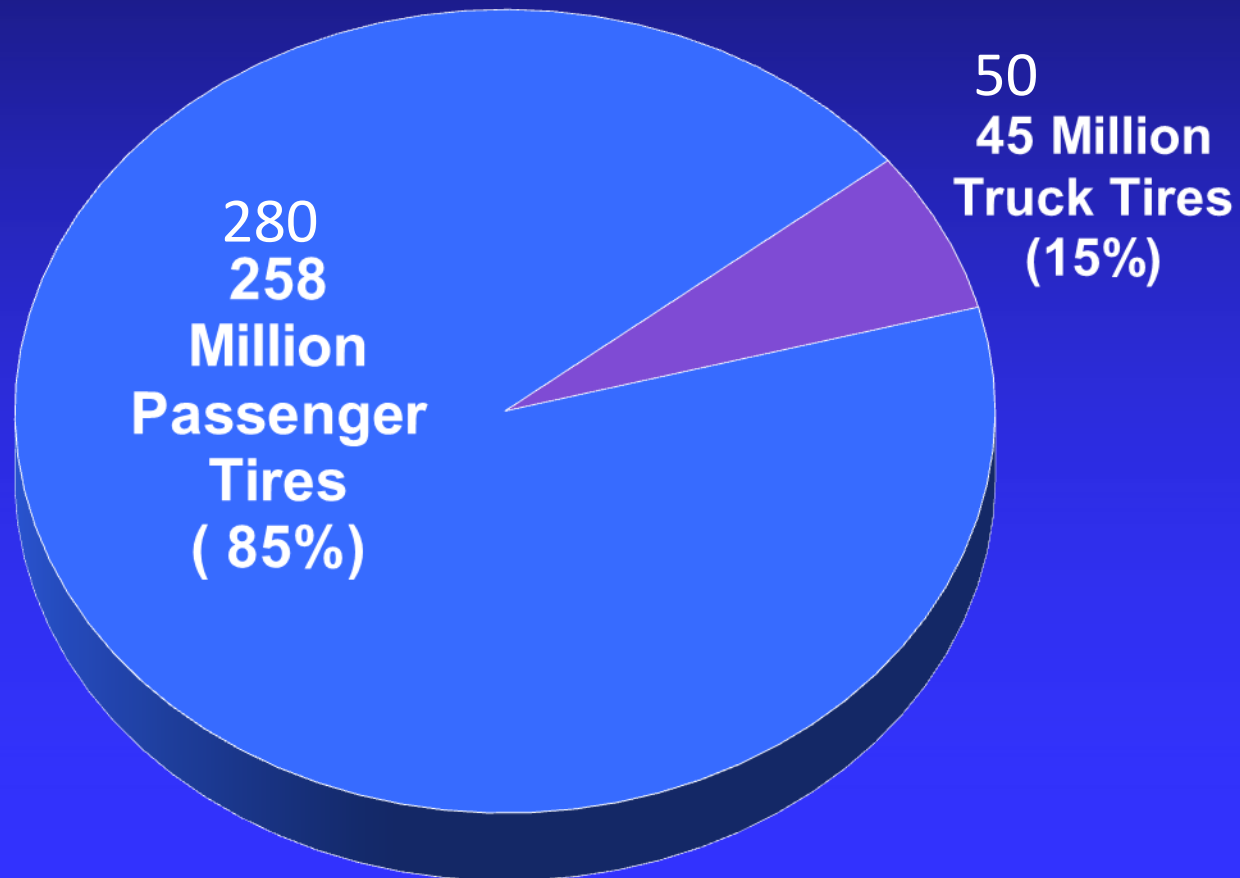


Tapping the Tire Pile

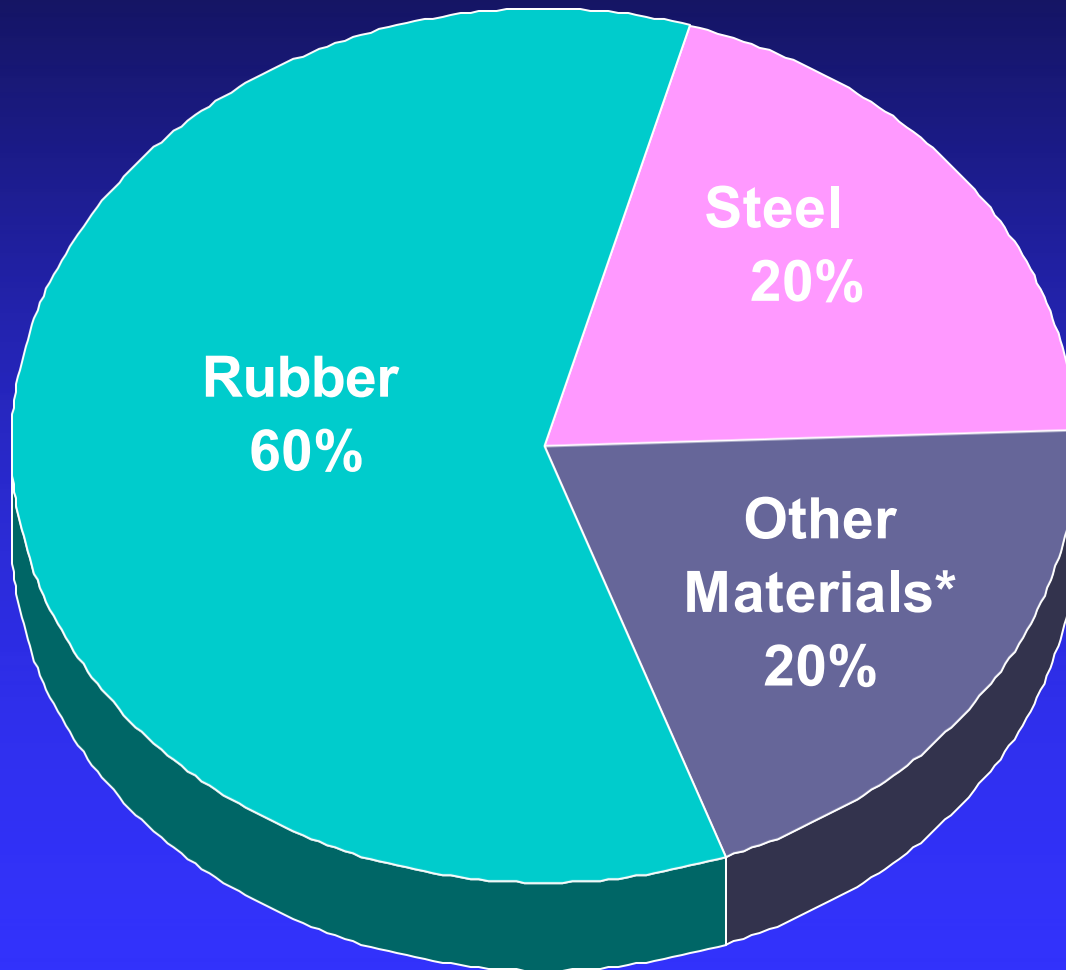


U.S. Scrap Tires

- 330,000,000 scrap tires produced annually (1 tire/ person)



Passenger Car Tire Composition



***Other Materials include fiber, oils, waxes, and pigment**

Typical Composition of a Tire

Typical Composition of a Tire

- **Synthetic Rubber**
- **Natural Rubber**
- **Sulfur and sulfur compounds**
- **Silica**
- **Phenolic resin**
- **Oil: aromatic, naphthenic, paraffinic**
- **Fabric: Polyester, Nylon, Etc.**
- **Petroleum waxes**
- **Pigments: zinc oxide, titanium dioxide, etc.**
- **Carbon black**
- **Fatty acids**
- **Inert materials**
- **Steel Wire**

Crumb Rubber Processing

**Ambient, Cryogenic, Wet Grind,
and Cryogenic/Ambient
Whole Tire Processing**



Whole tires fed to primary shredder



Shreds fed to secondary shredder, steel removed



Steel and non-reclaimed rubber from ambient system



One Ton Super Sacks



Rubberized Asphalt History

***Rubberized Asphalt &
Asphalt Rubber Advantages
and Disadvantages***

Advantages of Rubberized Asphalt

- Longer overall pavement life
- Increased crack resistance
- Increased rut resistance
- Reduced oxidation (slower aging)
- Reduced maintenance needs/cost
- Reduced traffic noise
- Increased skid resistance
- Standard HMA production, paving, and compaction equipment can be utilized

Disadvantages of Rubberized Asphalt

- Higher initial cost (or is it????)
- Lack of experienced contractors in early stages of agency implementation
- Requires either use of blending unit or coordination with supplier for pre-blended binder
- Requires agitated binder storage tank for rubber-modified liquid binder at HMA plant
- Requires slightly higher production temperatures

ADOT I-19, Asphalt Rubber Project Tucson, AZ MP 58-60

Maintenance Cost Comparison

Performance Indicators	Values Before Overlay	14 Years After Overlay
Ride inches/mile	172	70
Skid (Mu Meter)	38	64
Rutting (inches)	N/A	0.11
Percent Cracking	N/A (Trans Joint)	1%
Maintenance Cost /Lane Mi/Year	\$857	\$59

I-40 1998 Appearance After 8 Years Conventional Overlay on Left, Rubber on Right



Asphalt Rubber
Minimum 15% Crumb Rubber



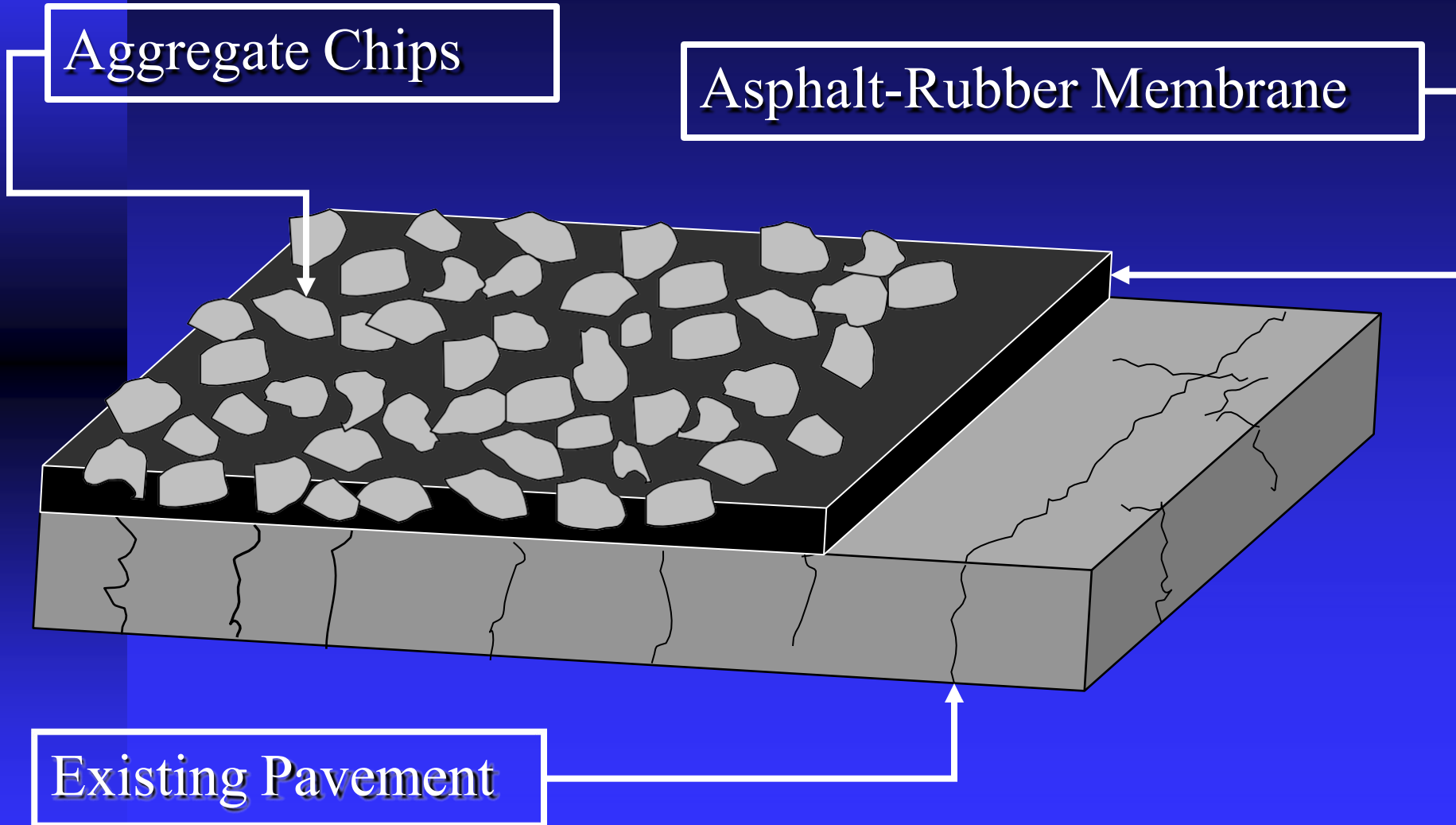
AR System

Neat Asphalt

Asphalt Rubber Seal Coats

(SAM and SAMI)

Stress Absorbing Membrane (SAM)



Asphalt-Rubber SAM Application



Pre-Coated Aggregate Application



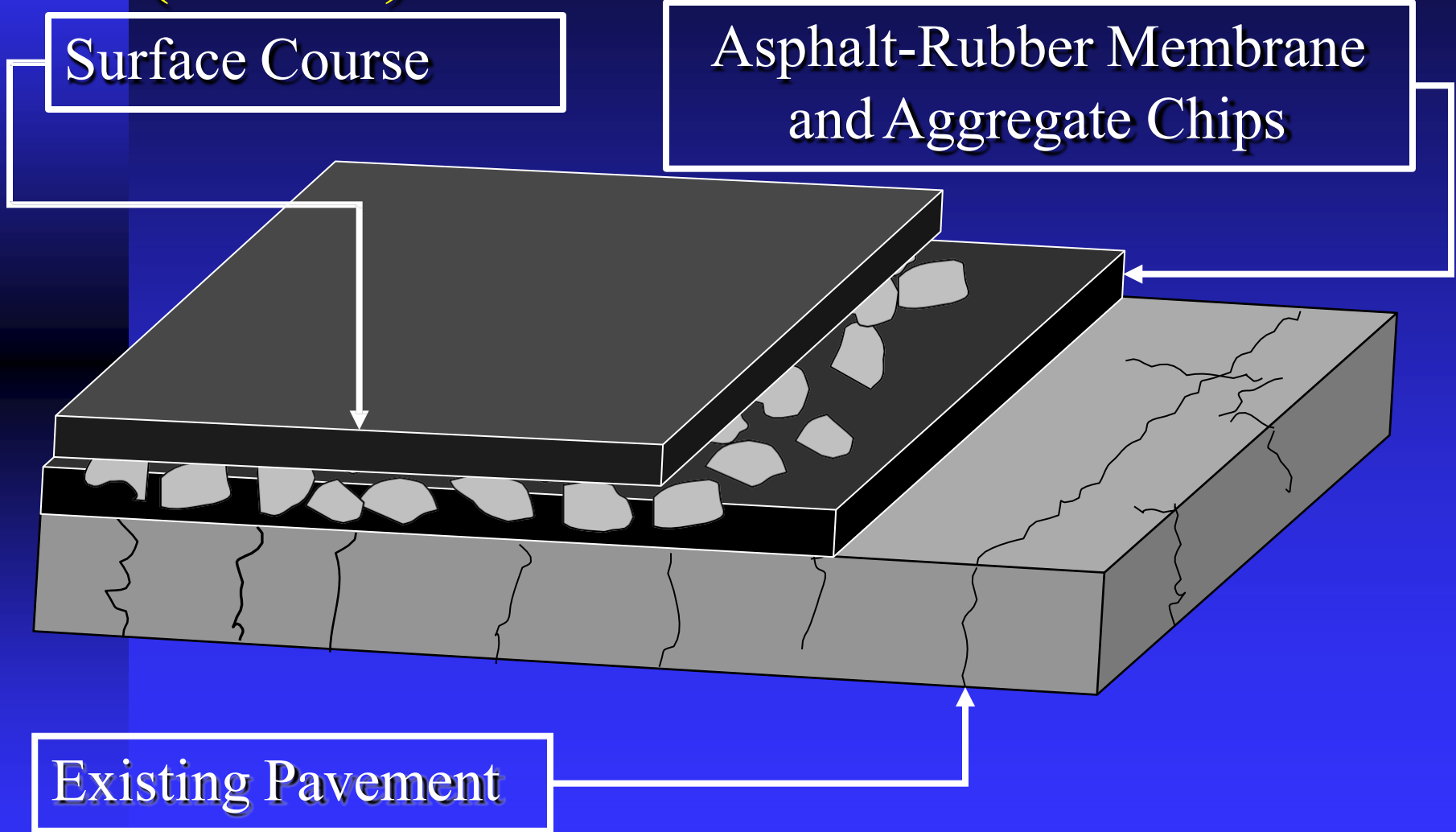
Finished Surface Before Fog Seal



Completed SAM Application (After FOG Seal)



Stress Absorbing Membrane Interlayer (SAMI)



Stress Absorbing Membrane Interlayer Applying Asphalt Binder Layer



Stress Absorbing Membrane Interlayer Applying Aggregate to Asphalt Binder Layer



Stress Absorbing Membrane Interlayer Seating Aggregate with Rubber-Tire Rollers



Stress Absorbing Membrane Interlayer

SAMI Left Lane, Existing Pavement Right Lane



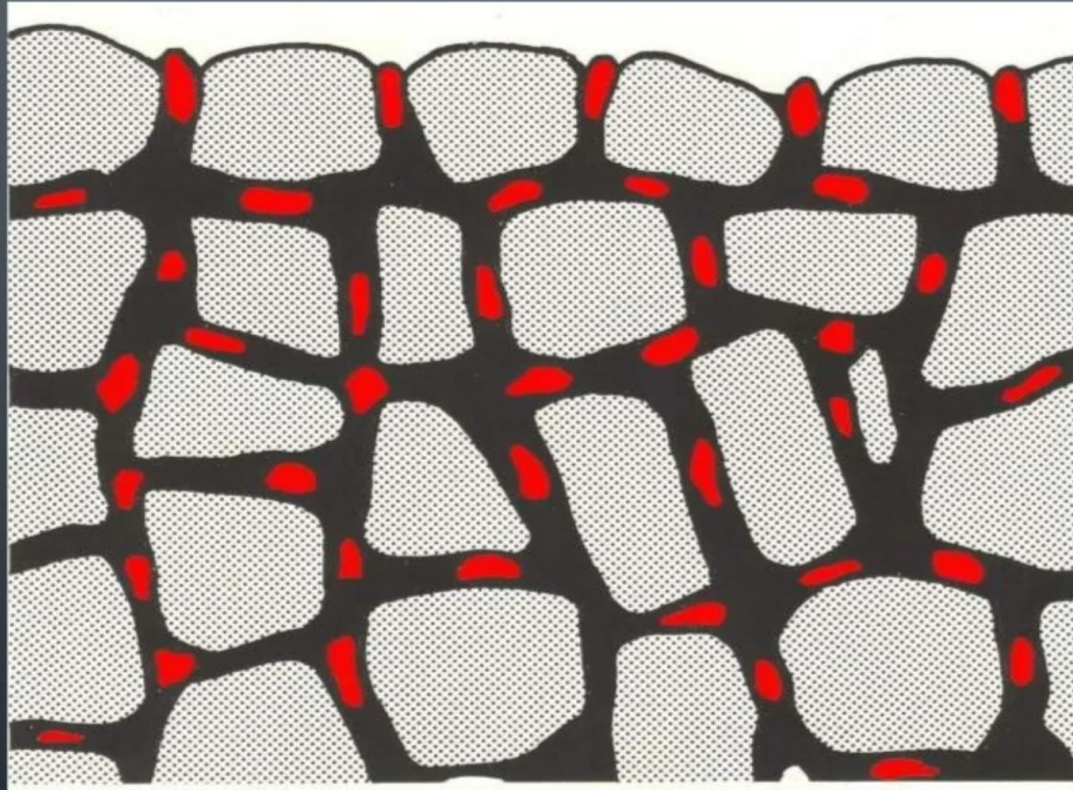
Stress Absorbing Membrane Interlayer Placing HMA Surface over Aggregate Layer



SAMI Application



22,937,600 rubber particles
per ton of mix help fight cracking



Few examples of projects that the team members have been involved for the last 35 years

Stress Absorbing Membrane Interlayer

Applying Asphalt Binder Layer



Stress Absorbing Membrane Interlayer

Applying Aggregate to Asphalt Binder Layer



Stress Absorbing Membrane Interlayer Seating Aggregate with Rubber-Tire Rollers



Stress Absorbing Membrane Interlayer

Placing HMA Surface over Aggregate Layer



US Hwy 76

Newberry County, SC



US Hwy 52 (Rivers Ave.)

Charleston County, SC



Lubbock, Texas -1985

(Before SAM Application)



Lubbock Texas - 2000

(After 15 Years of Performance)



Before SAMI Application



After 16 Years of Performance



Flagstaff Arizona (2001)

After 12 Years of Performance



September 2019 - Durango Street

SAMI

Two Layer - Pavement Preservation System



Pavement Condition Prior to Multi-Layer System





Edge Milling 1½ Inch Depth



First SAMI Application in Wheel Paths



Second SAMI Application Entire Surface



Hot Mix Placement



Compaction



Before Condition



After Two Months



Before Condition(2019)



After Three Years:2022



Conclusions

- Environmental Issues
- Cost Issues (Initial and LCCA)
- Compatibility Issues
- Recycling of the New Pavement
- Public Perceptions
- Acceptance by Governmental Agencies

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Thank You