LOUISIANA BITUMINOUS SURFACE PRESERVATION PROGRAM

Enabling Thin Overlays

June 2009

Baton Rouge, LA

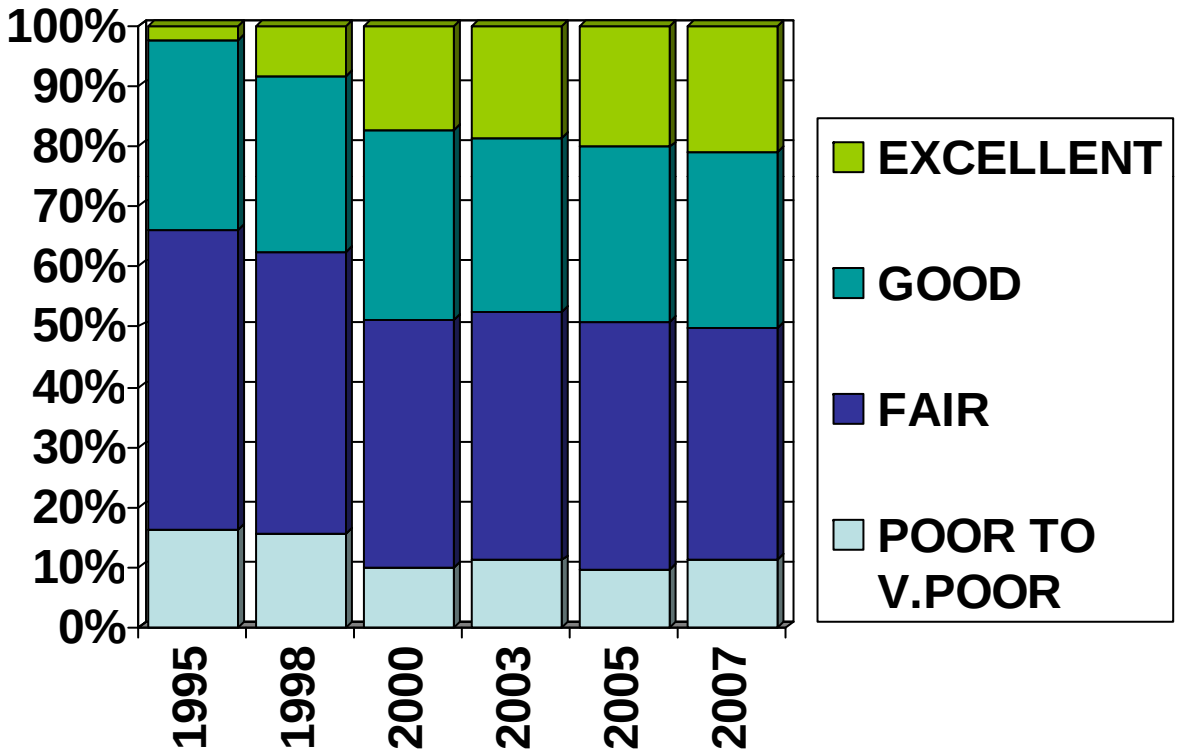
Topics covered in this presentation

- Louisiana Highway Facts
- Surface Preservation and Thin Overlay
- The value of preservation
- “Spray paver” - thin overlay
- Importance of Tack Coat
- Summary

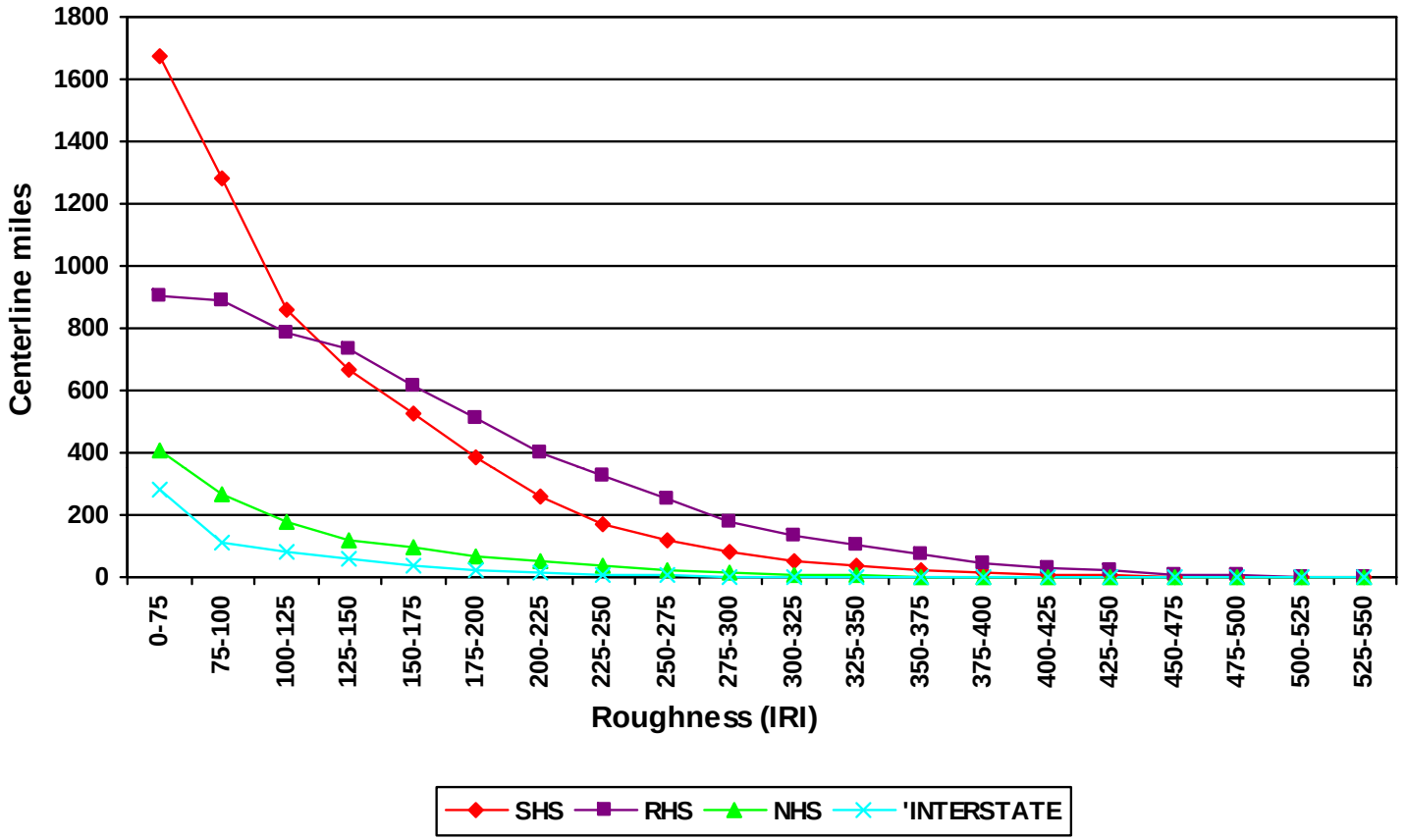
Louisiana Highway Facts

- 16,750 total miles of state/federal highways
  - 12,075 miles of Bituminous Surfaces over concrete or soil cement
  - 3,007 miles of flexible pavement
    - > 4” thick over improved base
- 22,150 miles of non-state bituminous surfaces

Roughness Condition Statewide From1995 To 2007



Current ROUGHNESS DISTRIBUTION



Note: Distribution calculated from tenth of a mile records with no invalid IRI readings

	0-75	75-100	100-125	125-150	150-175	175-200	200-225	225-250	250-275	275-300	300-325	325-350	350-375	375-400	400-425	425-450	450-475	475-500	500-525	525-550
SHS	1676.74	1280.7	858.84	664.76	525.3	384.87	260.87	172.64	115.5	77.9	52.43	34.8	19.8	15.3	8.8	5.8	2.2	1.6	0.5	0.7
RHS	901.55	889.45	783.03	731.52	618.1	508.28	402.52	324.65	255.4	177.89	132.8	100.5	70.78	42.4	29.73	19.1	9.6	5.8	2.7	1.7
NHS	405.82	269.95	177.2	117.73	95.8	69.56	48.36	33.46	22.6	14	7.1	4.6	1.9	1.5	1	0.9	0.4	0	0	0.1
'INTERSTA	280.29	110.3	79.56	62.4	38.9	20.5	11.5	4.4	4.6	1.8	1.1	0.4	0.2	0	0	0	0	0	0	0

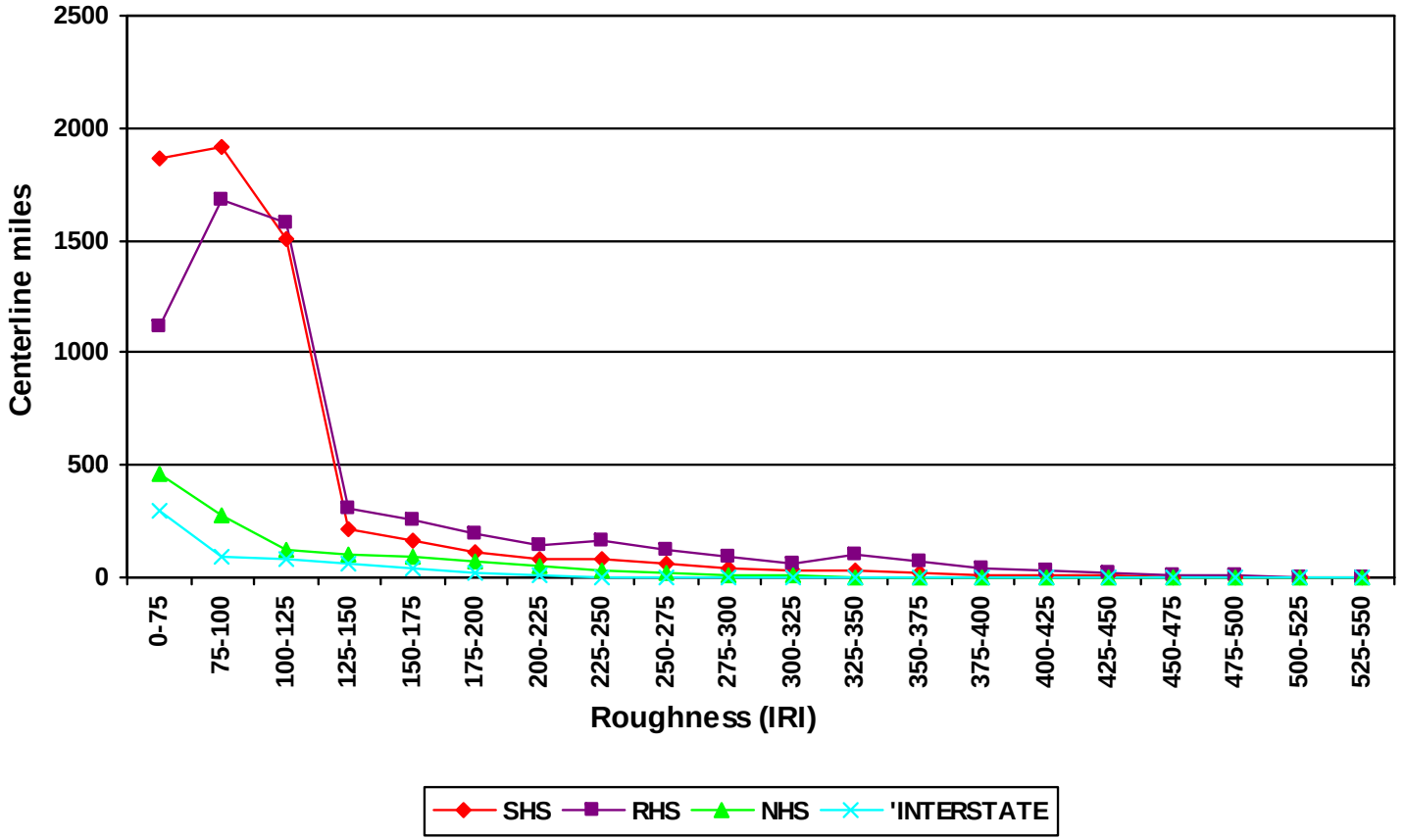
“Thin Overlay”

- Any 1 ½” to ½” asphalt layer placed as a wearing surface over…
  - milled surface
  - existing surface
- …that improves the surface characteristics of a highway.

Predicted Condition of Highways with Thin Overlay preservation investment of $140 million / year

	2007	2009	2010	2011	2012
POOR TO V.P.	1859	1800	1784	1547	1310
FAIR	6377	4470	3879	3067	2255
GOOD	4872	5970	6819	7668	8516
EXCELLENT	3240	3665	3865	4066	4267

ROUGHNESS DISTRIBUTION after 4 yr plan of thin overlay



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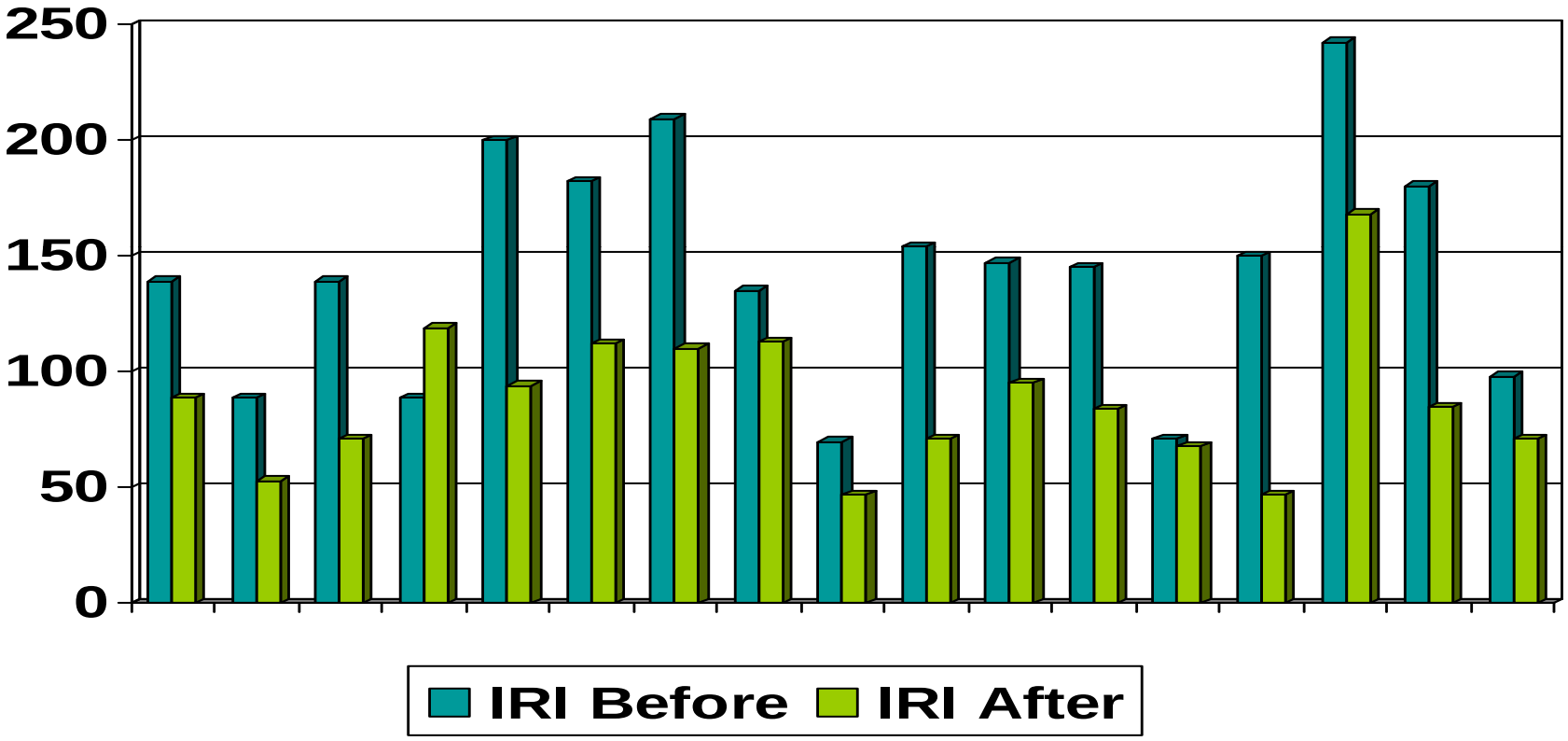
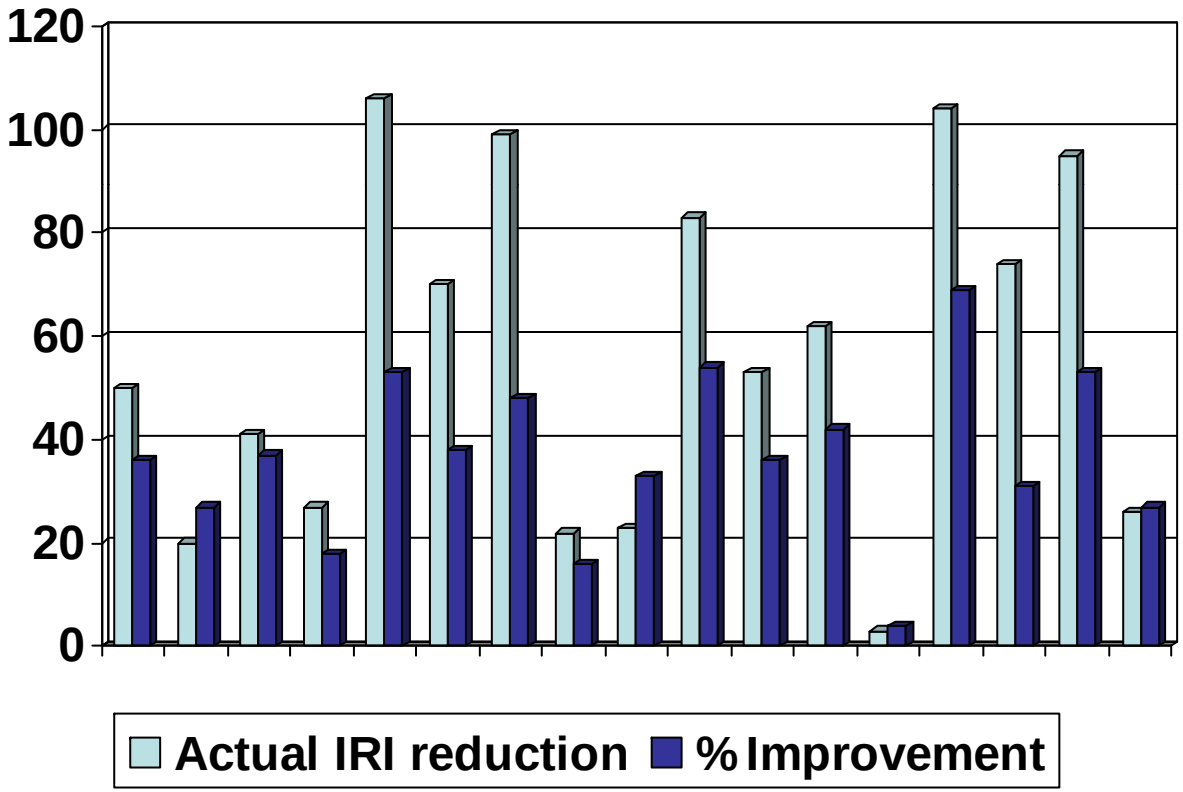
SHS	1866.39	1915.97	1502.55	219.27	162.81	115.92	78.39	86.32	57.75	38.95	26.22	34.8	19.8	15.3	8.8	5.8	2.2	1.6	0.5	0.7
RHS	1115.83	1685.41	1581.12	308.63	251.32	190.6	146.9	162.33	127.7	88.95	66.4	100.5	70.78	42.4	29.73	19.1	9.6	5.8	2.7	1.7
NHS	460	280	122	107	95.8	69.56	48.36	33.46	22.6	14	7.1	4.6	1.9	1.5	1	0.9	0.4	0	0	0.1
'INTERSTA	300	90	80	62.4	38.9	20.5	11.5	4.4	4.6	1.8	1.1	0.4	0.2	0	0	0	0	0	0	0

Ultrathin Wearing Course "Smoothness"



Avg IRI Before = 143 (fair)
Avg IRI after = 88 (good)

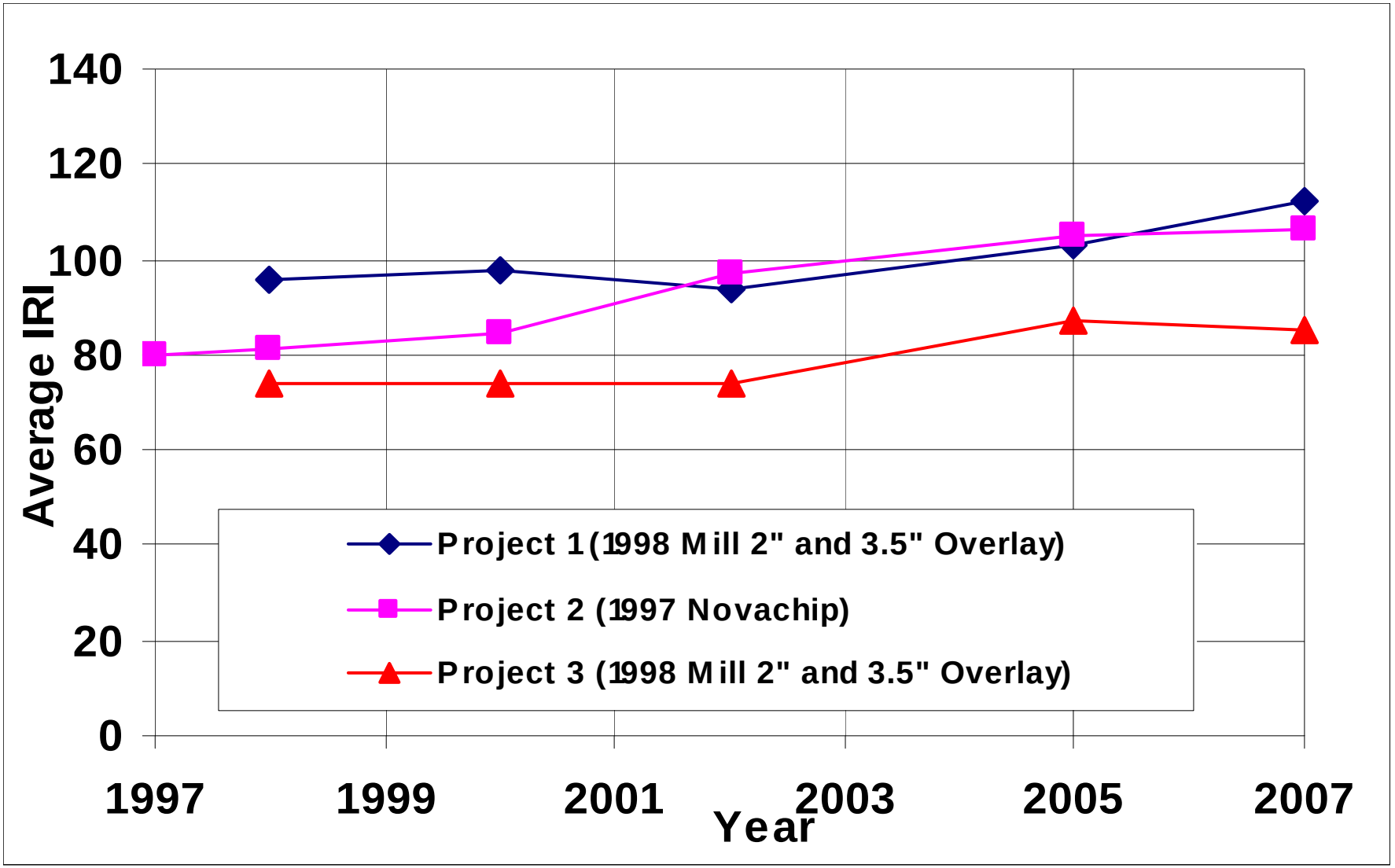
Ultrathin Wearing Course
Average Smoothness Improvement



Avg reduction in IRI = 55

Avg % reduction = 37

Highway 308
10 yr. Performance Comparison



Louisiana Highway Facts

- Pre 1996 - 2006--$100 million average annual budget for overlays or 2,000,000 tons of hot mix on federally funded roads per year.
  - Provided an rehab/overlay every 20 years + m
- 2008 Price of Liquid Asphalt escallated from $350/ton to $750/ ton. Presently back at $350
- Two or three years of surplus funding assisted in keeping up.
- AGGRESSIVE PRESERVATION PLAN NEEDED –IF WE WANT TO SHOW SIGNIFICANT IMPROVEMENT

Cost Estimates

Non-Interstate

- Chip Seal (single layer): $30,000 per mile
- Chip Seal (double Layer): $50,000 per mile
- Chip Seal (triple layer): $85,000 per mile
- Microsurfacing (two application) : $95,000 per mile
- “Thin overlay w/ spray paver” - $140,000 per mile
- Cold Plane and overlay (2"): $210,000 per mile
- Cold Plane and overlay (3.5"): $330,000 per mile
- Cement treated base and 3.5" overlay: $415,000 per mile

Interstate

- Major rehabilitation (rubblize and overlay): $620,000 per lane per mile
- Reconstruction (new pavement): $1.5 million per lane per mile

Proposed Surface Preservation Program

- 16,750 miles of bituminous surface
- Budget $175,000,000 to cover 10% or 1675 miles per year
  - 1000 miles using thin overlay w/ 0.1 gallon per square yard polymer tack @ $10/ sq yd -$140,000 per mile
  - 675 miles using chip seal @ $50K /mile or $33,750,000

Note: Spray paver required to achieve even distribution of polymer tack coat at minimum rates of 0.1 gallon/ square yard.

General Information

- National Center for Pavement Preservation
  - $6 - $10 or more could be saved for each $1 spent on preservation
  - “Cost-Effective Preventive Maintenance: Case Studies”
    - **“Policy of constructing pavement and then letting it go to rehabilitation or reconstruction is not cost-effective”**

- Survey reprinted in Focus (2000)
  - 34 of the 40 agencies surveyed have established pavement preventive maintenance (PM) programs,
  - 28 have **dedicated funding**
  - **Overlays are the most frequently cited treatment**

- Nationwide survey by Rebuild America Coalition
  - Americans are willing to invest in preventive measures, but only if they can see the difference

General Information

- Legal framework for federal funding
  - 1991, the Intermodal Surface Transportation Efficiency Act made highway PM eligible for federal-aid funds – provided States provide justification
    - The Federal Highway Administration's (FHWA) National Highway Institute (NHI) is now offering a free web-based training course on pavement preservation designed for state and local highway agency personnel and contractors.

International Acceptance of the Value of Preservation

- Austrailia
- New Zealand
- United Kingdom

Australia

- About 90% of maintenance budget goes for preventive maintenance and only about 10% rehabilitation.
- Uses 10-year program focusing on long-term maintenance contracts that give control and responsibility for maintenance and rehabilitation to private contractors.

New Zealand

- Skid resistance measurement program implemented in 1995

- Skid resistance has improved sufficiently to result in a 29% reduction in wet-skid crashes at the treated sites (Ministry of Transport 2003).

United Kingdom

- Safety
  - Increases in texture depth from 0.3 mm to 1.5 mm can reduce the accident rate by approximately 50%
  - Increasing the skid resistance from 0.35 to 0.6 reduces the accident rate by about 65%.
  - Reduced fatalities
    - 1991: 1.1 fatalities per 100 million vehicle kilometers traveled (VKT)
    - 1998: 0.8 fatalities per 100 million VKT (UKDT 2003).

Views from the States

- Montana: PM program extends the service life of asphalt pavements from about 14 to 30 years
- New York: (Geoffroy 1992), “LCC of preventive maintenance is 3.6 times less than reconstruction after 24 years.”
- New York: implementing PM increased % of good roads by 20% and decreased fatalities per VMT.
- Oregon: Eugene Public Works estimates that investing $8.5 million a year in system preservation would produce an annual rate of return of 17%.
- Pennsylvania: with ten+ years of data, the Preventive maintenance program has proven to be cost effective
- Tennessee: Nashville, 2007 *Pavement Preservation Excellence Award* for public agencies
- Texas: Improving surface texture will save 12 lives and prevent over 1000 accidents per year.
- Rhode Island: Dr. Ankner, to House Transportation and Infrastructure Committee: “I-295 will cost $30 million to fix; costs for preventive maintenance would have been $6 to $7 million over the years.”

California
Advantages of Preventive Maintenance

- PM Lowers cost
  - Life cycle cost shows 20 to 50% savings w/ 30 yr. analysis period.
  - Additional LCC savings using **CalTrans *user delay* costs (10-mile)**
    - Chip seal: $2,900 per lane-mile per day
    - 1-inch overlay: **$1,980 per lane-mile per day**
    - 7-inch rehabilitation: $14,000 per lane-mile per day
  - Roads in good condition provide lower annual user costs ($500-$700).
  - Smoother roads with fewer potholes cause less damage and wear on vehicles.
- Improves safety (to the public and the workforce)
  - Use of PM treatments allow the contractor to get in and get out fast, minimizing work accidents
  - Better road surfaces provide for good drainage and skid resistance
- Improves overall network health

Georgia

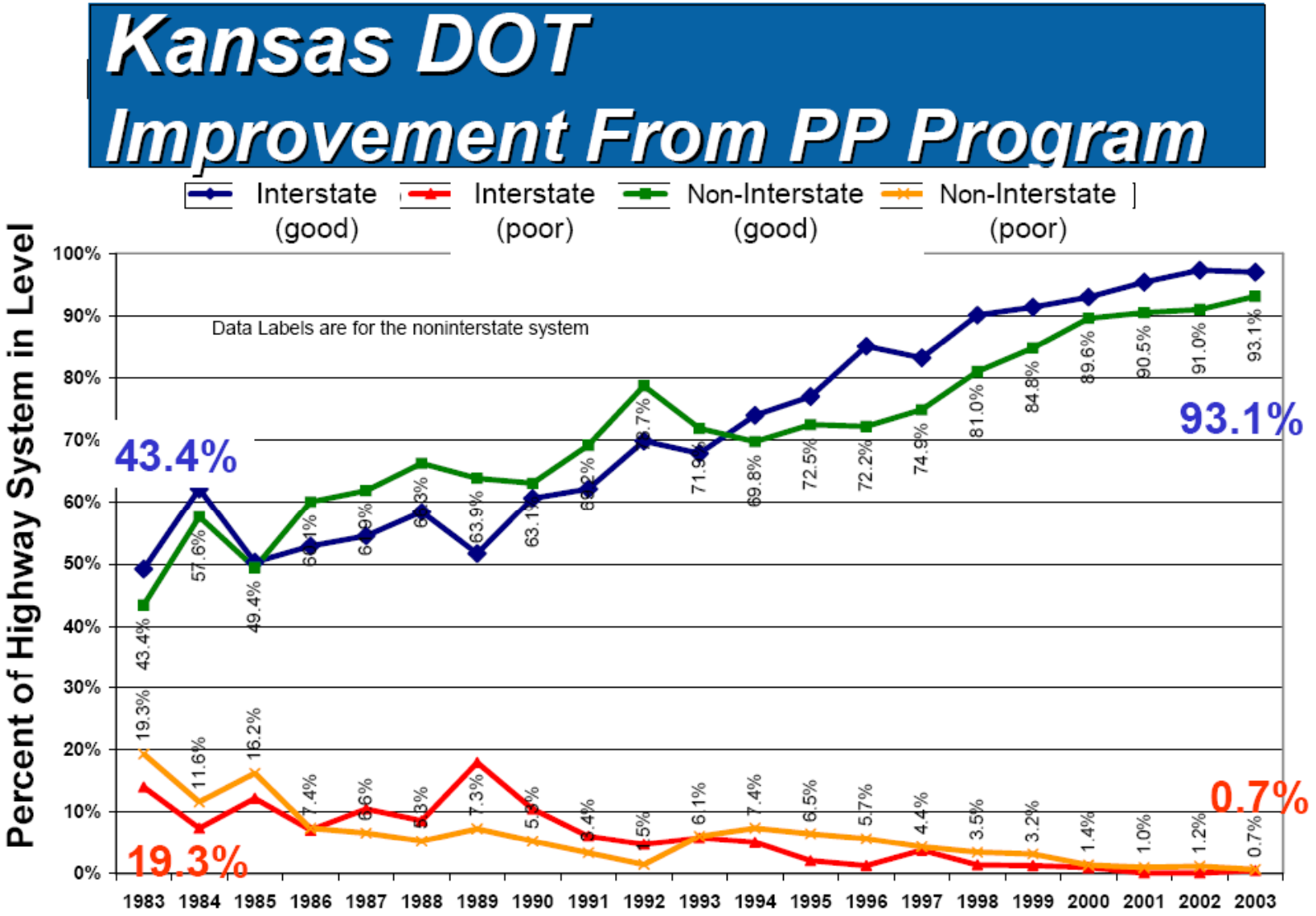
- Treats 10% of its pavements each year using variety of PM (2000)
- 1972 – 1997: Smoothness of asphalt pavements improved by more than 300%
- 1979 – 1996: Smoothness of concrete pavements on interstate highways improved by more than 200%

Note: Georgia's pavements consistently rank in the top 5 in the country - largely due to the smoothness achieved using PM.

Kansas

- Instituted a proactive PM program in the early 1980s
- Improvement in overall pavement quality
  - 1983: less that 50% of the pavements in good condition
  - 2003: 95% of those pavements in good condition
- 70% of the project actions selected are considered as PM projects
- Fewer and lighter rehabilitation projects being required

Pavement Preservation … Longer Lasting Roads



Courtesy of Dean Testa, KDOT, AASHTO Maintenance Conf. July, 2003

Michigan

- Rehab and reconstruction projects cost about 14 times more than preventive maintenance projects per lane mile (2000)
- Saved more than $700 million between 1992 and 1998
- Saves up to $10 for each preventive maintenance dollar spent
- PM adds 5 to 10 years of life to Michigan pavements.

  - B.T. Bellner & Associates (2001):
    - “Preserving the highway network is the most cost-effective and efficient means to assure serviceable roadways in the future. The greatest benefit derived from preventive maintenance activities is improved performance, which is measured as service life.”

Michigan Preventive Maintenance Strategic Planning

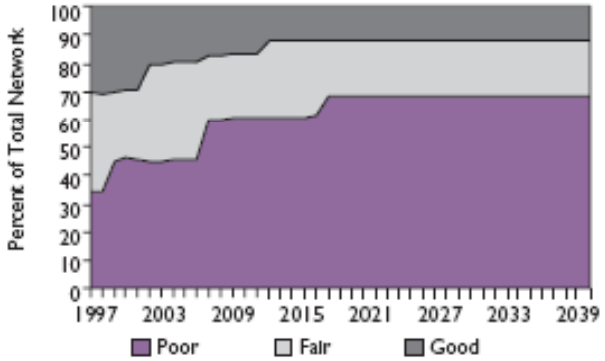


FIGURE 2 Projected condition of Michigan's highway network with combined reconstruction and rehabilitation programs (10- to 30-year fixes), at funding of $400 million per year (adjusted for inflation).

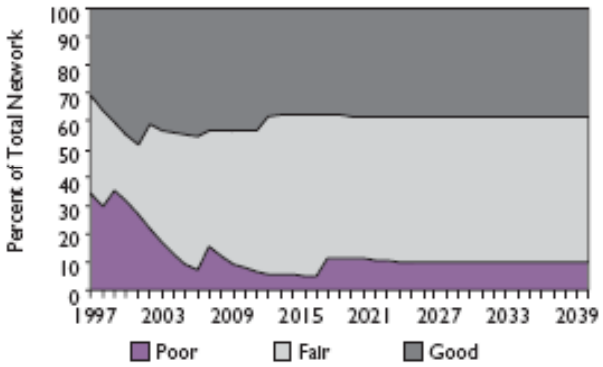


FIGURE 3 Projected condition of Michigan's highway network with combined reconstruction, rehabilitation, and preventive maintenance programs (5- to 30-year fixes), at funding of $400 million per year (adjusted for inflation).

Projected future performance based on 1992 to 1998 data

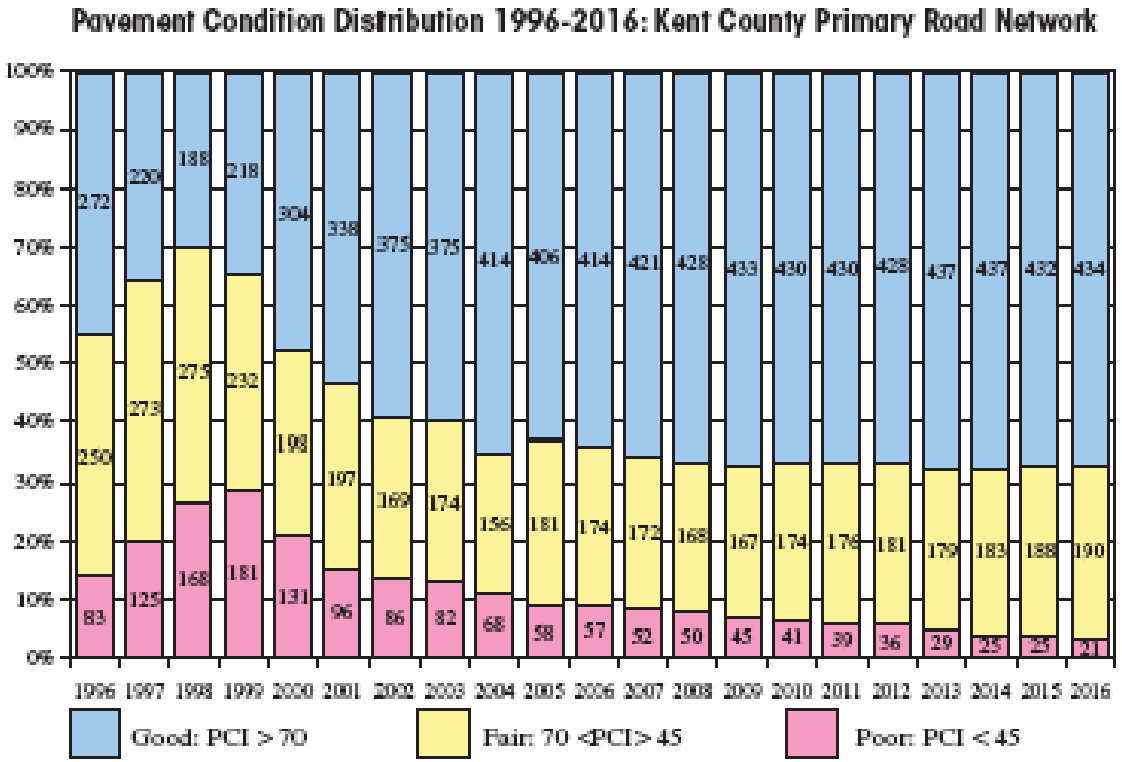
Figure 3: 80% funding for rehabilitation and reconstruction and 20% funding for preventive maintenance ($200 million total – 1992 $$)

Vs.

Figure 2: 100% funding for rehabilitation and reconstruction

Agency will improve level of service with modest investment in Preventive maintenance.

Projected Improvement



Pavement Condition Index (PCI) Distribution 1996-2016: Kent County Primary Road Network. Good pavements in blue with a PCI >70; Fair, yellow, with PCI <70 and >45; and Poor, PCI <45

- Projected improvement in condition of Kent County roadway network using asset management strategy. From “Kent County, Mich., Dumps ‘Worst First’ in Favor of Asset Management” (Pavement Preservation Journal, spring 2008)

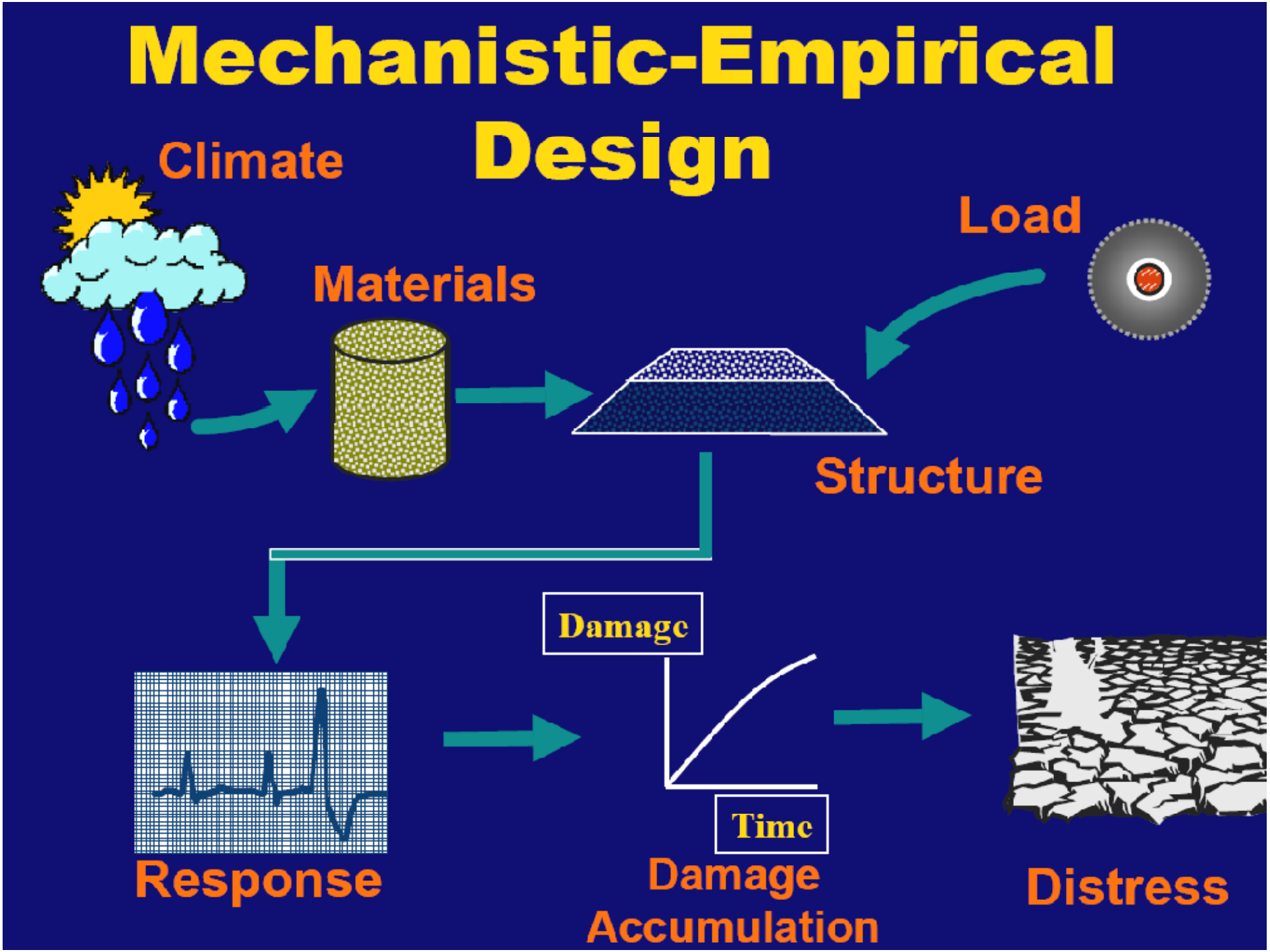
Potential application of Thin Overlay using spray paver

- Thin overlay can improve IRI by 50%
- Thin overlay w/ spray paver has been proven to be equal or better than mil 2” and replace 2” and can be applied on old oxidized and cracked surfaces.
- Surface texture by design. Allows department to vary mix type to optimize surface texture as needed for application
- Spray paver enables higher tack coat rates and better performing tack coats (polymer modified tack coat)

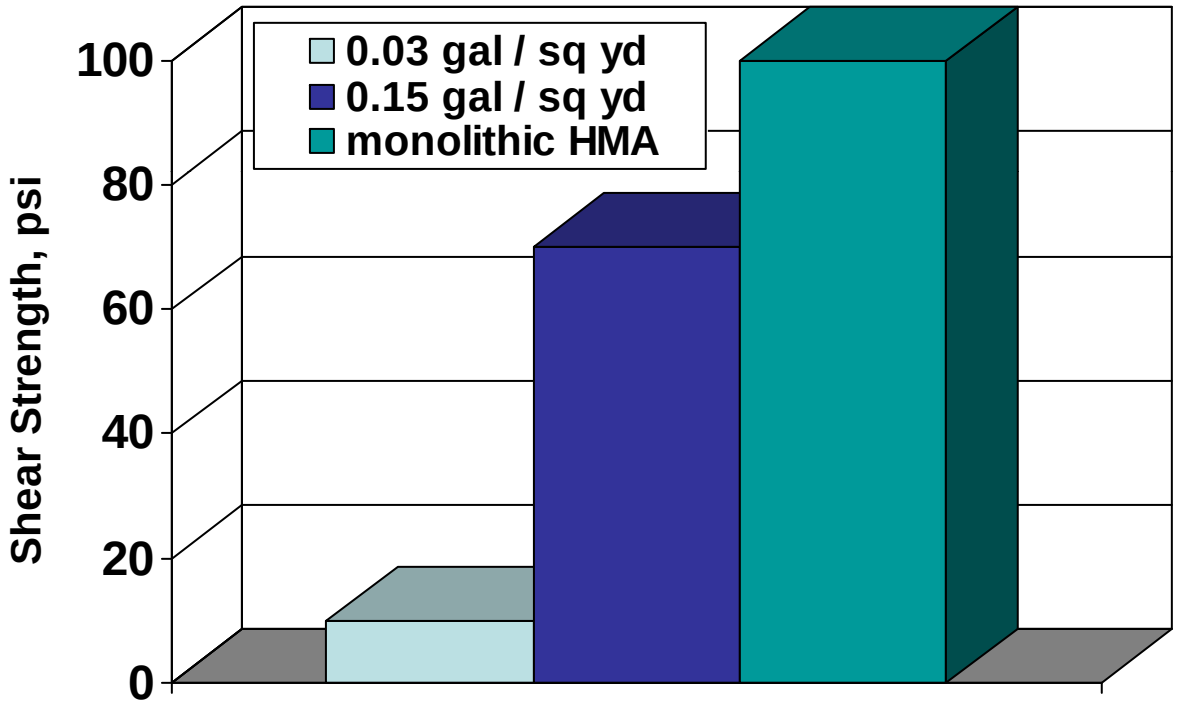
Thin overlay w/ spray paver is:

Reliable, Smooth and Safe

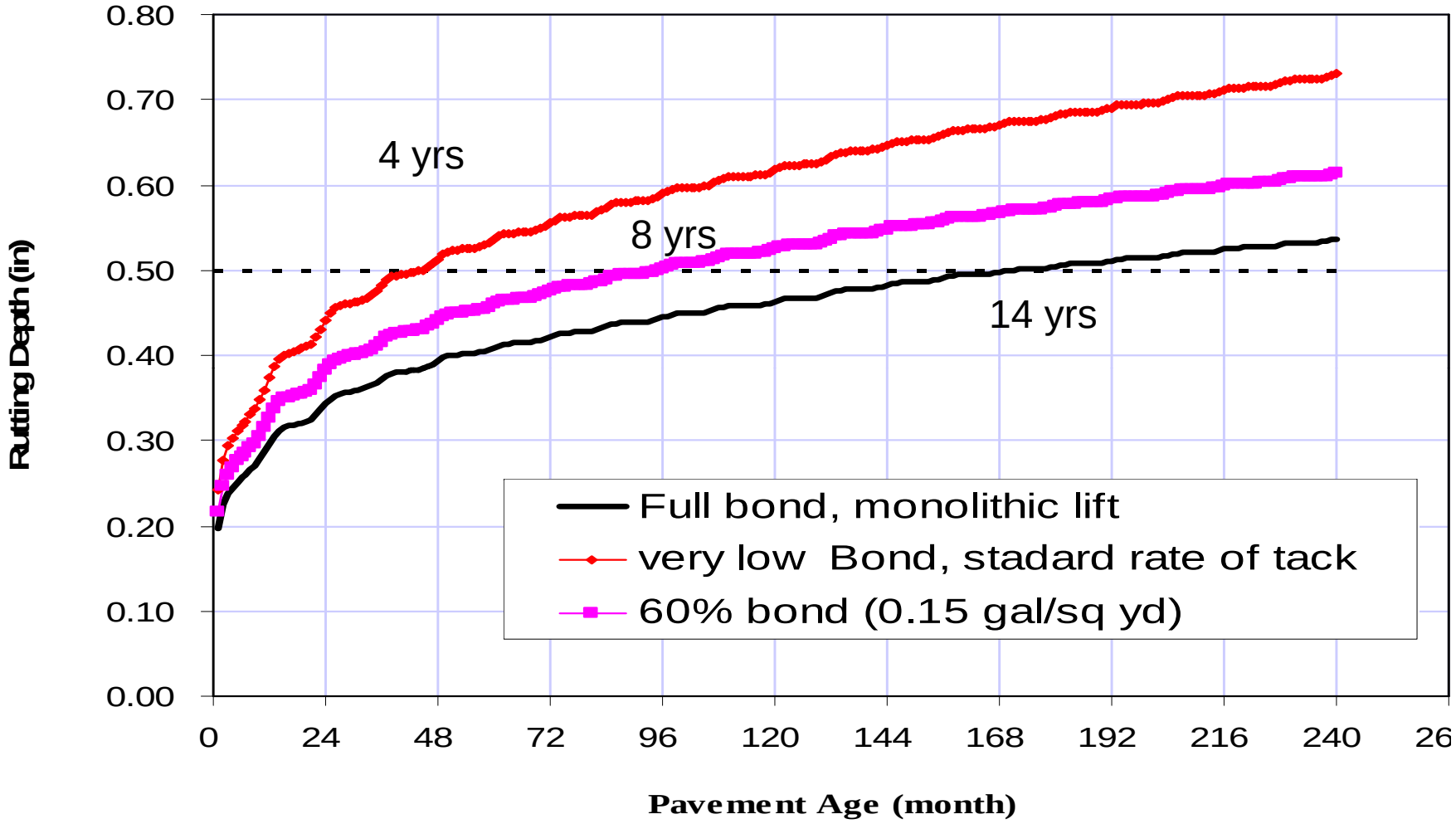
Mechanistic-Empirical Design



Importance of Tack Coat
Interface Shear Strength



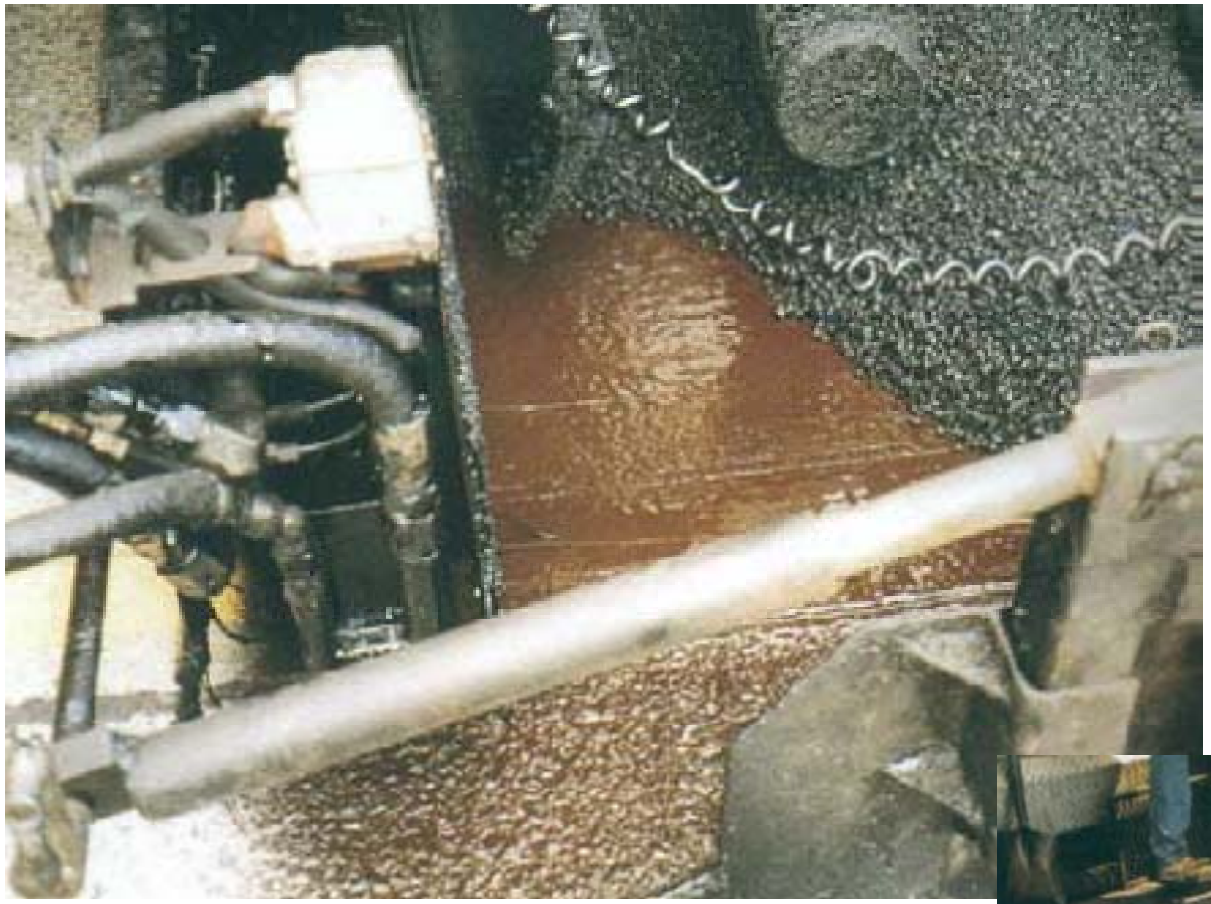
Importance of Tack Coat



Based on MEPDG predictions given standard inputs over low modulus subgrade and high level of traffic.

“Novachip” or Thin Lift w/ Spray paver documented performance

- CALIFORNIA, October 2003
- Penn DOT research report 93-067A
- North carolina,2005
- Texas, 2004
- Louisiana (See 1997Novachip Tech Asst. Report)
- Florida



Roadtec SP-200

Spray Paver 200

The SP-200 Spray Paver is a revolutionary new paver which allows the contractor the ability to spray asphalt cement or emulsion directly in front of the asphalt mix before it is laid. The SP-200 has a heated 2100 gallon (7949 liter) asphalt cement/emulsion tank and three rows of spray nozzles for delivering A/C or emulsion. An onboard microprocessor controls the rate of flow. The SP-200 can be equipped with an Eagle 10™ extendable 10 foot (3.0 m) screed as well as any of the other available Roadtec® and Carlson® 10 foot (3.0 m) screeds.

Roadtech Spray Paver
SP-200 Specs

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- **SP-200 SPECIFICATIONS**
- **ENGINE:**
- John Deere™ 6068H, 414 cu. in. (6.8 L), 6-cylinder engine, 200 HP (149 kW) @ 2200 rpm.
- **PROPEL SYSTEM:**
- Variable displacement 90 series hydraulic pumps driving planetaries with 2 speed motors. Paving speed is 0-168 fpm (0-51 mpm). Travel speed is 0-3.6 mph (0-5.8 kph).
- **ELECTRICAL SYSTEM:**
- Heavy-duty 12V starting system and a 12V operating system. 90A alternator.
- **AUGERS:**
- 14" (355.6 mm) x 3⁄4" (19 mm) thick Ni-hard, hydraulically raisable auger system with tilt capabilities which allow the operator to maintain a parallel position of the auger and screed bottom.
- **TRACKS:**
- Two 6.735" (171 mm) pitch D4 tracks with 92" (2337 mm) track gauge, 111.5" (2832 mm) track sprocket idlers and polyurethane replaceable pads.
- **SPRAY SYSTEM:**
- Spray bar contains three rows of spray nozzles which are controlled automatically by a microprocessor. The spray bar extends with the screed extensions.
- **SCREED:**
- 10' (3.0 m) Eagle 10™ vibratory screed equipped with 24" (610 mm) wide, 1⁄2" (12.7 mm) thick T-1 plate replaceable wearing surface. Power crowning capacity of 3" positive to 1" negative.
- *other 10' (3.0 m) screeds are also available.
- **FUME EXTRACTION SYSTEM:**
- FXS standard. One blower exhausts fumes from working area.
- **SERVICE CAPACITY:**
- Fuel .....133 gal (503 l)
- Hydraulic system .....81 gal (307 l)
- Hopper Capacity .....11 tons (10MT)
- Product Tank.....2100 gal (7949 l)
- **SHIPPING WEIGHT:**
- 62,500 lbs (28,350 kg) with Eagle 10™ screed
- **AUTOMATIC GRADE /SLOPE CONTROL:**
- Automatically controls the elevation or slope of the mat being placed. Grade can be run on either or both sides and slope can be run with reference to either side. Moba and Topcon systems available.
- **AVERAGING SKI:**
- 30' (9.1 m) and 40' (12.2 m) skis available.
- 800 MANUFACTURERS ROAD • CHATTANOOGA, TN 37405 • TELEPHONE 423-265-0600 • FAX 423-267-7104
- Rtec 07.18.05B10' 3" 3.12m 25' 7.63m 11'4" 3.46m **SHIPPING WEIGHT:** 62,500 lbs (28,350 kg) with Eagle 10™ screed

Summary

- Plan to practice Preventive Maintenance
- Commit to at least 1000 miles of thin overlay a year.
- Require Min. 0.1 gallon / sq yd polymer tack coat for all thin overlays over existing surface. ½” minimum thickness up to 2”.
- Tack coat **MAY** not be required for milled surfaces (fill w/ 1.5” min. thickness)--- see Dr. Mohammad

Supported by Facts not Mentioned: This program will save lives

Research Results

- North Carolina: “Ultrathin Bonded Wearing Course as a Pavement Preservation Treatment for Jointed Concrete Pavements” by Judith Corley-Lay, Ph.D., PE