

RESURFACING: WHEN AND WHERE

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What is Pavement Management?

It is a management approach used by personnel to make cost-effective decisions about a road network.

*AASHTO Pavement
Management Guide (2001)*

A Pavement Management System is a set of tools or methods that assist decision-makers in finding optimum strategies for providing, evaluating, and maintaining pavements in a serviceable condition over a period of time.

*AASHTO Guide for Design of
Pavement Structures (1993)*

What is Pavement Management?: Plain Language Version

The **Right** pavement in the **Right** place at the **Right** time.

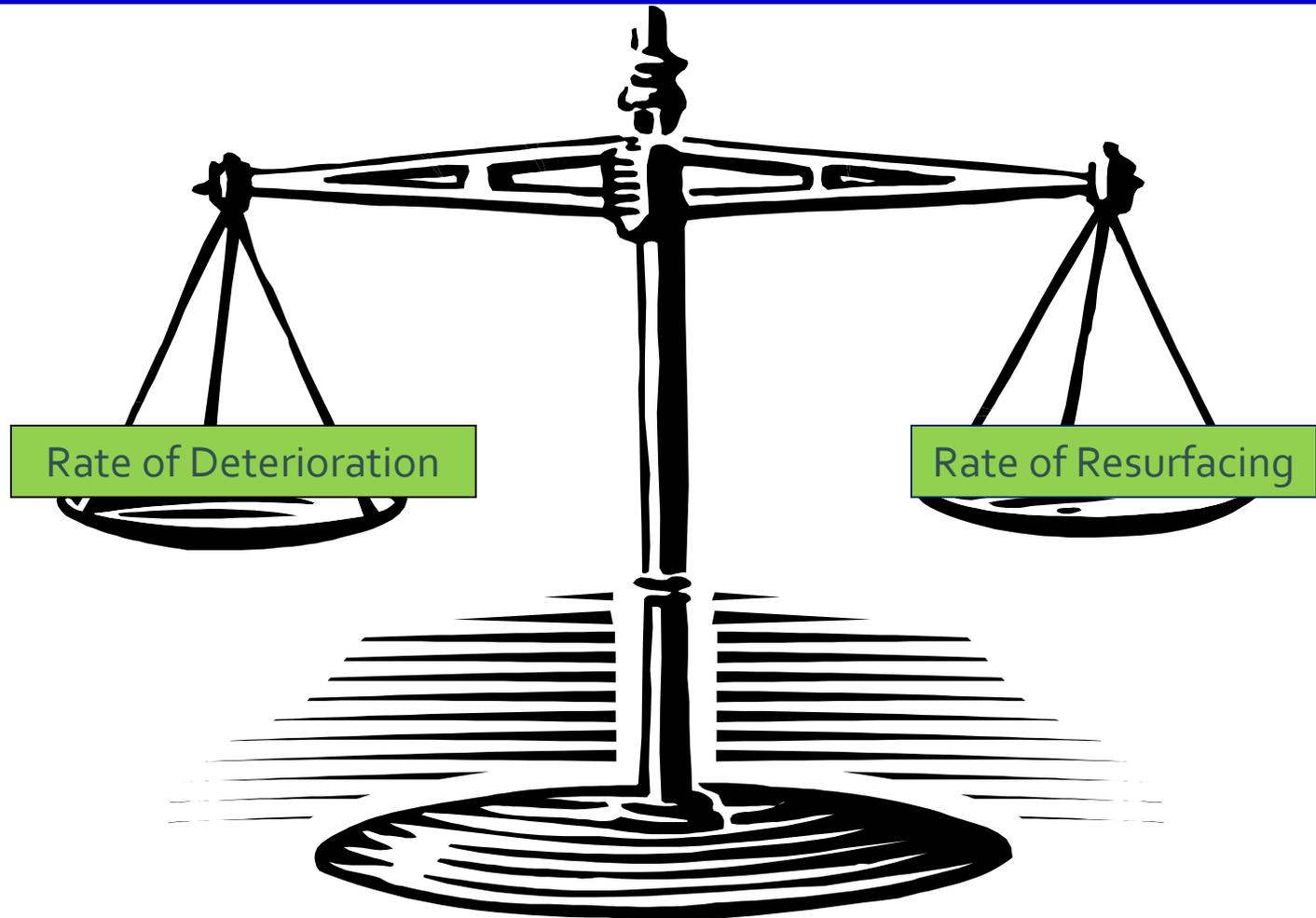
- When (This Session)
- Which roadways (This Session)
- What treatment (This Session)
- How much money (Next Session)
- System-wide planning (Next Session)

To make these decisions,
we must first know the “why”

Why We Resurface Roads

- Long Range Objective
 - Preserve the State Highway System
- Short Range Objective
 - Through the Tentative Work Program, ensure that the 80% of pavement on the SHS meets Florida Statute Section 334.046

Section 334.046 of Florida Statutes: “Ensuring that 80% of the pavement on the SHS meets Department Standards”



Achieved by balancing the rate of deterioration with the rate of resurfacing

Why We Resurface Roads

- Projects are chosen in accordance with the criteria of *safety*, *preservation of the system* (cracking or other structural deficiency), *ride* (roughness), or other as needed to maintain the System's integrity.

Safety: Wheelpath Rutting, Friction

Preservation: Cracking, Delamination, Potholes, Spalling, Raveling, Patching, Depressions

Ride: Rippling, Faulting, Utilities, Public Complaints

Project Eligibility Criteria

- Projects are programmed to correct deficient segments.
- The Pavement Condition Survey (PCS) rates pavement segments on a scale of 0 (worst)-to-10 (best).
- Flexible pavements are rated for rutting, cracking, and ride.
- Rigid pavements are rated on defect and ride.
- Pavement segments having any rating ≤ 6.4 are classified as deficient.
 - Exception: A segment with a posted speed limit of < 50 mph and whose ride rating is between 5.5 and 6.4 while its other ratings are greater than 6.4.

Project Eligibility Criteria

Work Program Instructions:

Construction phases for pavement segments rated 7 and projected to be deficient by the year of construction may be gamed for adoption in the third year of the new five-year work program.

However, due to the variability in pavement deterioration rates, *it is not recommended* that construction phases be gamed for non-deficient sections in the last two years of the work program.

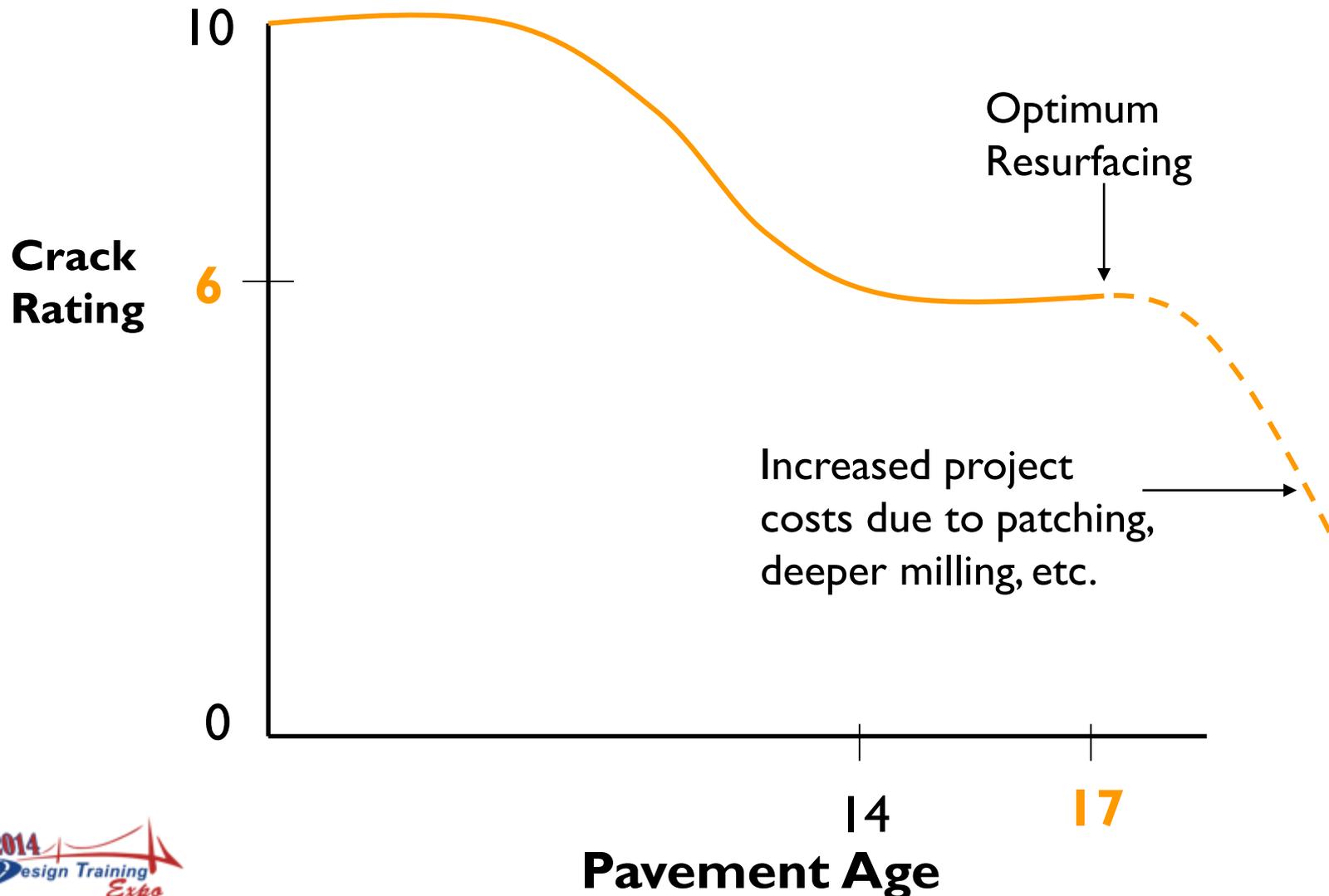
This is based on the theoretical textbook Optimum Time for Resurfacing curve.

When to Resurface

- New resurfacing projects are programmed for the new 3rd year of the 5 year work program.
- Pavement condition deterioration typically accelerates with time.
- In order to resurface pavements at the *optimum time*, they need to have been identified, gamed in the work program, and designed prior to reaching that critical stage.

This is based on the theoretical textbook Optimum Time for Resurfacing curve.

Graph Showing Typical *Theoretical* Textbook Optimum Time for Resurfacing



Which Roadways?

Complicated process involving many factors

- Pavement Condition Ratings
- Type of Distress
- AADT
- Truck Volume
- Age
- Surface Type
- Location
- Maintenance Issues

Ultimately, the decision to rehabilitate a roadway segment comes down to **engineering judgment**, based on the available information and experience.

Which Roadways?: Pavement Condition Ratings

- Good starting point:
 - Easily identify deficient roadways
 - Easily identify good performers
 - Allows initial screening:
 - Definitely needs to be resurfaced
 - Maybe needs to be resurfaced
 - Definitely does not need to be resurfaced
- Not nuanced enough for complete picture
- Sorting through the “maybes” requires other analysis

Which Roadways?: Pavement Condition Ratings

- Type of Distress:
 - Wheelpath Rutting:
 - Most critical concern, least prevalent distress
 - Safety issue at high speeds
 - Cracking:
 - Most common distress
 - Allows infiltration of water into pavement structure by top down cracking
 - Left untreated, can lead to reconstruction
 - Ride Quality:
 - Forms public opinion
 - Poor ride could lead to higher user costs in the form of vehicle maintenance

Which Roadways?: Other Factors

- AADT:
 - Increases the costs and benefits of resurfacing
 - Delays associated with resurfacing (lane closures)
 - Higher construction cost with higher AADT
 - Benefits of resurfacing reach a larger number of people
- Truck Volume:
 - Trucks contribute about **95%** of all damage done to roadways
 - Higher truck volume tends to increase the rate of pavement deterioration

Which Roadways?: Other Factors

- Age:
 - Average non-deficient life for FDOT pavements: \approx 14 years
 - Standard deviation: \approx 5 years
 - Average age at resurfacing: \approx 17 years
 - Older pavements are more likely to experience a sudden, dramatic decrease in functionality than new pavements
- Surface Type:
 - Dense-graded: Typical age \approx 18 years
 - Open-graded: Typical age \approx 12 years
 - OGFC more susceptible to raveling
 - OGFC more likely to have rim marks from large trucks

Which Roadways?: Other Factors

- Location:
 - South Florida pavements generally deteriorate at a slower rate than those in North Florida
 - surface proximity of limerock
 - soil variability
 - construction methods
 - Presence of muck or other unsuitable embankment material
- Maintenance Issues:
 - Recurring roadway patches
 - Depressions at cross drains
 - Standing water during heavy rains

Which Roadways?: Finding Information

- Pavement Management Infonet
 - Numerous reports to provide necessary information
 - Includes data from PCS, RCI, Work Program, Construction, and Core Reports
 - Prepared reports issued in printer-friendly format
 - Dynamic reports allow specific, user-defined parameters

<http://infonet.dot.state.fl.us/PavementManagement/>

Pavement Condition Survey

For District 3

Other Conditions: Critical Value=6.4

Click on the Begin Mile Point to plot the history and forecast years of crack, ride and rut ratings distribution for a roadway segment.

Click on the Roadway ID to plot the current year of crack, ride and rut ratings distribution for an entire roadway.

Roadway Segment									Tentatively Planned Project						PCS Survey Information								
Roadway ID # (Section Graph)	SR	US	Begin Mile Point (History Link)	End Mile Point (Link Multi Proj)	Rdwy Side	Posted Speed	AADT	% Trucks	Item Segment	Begin Mile Point	End Mile Point	Rdwy Side	Fiscal Year	Work Mix	Current Pvm Age In Yrs	% of Cover	Cracking 2014	Ride 2014	Rutting 2014	Lane Miles	Video Log	GIS Map	F.A.S.T. Plot
46010100	30	98	1.849	1.953	R				3	C			2015	0213	5	94%	10.0	8.4	10.0	0.312	Picture	Map View	FASTPLT
46010100	30	98	1.885	1.953	L				3	C			2015	0213	5	100%	10.0		10.0	0.204	Picture	Map View	FASTPLT
46020000	30	98	0.742	1.263	L										5	100%	10.0	7.7	9.0	1.042	Picture	Map View	FASTPLT
46020000	30	98	0.742	1.263	R										5	94%	10.0	8.4	10.0	0.312	Picture	Map View	FASTPLT
46020000	30	98	0.742	1.263	R										5	100%	10.0		10.0	0.204	Picture	Map View	FASTPLT
46020000	30	98	12.177	13.694	L	45	21500								5	100%	10.0	7.7	9.0	1.042	Picture	Map View	FASTPLT
46020000	30	98	12.177	13.694	L	45	21500								5	100%	10.0	7.5	9.0	1.350	Picture	Map View	FASTPLT

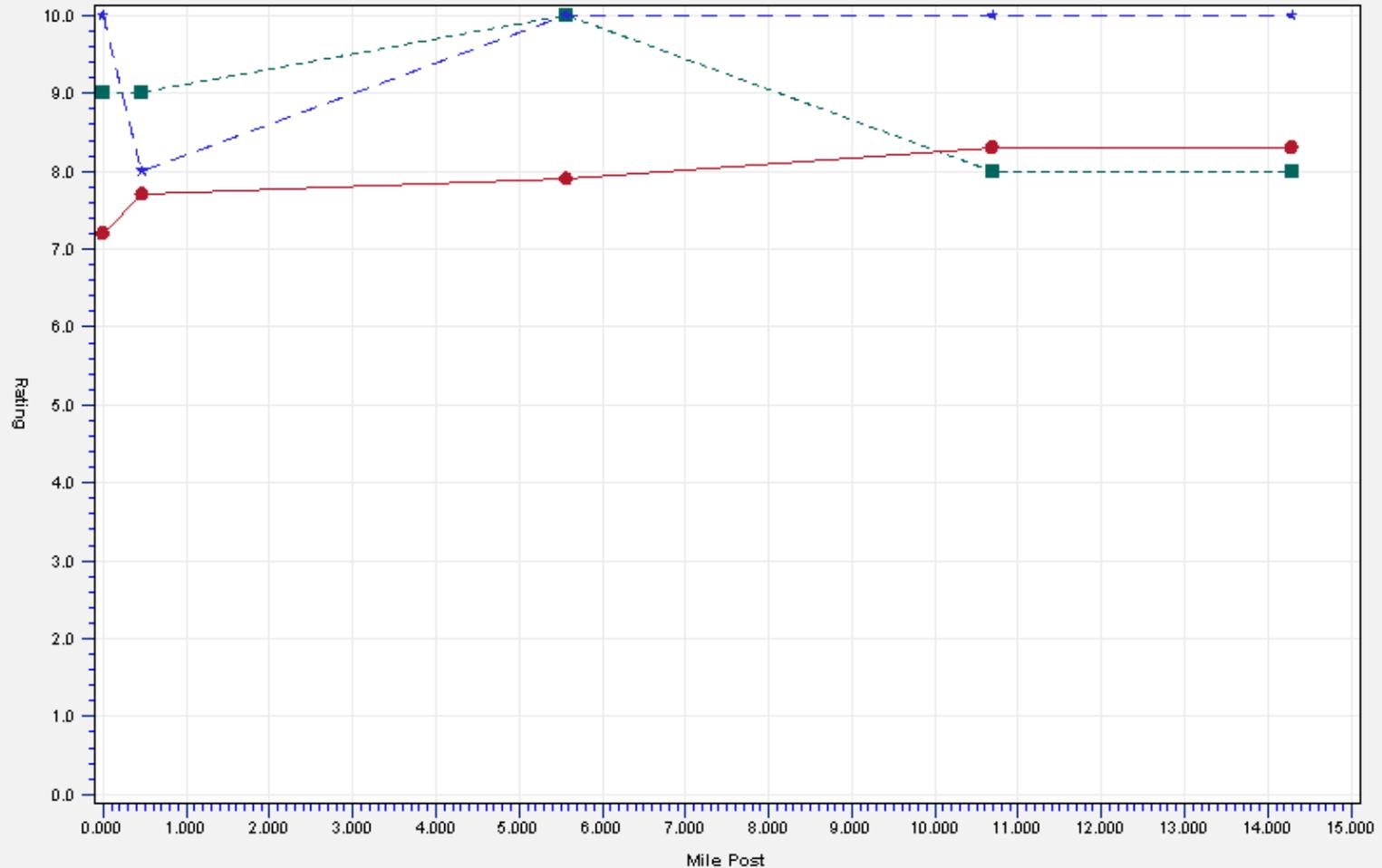


Following are examples of on-line reports available to aid the Districts in picking candidate resurfacing projects...

Florida Department of Transportation

2014 Pavement Condition Survey

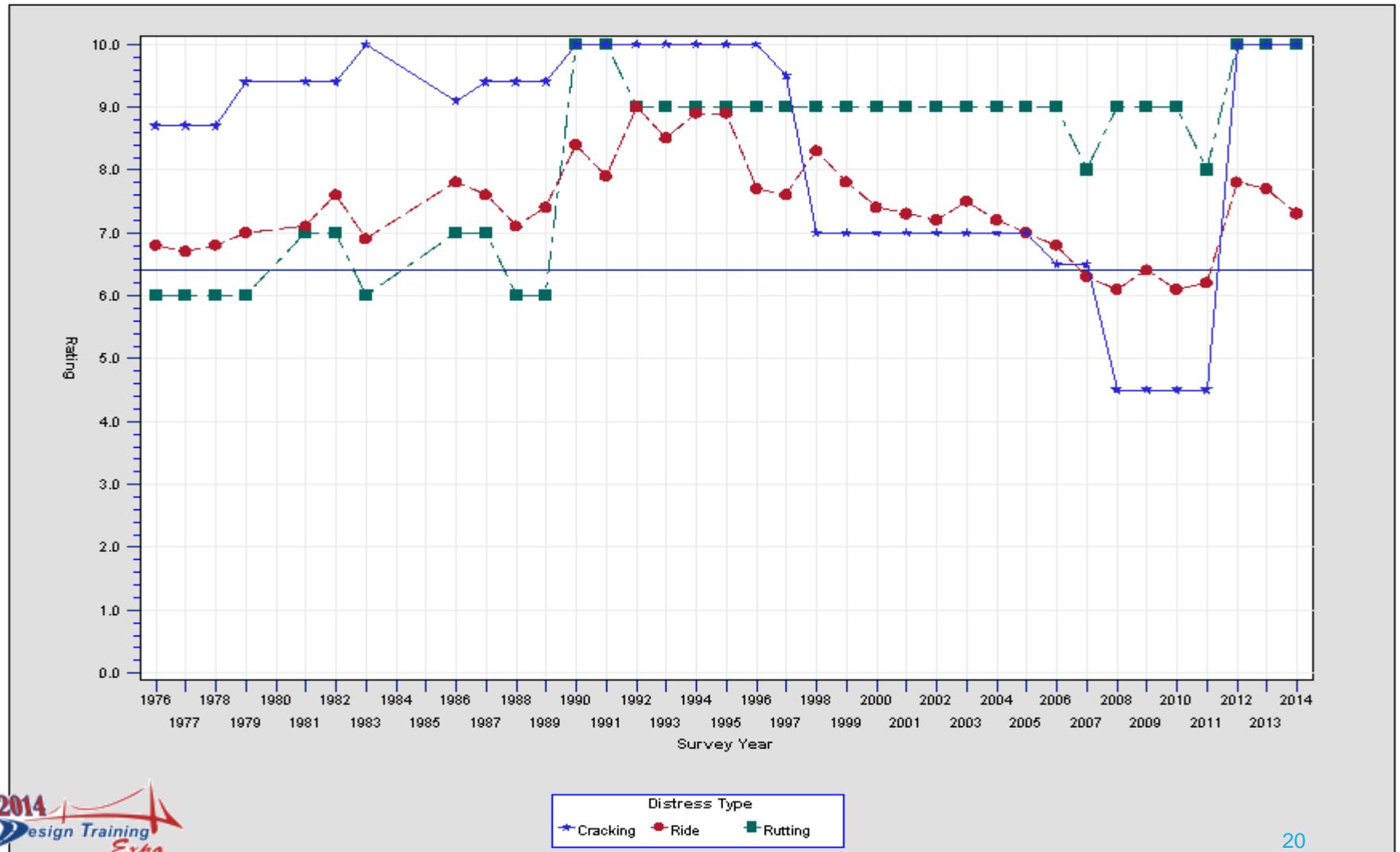
For Rdwyid = 26005000, Roadside= L (Milepost: 0.000 - 14.290)



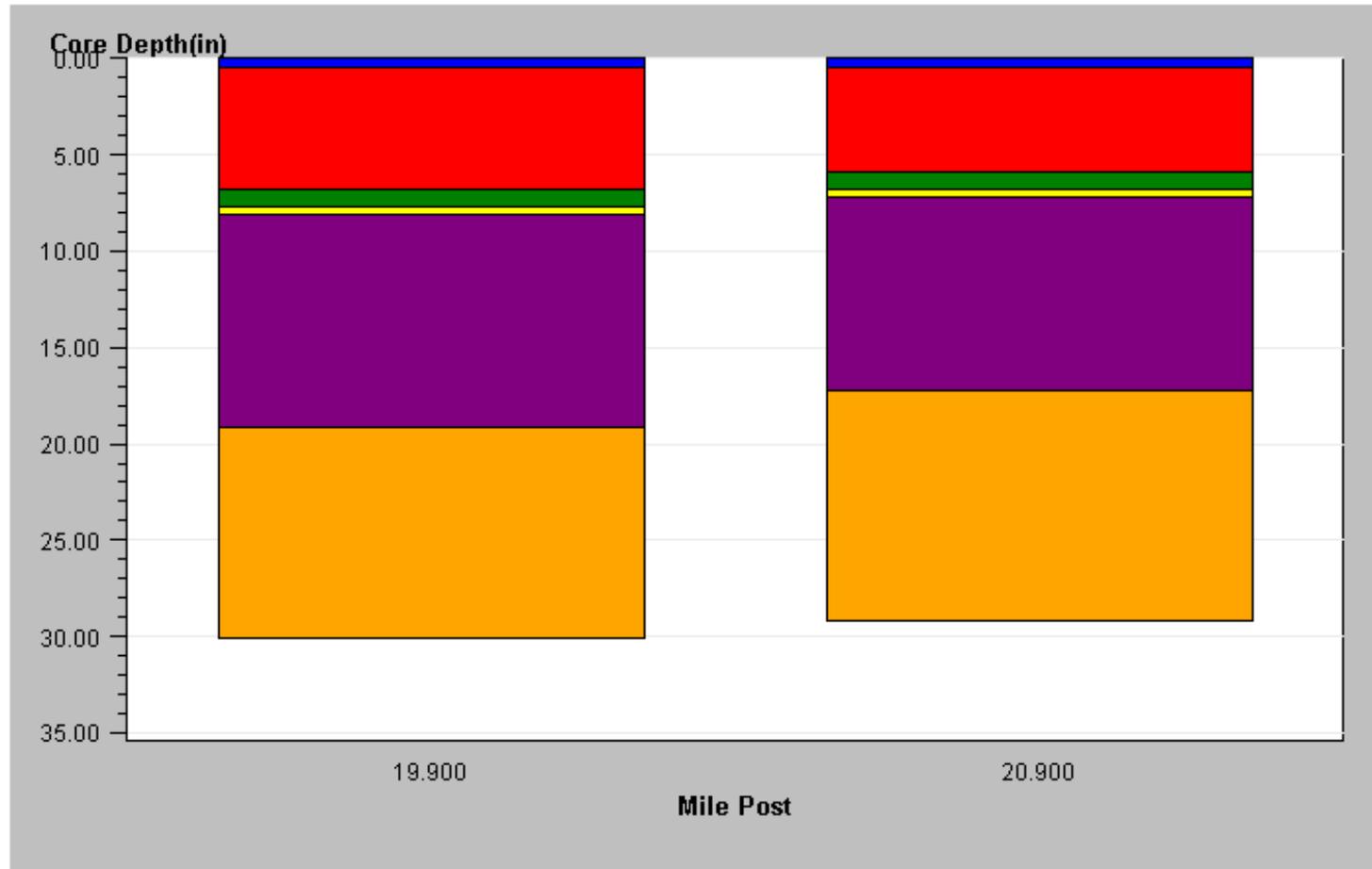
Pavement Condition Survey History

for Roadway ID: 26003000

Mile Post: 0.000 to 2.544, Roadway Side: C



Core Makeup
Project # 193787 -1 -31 -01 / Roadway ID # 01010000
Local Name: US41
Lane L1



FLORIDA DEPARTMENT OF TRANSPORTATION

ALL SYSTEM PAVEMENT CONDITION FORECAST

PAVEMENT IMPROVEMENT PROJECTS IN FM WPA TENTATIVE PLAN – 2014 - 2019, EXTRACTED ON 05/21/2014

SORT BY RDWYID MILEPOST R ASCENDING L DESCENDING

----- DISTRICT = 5 COUNTY = OSCEOLA -----

RDWYID	BMP	EMP	RW	SYS	TYP	SPD	DISTRESS	SURVEYED YEAR											FUTURE		
								1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		2000	2001
600 17	0.000	0.536	C	1	1	55	CRACKING	9.4	8.7	8.0	8.0	10.0	9.5	9.5	9.0	9.0	9.0	9.0	7.5	6.5	
INTERSECT AT (MP SIDE)								SURFTYPE =====													
LABOR CAMP RD(0.0L)								FC95													
4135921	0.000	5.671	C	2006		0012	CRACKING	6.5	6.5	6.5	6.5	6.5	6.5	10.0	10.0	10.0	10.0	10.0	9.0	9.0	7.5
THE MIDDLESEX CORPORATION (2008)								SP													
								RIDE													
								RUTTING													
								RIDE													
								RUTTING													

SURVEYED YEAR														FUTURE
1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001		
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2019	(FAST)
9.4	8.7	8.0	8.0	10.0	9.5	9.5	9.0	9.0	9.0	9.0	7.5	6.5		
8.7	8.7	8.3	8.3	7.8	8.5	8.3	8.3	8.5	8.6	8.2	8.1	7.6		
9.0	9.0	8.0	8.0	8.0	8.0	7.0	8.0	8.0	7.0	8.0	8.0	8.0		
6.5	6.5	6.5	6.5	6.5	6.5	10.0	10.0	10.0	10.0	10.0	9.0	9.0	7.5	
8.3	8.4	7.2	6.8	7.0	6.9	8.5	8.4	8.4	8.2	8.1	8.1	8.2	8.0	
8.0	8.0	8.0	8.0	8.0	8.0	10.0	10.0	9.0	10.0	9.0	9.0	9.0	8.0	

4135921	0.000	5.671	C	2006		0012					9.1	8.7	8.8	9.1	9.0	9.0	9.0	9.0	9.0	9.0	9.0
THE MIDDLESEX CORPORATION (2008)								SP													
								RUTTING													
								RIDE													
								RUTTING													
								RIDE													
								RUTTING													

92010000	9.624	10.298	R	1	1	45	CRACKING	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
600 17	PALMETTO AVE(9.7R)		2		6.5	54000	RIDE	8.0	7.9	7.6	8.4	8.3	8.2	7.9	8.0	8.0	8.1	7.5	7.3	7.2		
								FC2														
4071641	9.624	10.212	C	2003		0012	CRACKING	10.0	9.5	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	8.5	8.5	7.5	
APAC-FLORIDA INC (2005)								SP														
								RIDE														
								RUTTING														
								RIDE														
								RUTTING														

Which Roadways?: Engineering Judgment

- Field Review:
 - Single most important factor
 - Don't let numbers cloud the way of good judgment
 - Video Log not adequate – often outdated
 - Walk alongside the roadway at various points, see what is happening
 - Many distresses are not visible from the cab of a vehicle at traveling speed, but can be easily spotted from the roadway shoulder
 - Experience leads to knowledge about how certain distresses are likely to worsen over time, and which ones are most critical

Example of typical top-down fatigue cracking



Beginning of crack spalling, typically after 3 years deficient



Severe spalling with extensive patching (i.e., waiting too long to fix).



Patching operations are expensive and inconvenient to the public.



What Treatment?

- Overlaps with Pavement Design
- Depends upon the distress
- Thin mill and overlay is typically used to treat surface distresses
- Deeper mill and overlay may be needed to address deeper cracking or unstable pavement layers that are causing rutting
- Reconstruction used in areas where the causes of pavement distress are deep within the pavement structure, including base and subgrade layers

What Treatment?

- Alternative Treatments:
 - Often applicable to a very specific set of conditions
 - FDOT studying a variety of different treatments:
 - Hot-in-place recycling
 - Bonded friction course
 - Microsurfacing
 - Full depth reclamation
 - Crack sealing
 - Crack relief layers
 - Can generally be constructed cheaper than conventional methods
 - Generally have a limited life-cycle, although some treatments may provide a longer life, but have other drawbacks

