

# New TxDOT Profiler Certification Tracks

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# Today's Presentation

- TxDOT needs and objectives
- New test sections
- Preliminary tests
- Conclusions and recommendations

# TxDOT Needs

- Broaden range of test sections to include pavement surfaces covered under existing TxDOT ride specs
- Represent chip seal sections included in TxDOT's annual network survey of pavement ride quality

# Project Objectives

- Build new test sections for profiler certification.
- Assess the applicability of TxDOT's existing certification requirements on new pavement surfaces.
- Provide recommendations for investigating changes to TxDOT's existing profiler certification protocols.

# Project Work Plan

Task	Description	Status
1	Procure site to build new test tracks	Completed
2	Develop construction plans	Completed
3	Solicit bids and construct new test tracks	Completed
4	Perform preliminary tests	Completed
5	Prepare project report	Completed



# Location of New Test Tracks

# New Test Tracks for Profiler Certifications

**CRCP Test Track**



**Flexible Pavement Test Track**

# 1-inch Longitudinally Tined CRCP Section



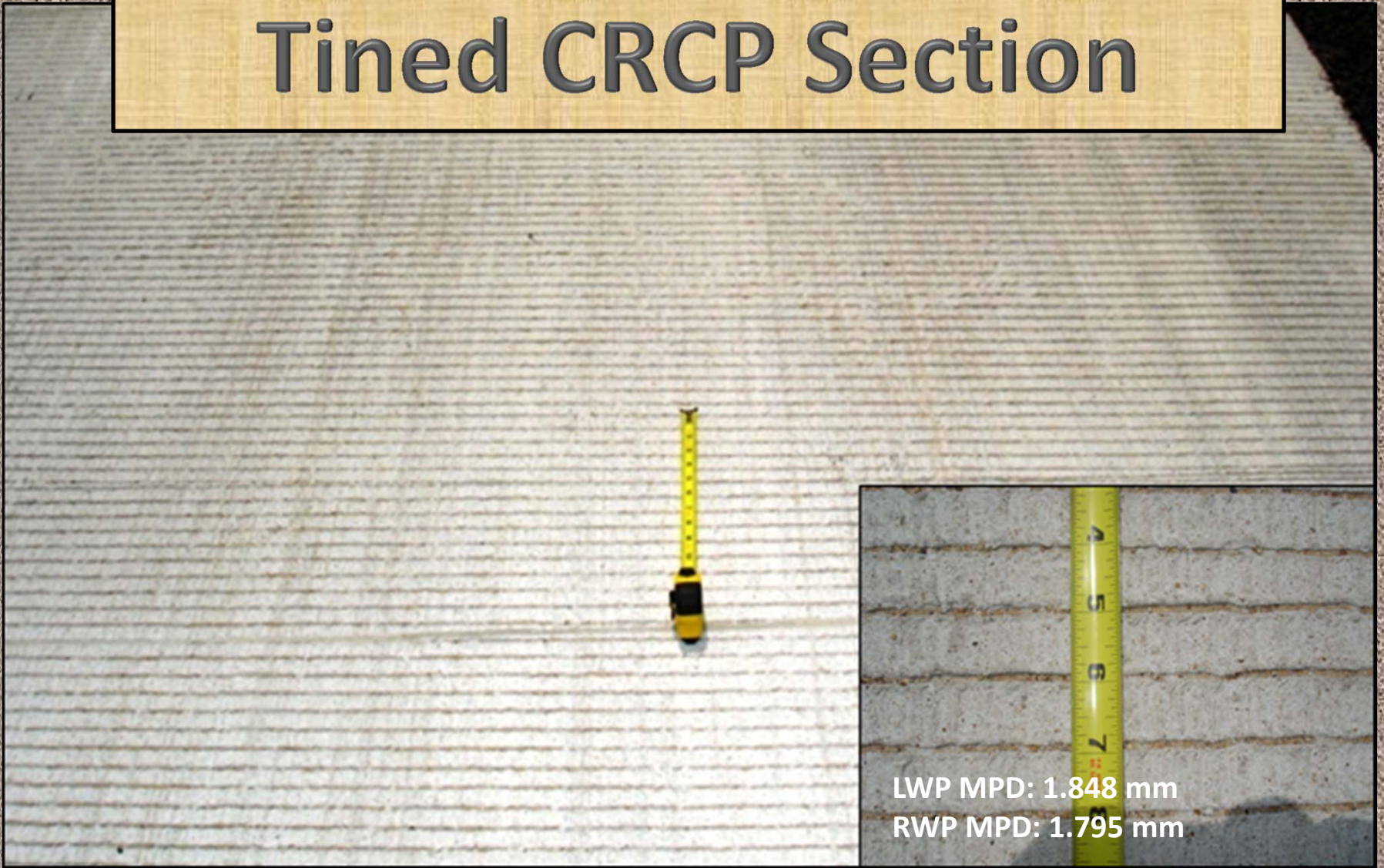


# 1/2-inch Transversely Tined CRCP Section



LWP MPD: 1.961 mm  
RWP MPD: 1.918 mm

# 1-inch Transversely Tined CRCP Section



LWP MPD: 1.848 mm  
RWP MPD: 1.795 mm

# Permeable Friction Course Section

PFC

LWP MPD: 3.055 mm  
RWP MPD: 2.045 mm



# Inverted Prime Section



# Grade 3 Chip Seal



LWP MPD: 1.570 mm  
RWP MPD: 1.199 mm



# Reference Profile Measurements



- Locate wheel paths and delineate with paint dots at 5-ft intervals.
- Collect elevation readings at 1-inch intervals using SurPRO.
- Tie SurPRO data to a common benchmark using rod and level measurements collected at 190-ft intervals.
- Make 3 repeat reference profile runs per wheel path.

## Repeatability of Unfiltered Reference Profiles on CRCP Test Track

Section	Avg. Standard Deviation (mils)	
	LWP	RWP
1-inch longitudinally tined	9.51	9.52
½-inch transversely tined	9.12	9.66
1-inch transversely tined	9.90	9.75
Entire CRCP Test Track	9.57	9.65

## Repeatability of IRI Filtered Reference Profiles on CRCP Test Track

Section	Avg. Cross-Correlation (%)	
	LWP	RWP
1-inch longitudinally tined	98	98
½-inch transversely tined	98	98
1-inch transversely tined	99	99
Entire CRCP test track	99	98



## Repeatability of IRIs on CRCP Test Track

Section	IRI standard deviation (in/mile)	
	LWP	RWP
1-inch longitudinally tined	0.44	0.61
½-inch transversely tined	0.75	0.46
1-inch transversely tined	0.36	0.25
Entire CRCP test track	0.25	0.40

## Repeatability of Unfiltered Reference Profiles on PFC-Chip Seal Sections

Section	Avg. Standard Deviation (mils)	
	LWP	RWP
Permeable friction course	9.61	9.56
Inverted prime	11.83	19.29
Grade 3 chip seal	10.79	12.71
Entire PFC-Chip Seal Track	10.67	13.40

## Repeatability of IRI Filtered Reference Profiles on PFC-Chip Seal Sections

Section	Avg. Cross-Correlation (%)	
	LWP	RWP
Permeable friction course	99	100
Inverted prime	99	99
Grade 3 chip seal	99	99
Entire PFC-Chip Seal Track	99	99

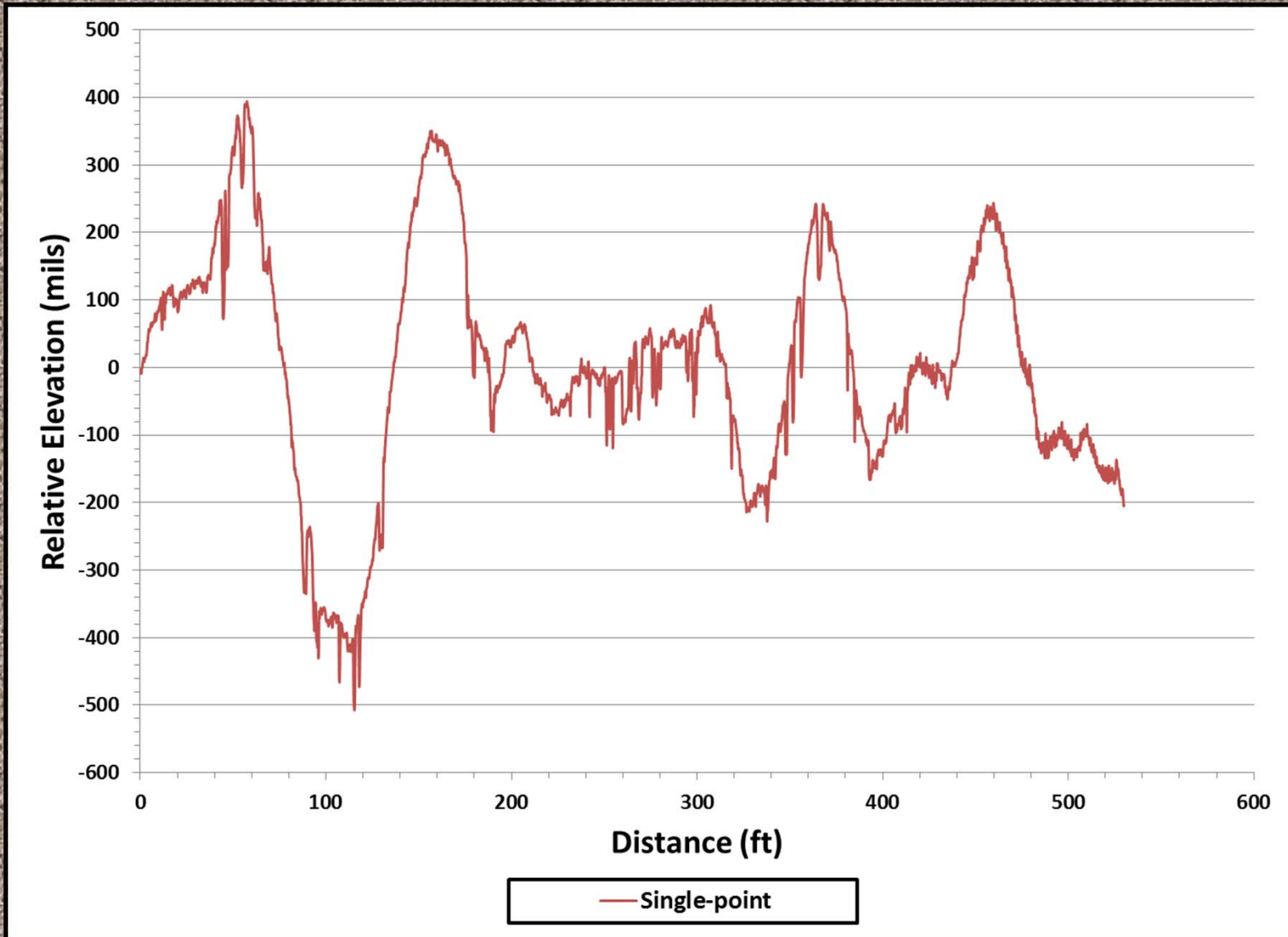
# Repeatability of IRIs on PFC-Chip Seal Sections

Section	IRI standard deviation (in/mile)	
	LWP	RWP
Permeable friction course	0.25	0.25
Inverted prime	0.26	0.51
Grade 3 chip seal	0.61	0.40
Entire PFC-Chip Seal Track	0.15	0.29

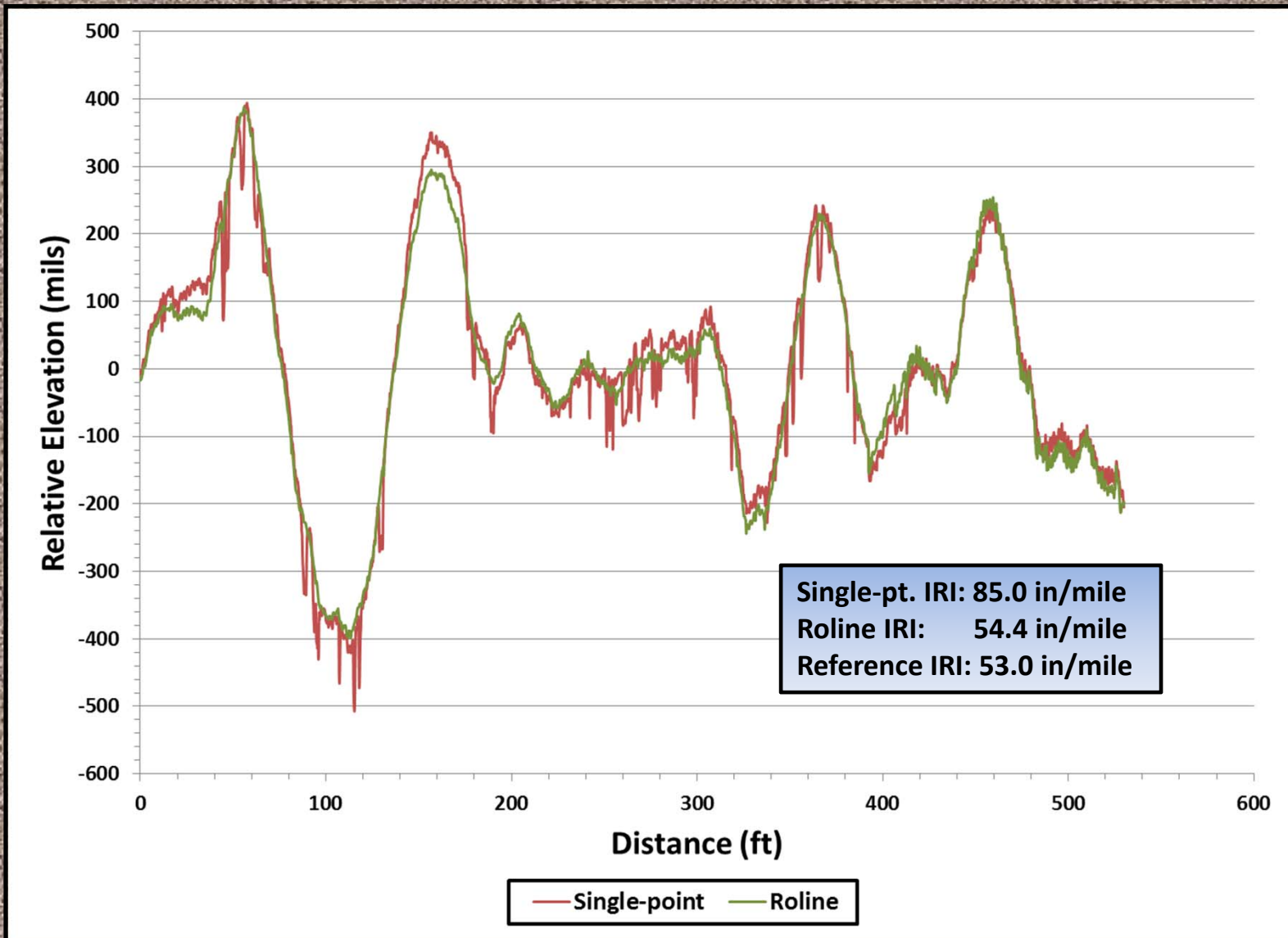
# Initial Testing of Inertial Profilers

- Collected data from inertial profilers equipped with different lasers
- Two TxDOT profilers with single-point lasers
- Dynatest profiler with Roline lasers
- TTI profiler with 19mm lasers

# Comparison of Profiles on Longitudinally Tined Section



# Comparison of Profiles on Longitudinally Tined Section



## Repeatability of IRIs on Longitudinally Tined Section

Profiler/Laser	IRI standard deviation (in/mile)	
	LWP	RWP
3209H/Single-point	9.15	9.89
3287G/Single-point	9.70	12.69
04-172/Roline	0.14	0.65
TTI/19mm	3.15	4.29



## Repeatability of IRIs on Longitudinally Tined Section

Profiler/Laser	IRI standard deviation (in/mile)	
	LWP	RWP
3209H/Single-point	9.15 (30%)	9.89 (25%)
3287G/Single-point	9.70 (27%)	12.69 (21%)
04-172/Roline	0.14 (99%)	0.65 (97%)
TTI/19mm	3.15 (61%)	4.29 (54%)

# Accuracy of IRIs on Longitudinally Tined Section

Profiler/Laser	IRI difference (in/mile)	
	LWP	RWP
3209H/Single-point	42.6	43.3
3287G/Single-point	43.5	52.0
04-172/Roline	1.5	4.5
TTI/19mm	19.8	18.7

# Accuracy of IRIs on Longitudinally Tined Section

Profiler/Laser	IRI difference (in/mile)	
	LWP	RWP
3209H/Single-point	42.6 (27%)	43.3 (21%)
3287G/Single-point	43.5 (24%)	52.0 (18%)
04-172/Roline	1.5 (92%)	4.5 (83%)
TTI/19mm	19.8 (57%)	18.7 (50%)

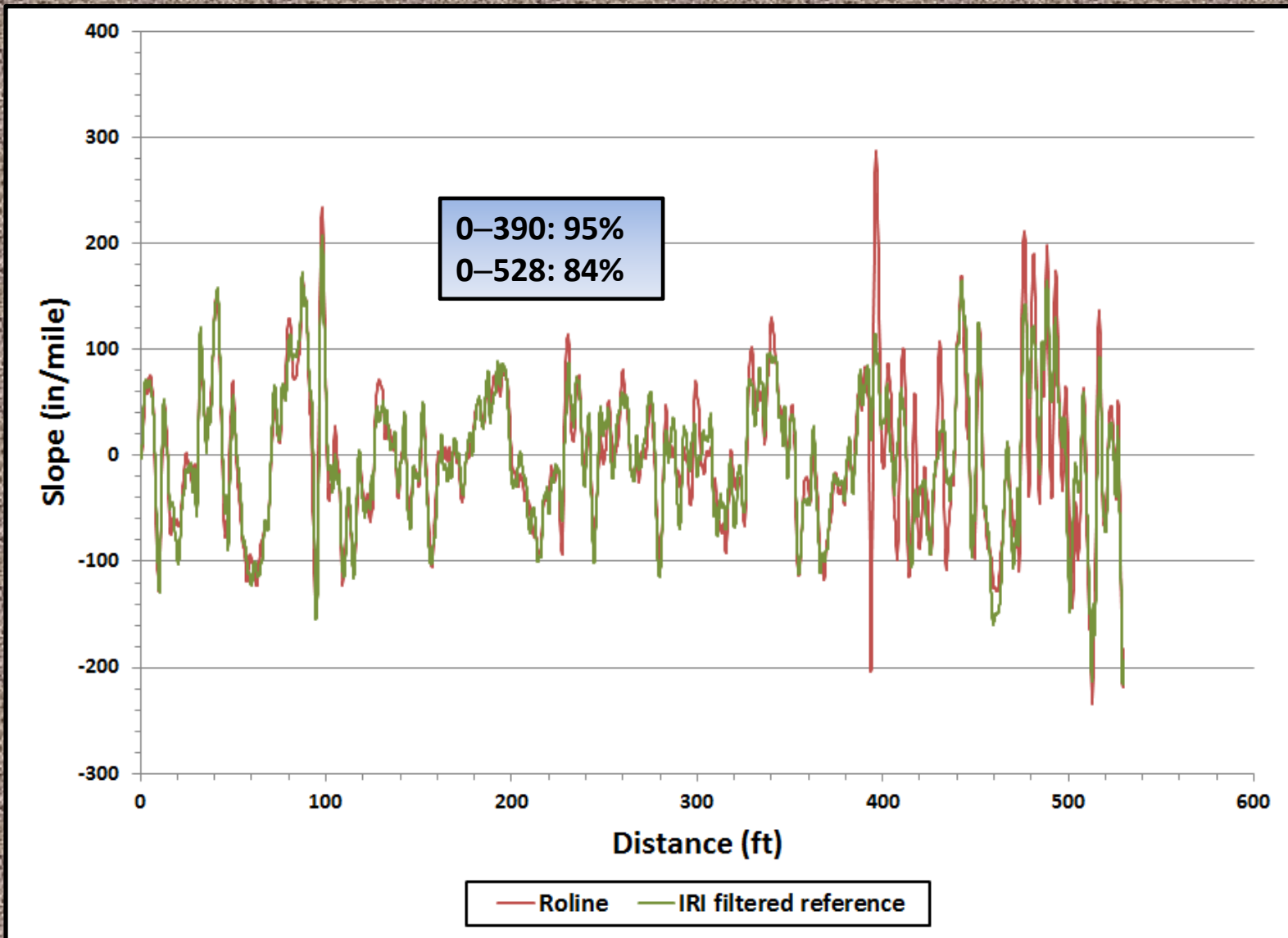
# Repeatability of IRIs on Half-Inch Transversely Tined Section

Profiler/Laser	IRI standard deviation (in/mile)	
	LWP	RWP
3209H/Single-point	0.66	1.16
3287G/Single-point	0.83	2.52
04-172/Roline	0.24	0.46
TTI/19mm	0.51	1.81

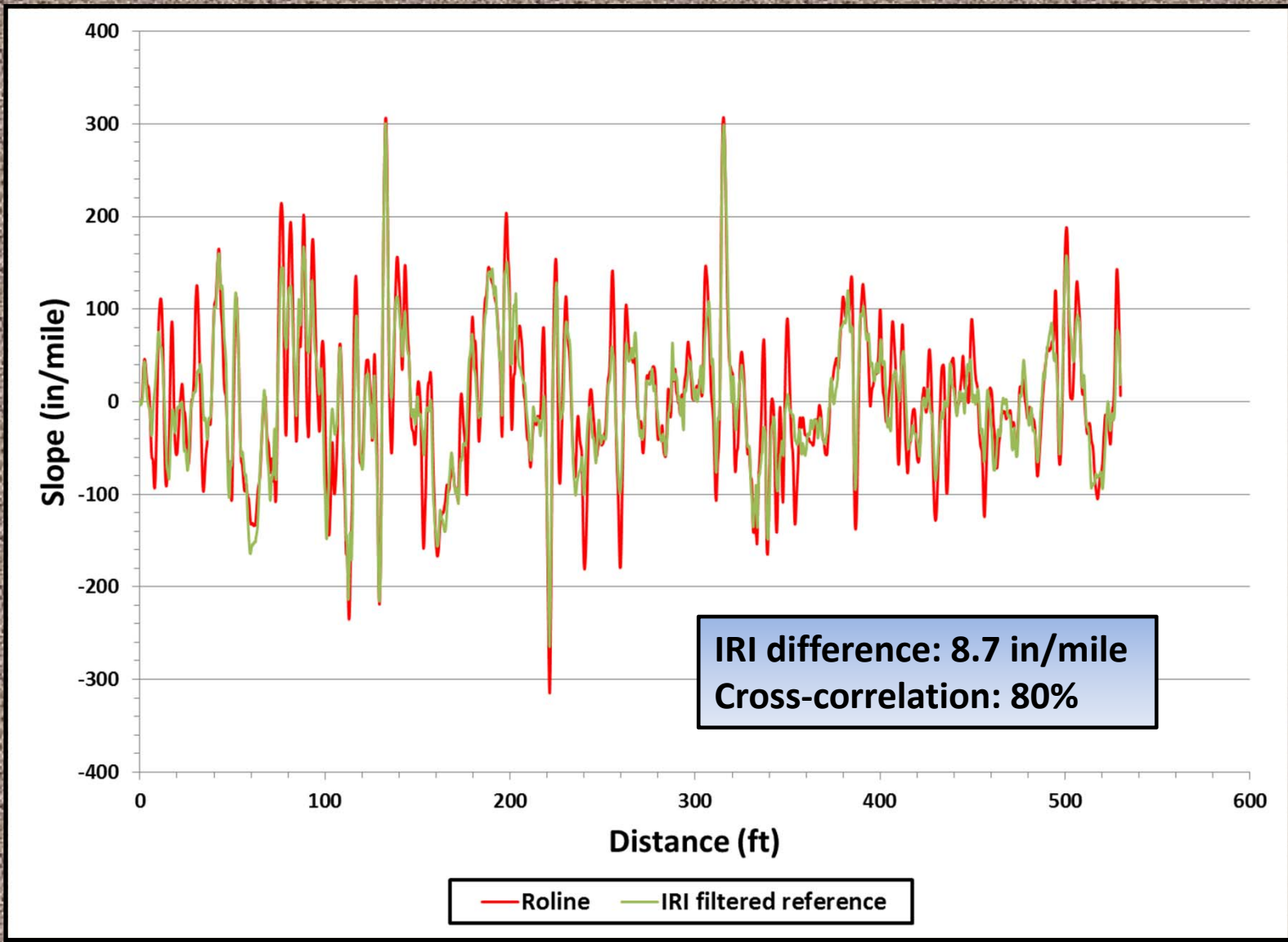
## Accuracy of IRIs on Half-Inch Transversely Tined Section

Profiler/Laser	IRI difference (in/mile)	
	LWP	RWP
3209H/Single-point	2.9	3.1
3287G/Single-point	2.2	4.9
04-172/Roline	3.9	8.7
TTI/19mm	2.8	2.8

# Comparison of IRI-Filtered Profiles on Segment of CRCP Test Track



# Comparison of IRI-Filtered Profiles on ½-inch Transversely Tined Section



## Repeatability of IRIs on 1-inch Transversely Tined Section

Profiler/Laser	IRI standard deviation (in/mile)	
	LWP	RWP
3209H/Single-point	1.11	0.68
3287G/Single-point	1.37	1.51
04-172/Roline	1.35	0.40
TTI/19mm	0.62	0.62



## Accuracy of IRIs on 1-inch Transversely Tined Section

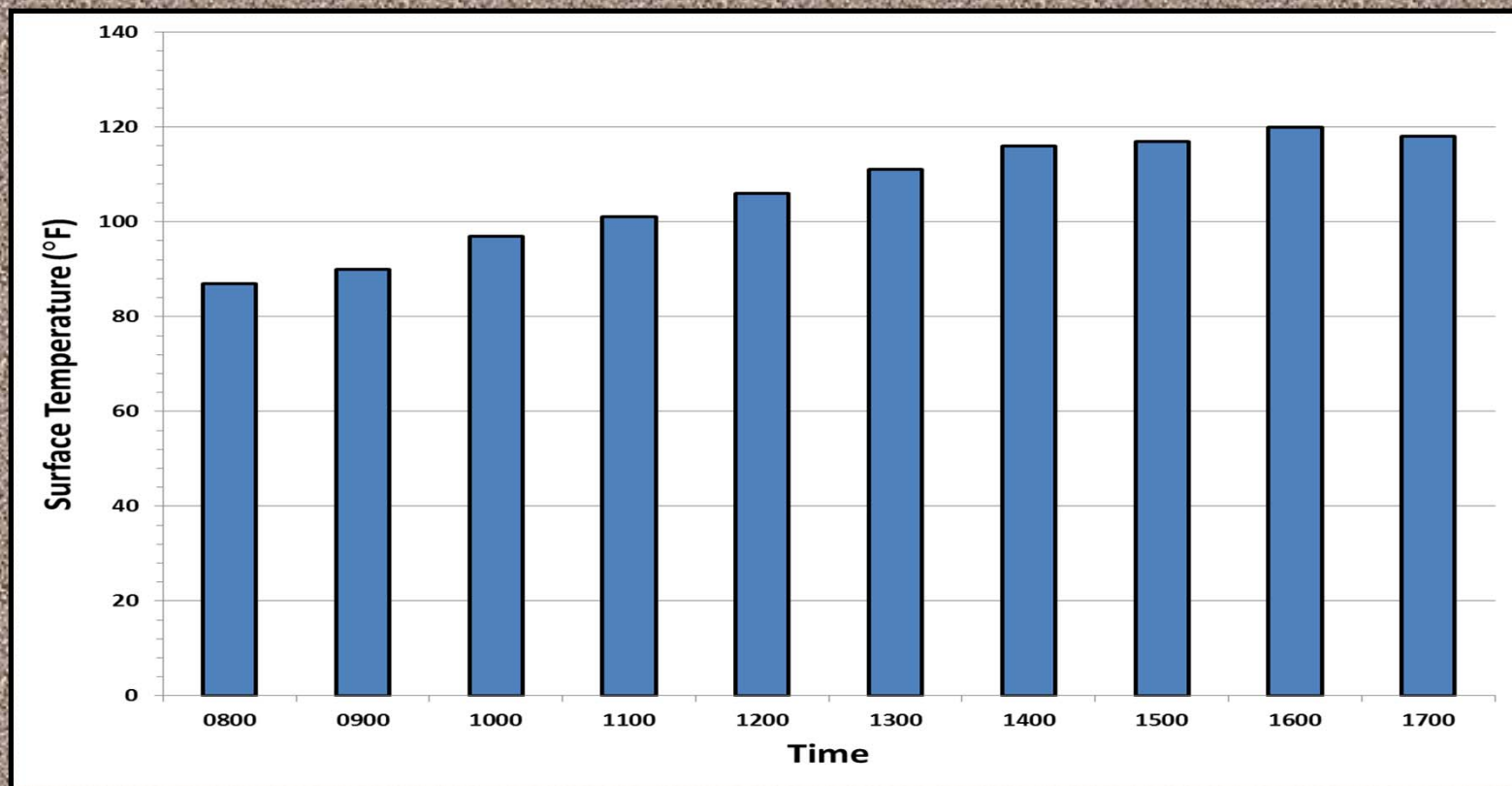
Profiler/Laser	IRI difference (in/mile)	
	LWP	RWP
3209H/Single-point	4.9	4.9
3287G/Single-point	3.2	4.25
04-172/Roline	5.3	4.7
TTI/19mm	4.9	3.7

# Findings from Preliminary Tests

- The SurPRO reference profiles from three repeat runs showed excellent repeatability.
- Only the Roline laser met Tex-1001S profiler certification requirements on the longitudinally tined CRCP section.
- On the transversely tined sections, the single-point and 19mm lasers met Tex-1001S certification specs. The Roline laser did not meet IRI accuracy tolerance on half-inch transversely tined section.

# Findings from Preliminary Tests

- Statistical analysis of profile measurements collected at hourly intervals showed no significant difference in mean hourly IRIs at a 95% confidence level.



# Findings from Preliminary Tests

Section	Wheel Path	Average IRI (in/mile)			IRI Standard Deviation (in/mile)	
		Min.	Max.	Range	Min.	Max.
½ -inch transversely tined	Left	63.5	64.8	1.3	0.80	1.57
	Right	56.0	56.9	0.9	0.78	1.15
1-inch transversely tined	Left	50.8	51.3	0.5	0.65	1.20
	Right	58.5	59.0	0.5	0.61	1.19

# Findings from Preliminary Tests

- Single-point and Roline lasers met Tex-1001S certification requirements on PFC section.
- None of the profilers passed Tex-1001S certification on the chip seal sections.

# Recommendations

- Test Roline at different footprint angles to determine optimal setup on CRCP sections.
- Test optimal Roline setup to verify applicability on hot-mix sections.
- Run additional tests at different seasonal or prevailing weather conditions to ascertain effect of temperature on CRCP profile measurements.
- Perform further tests on chip seal sections to determine applicable profiler certification requirements.

# Acknowledgment

- The authors thank the FHWA and TxDOT for funding the construction of new profiler certification sections.
- The authors also acknowledge the cooperation extended by TxDOT's Pavement Preservation Section and Dynatest in performing preliminary tests on the new profiler certification tracks.

**Thank you for your  
attention.  
Any questions?**