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Road Profile Users' Group

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2026 RPUG CONFERENCE ★ PITTSBURGH, PA ★ APRIL 28 - MAY 1

Lessons Learned from 10 Years of a Ride Quality Verification Program

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Background

2024 Specifications 585

Item 585

Ride Quality for Pavement Surfaces

1. DESCRIPTION

Measure and evaluate the ride quality of pavement surfaces.

- TxDOT Item 585: Ride Quality for Pavement Surfaces
  - Use contractor measurements for quality assurance (QA) and bonus/penalty payment
- 2014 FHWA audit revealed the need for a formal verification program for projects on the National Highway System (NHS)
- Title 23, Chapter 1, Subchapter G, Part 637 of the Code of Federal Regulations (CFR) establishes QA requirements
  - CFR637 Subpart B – Quality Assurance Procedures for Construction

TxDOT Ride Verification Program

Surface Test Type B. Provide a high-speed or lightweight inertial profiler, certified at the Texas A&M Transportation Institute. Provide equipment certification documentation. Display a current decal on the equipment indicating the certification expiration date.

- Outsourced to Texas A&M Transportation Institute
  - Independent assurance entity
  - Perform profiler and profiler operator certifications
- Utilize the *Verification Testing* article in the Specification (585.3.2.2.2.1)
  - Perform verification testing within 10 working days of the Contractor's QA testing…NOT 10 working days of data submission 

+0 in./mi +3 in./mi +6 in./mi

Use Contractor's QA Data	Use either contractor data, verification data, or an average of both	Referee Testing by TxDOT

+0 in./mi +3 in./mi +6 in./mi

Project Testing

- Typical testing frequency = 10% on NHS projects
  - TxDOT expanded to include all projects
  - TTI established a 15% target
- FY 2015 (i.e., first year of verifications) exposed the challenges with tracking and identifying verification projects 
  - TxDOT provided a monthly list of projects with Item 585…but sometimes Item 585 is not activated when this list is generated 
  - Projects span multiple years 
  - How is the frequency counted
    - Number of projects let within a year
    - Number of projects that pay Item 585 within a year

Verification Rates

Let Year	Total Projects with Item 585	Total Projects with Item 585 Accepted	Total Projects Accepted with Item 585 Paid	% of Projects Accepted	% of Accepted Projects with 585 Paid	Projected 585 Projects	10% Verification Rate	15% Verification Rate	Report Verifications	**Actual % verification**
FY 2016	428	426	275	99.53%	64.55%	277	28	42	38	**13.72%**
FY 2017	431	422	241	97.91%	57.11%	247	25	38	40	**16.19%**
FY 2018	537	510	335	94.97%	65.69%	353	36	53	47	**13.31%**
FY 2019	542	506	296	93.36%	58.50%	318	32	48	48	**15.09%**
FY 2020	352	292	184	82.95%	63.01%	222	23	34	51	**22.97%**
FY 2021	490	326	166	66.53%	50.92%	250	25	38	40	**16.00%**
FY 2022	557	236	121	42.37%	51.27%	286	29	43	43	**15.03%**
FY 2023	576	166	92	28.82%	55.42%	320	32	48	46	**14.38%**
FY 2024	393	14	6	3.56%	42.86%	169	17	26	46	**27.22%**
									*Aggregate Average based on report:	**15.84%**

*Does not include the current FY in the average calculation due to small number of projects accepted.

Let Year vs. Report Year

Report Year	Total Report Verifications	Project Letting Year										
		FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Projected 585 Projects				**277**	**247**	**353**	**318**	**222**	**250**	**286**	**320**	**NA**
2016	38	2	34	2								
2017	40[a]		9	18	11							
2018	47[b]		2	7	24	13						
2019	48[c]	1		1	4	35	6					
2020	51			2	1	21	25	2				
2021	40					10	13	17				
2022	43					1	7	10	18	7		
2023	46				1	2	1	6	11	15	10	
2024	46					1			6	13	19	6
Total FY Verifications				**30**	**41**	**83**	**52**	**35**	**35**	**35**	**29**	**6**
% Verification Based on FY Letting				10.8%	16.6%	23.5%	16.4%	15.8%	14.0%	12.2%	9.1%	NA
% Verification Based on FY Letting & Paid-to-Date				10.9%	17.0%	24.8%	17.6%	19.0%	21.1%	28.9%	31.5%	NA

[a]The FY 2017 verification list included a project let in FY 2011 and FY 2013.

[b]The FY 2018 verification list included a project let in FY 2013.

[c]The FY 2019 verification list included a project let in FY 2013.

Verification Rates Based on FY Payment

Item 585 Paid FY	No. of Projects	10% Verification Rate	15% Verification Rate	Report Verifications	Actual % Verifications	Total Bonus ($)	Avg. Bonus per Project ($)
2016	257	26	39	38	**14.8%**	$ 4,456,560	$ 17,341
2017	320	32	48	40	**12.5%**	$ 7,000,567	$ 21,877
2018	277	28	42	47	**17.0%**	$ 5,249,451	$ 18,951
2019	231	24	35	48	**20.8%**	$ 4,627,085	$ 20,031
2020	276	28	42	51	**18.5%**	$ 8,284,007	$ 30,015
2021	264	27	40	40	**15.2%**	$ 8,832,112	$ 33,455
2022	235	24	36	43	**18.3%**	$ 5,713,178	$ 24,311
2023	190	19	29	46	**24.2%**	$ 4,502,502	$ 23,697
2024	219	22	33	46	**21.0%**	$ 4,470,662	$ 20,414
Aggregate Average Verification:					**18.0%**		

Verification Rate Summary

Verification Year	Report Verifications	Predicted Projects Paying Item 585	Verification Rate	Projects Verified from FY	Verification Rate	Projects Paying Item 585	Verification Rate
2016	38	277	13.7%	30	10.8%	257	14.8%
2017	40	247	16.2%	41	16.6%	320	12.5%
2018	47	353	13.3%	83	23.5%	277	17.0%
2019	48	318	15.1%	52	16.4%	231	20.8%
2020	51	222	23.0%	35	15.8%	276	18.5%
2021	40	250	16.0%	35	14.0%	264	15.2%
2022	43	286	15.0%	35	12.2%	235	18.3%
2023	46	320	14.4%	29	9.1%	190	24.2%
2024	46	169	27.2%	6	3.6%	219	21.0%
Average Verification Rates:			**15.8%**		**15.6%**		**18.0%**

Amount of Bonus/Penalty Paid

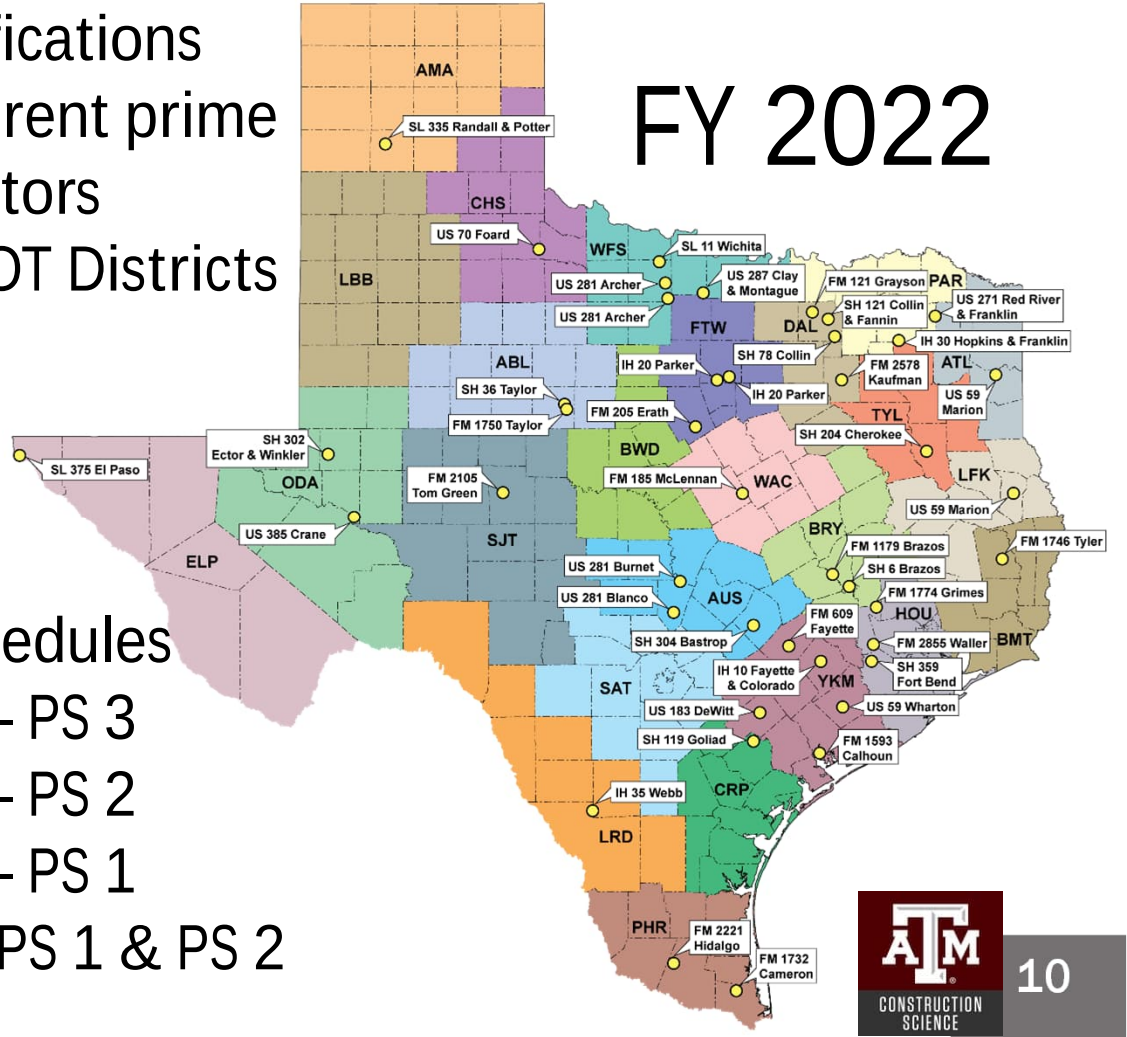
Let Year	Item 585 Paid on Accepted Subordinate CSJs	Number of Item 585 Occurences Paid	Total Bonus ($)	Avg. Bonus per Project ($)	Projected No. of Projects	Projected Statewide Bonus ($)
FY 2016	277	277	$ 5,808,666.54	$ 20,969.92	277	$ 5,808,666.54
FY 2017	211	211	$ 4,981,928.67	$ 23,611.04	213	$ 5,029,150.74
FY 2018	309	352	$ 9,839,285.51	$ 27,952.52	360	$ 10,062,905.64
FY 2019	285	309	$ 10,333,402.70	$ 33,441.43	318	$ 10,634,375.59
FY 2020	190	213	$ 6,051,542.34	$ 28,411.00	235	$ 6,676,584.27
FY 2021	205	227	$ 4,634,176.00	$ 20,414.87	266	$ 5,430,356.02
FY 2022	144	188	$ 3,419,987.75	$ 18,191.42	270	$ 4,911,684.53
FY 2023	205	253	$ 4,962,580.00	$ 19,614.94	353	$ 6,924,074.07
FY 2024	87	163	$ 3,865,042.97	$ 23,711.92	323	$ 7,658,950.18
FY 2025	9	28	$ 193,994.00	$ 6,928.36	157	$ 1,087,752.07

Example Annual Verifications

- Surfaces
  - 24 dense graded mixes (D-GR or SP)
  - 5 permeable friction courses (PFC)
  - 3 thin overlay mixes (TOM)
  - 9 stone matrix asphalt (SMA)
  - 1 TOM & PFC combination
  - 1 concrete

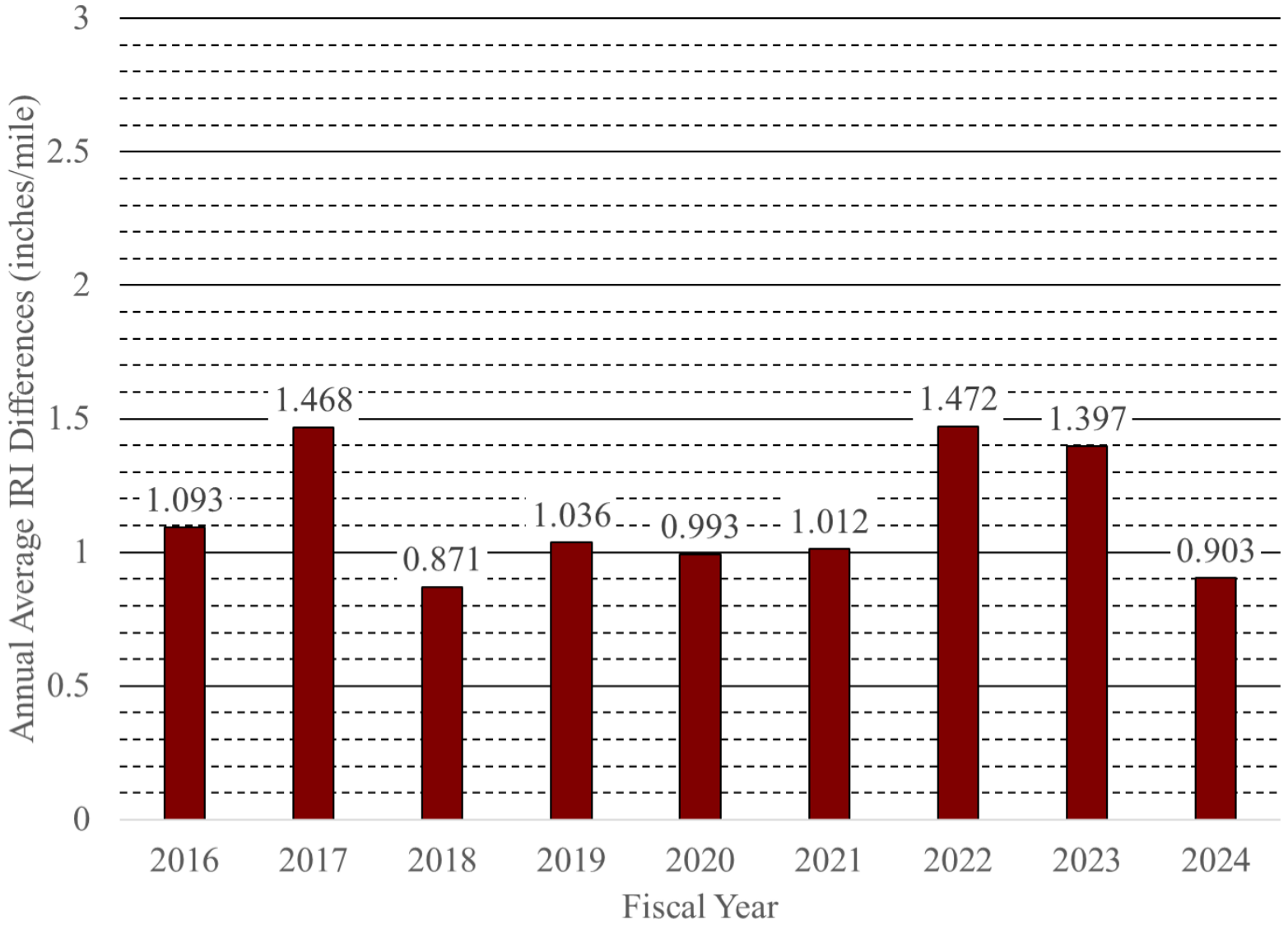
- 43 verifications
- 30 different prime contractors
- 22 TxDOT Districts

FY 2022

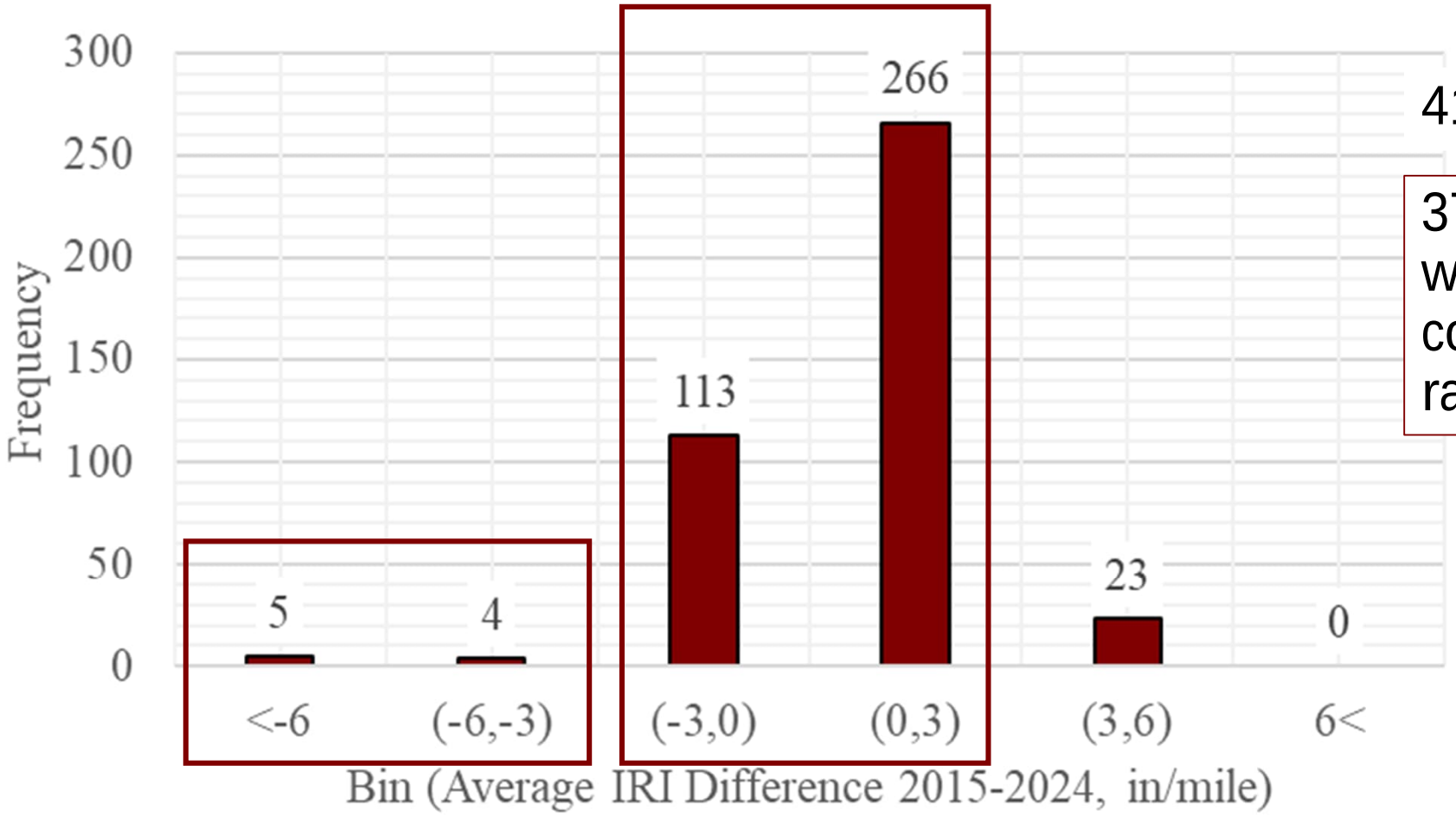


- Pay Schedules
  - 16 – PS 3
  - 14 – PS 2
  - 12 – PS 1
  - 1 – PS 1 & PS 2

Verification Results



10-Year Results Summary



411 Verifications

379 (92%) fall within the “use contractor data” range

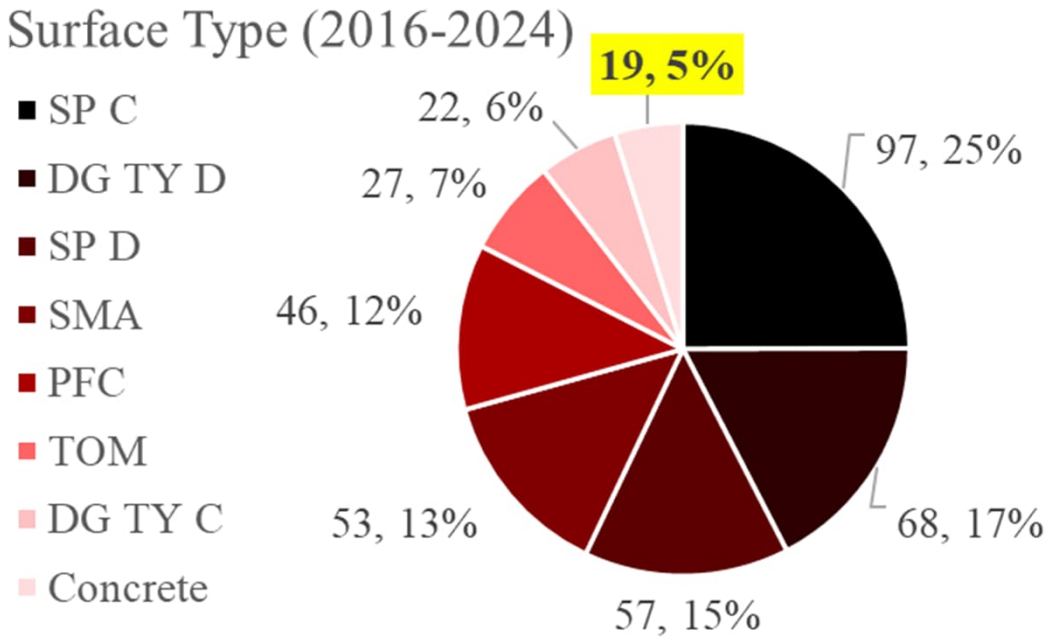
What causes large IRI differences?

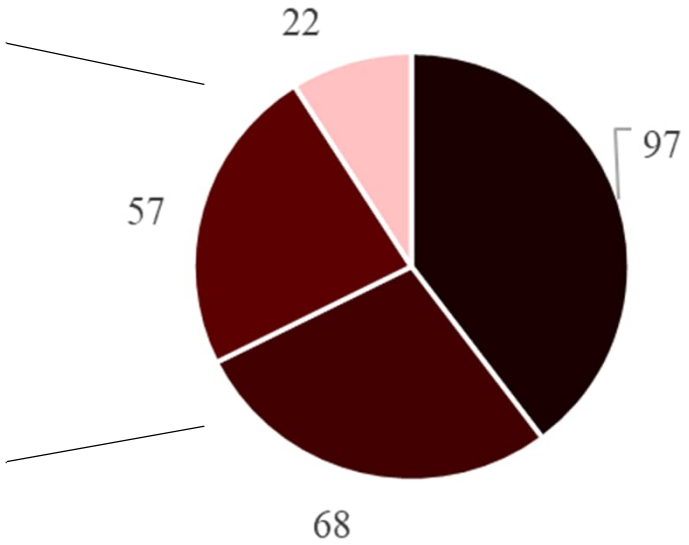
- Wheel path tracking
  - Permanent striping
  - Curb and gutter
  - Metal Beam Guard Fence Work
- Roadway cleanliness
- Shorter projects

Verification Testing. The Engineer may perform ride quality verification testing within 10 working days after the Contractor's QA testing is complete for the project or major stage of construction. When the Department's profiler produces an overall average international roughness index (IRI) value of more than 3.0 in. per mile higher than the value calculated using Contractor data, the Engineer will decide whether to accept the Contractor's data, use the Department's data, use an average of both parties' data, or request a referee test. Referee testing is mandatory if the difference is greater than 6.0 in. per mile.

Pavement Surfaces

- TxDOT maintains over 80,000 centerline miles (200,000 lane miles)
  - Approx. 10% is concrete





SP C, DG TY D, SP D, DG TY C
244, 63%

Lessons Learned

- Timely submission of data is key
  - The spec. requires prior approval before QA testing and data submission within 24 hours of testing
- The initial project list might not be comprehensive
- The unpredictable progress of highway projects limits a structured project selection process and requires continual monitoring of active paving projects
- Annual verifications will include projects that began across multiple years
  - The previous year will constitute the plurality or majority of verifications

Lessons Learned – Concrete Projects

- Concrete projects are challenging to verify
  - Long construction durations
    - Phased construction
  - Multiple quality control (QC) runs
    - Surface grinding between QC runs to eliminate corrective work locations
  - Delayed submission of data

Lessons Learned

- Proper wheel path tracking is key (especially in curb and gutter sections)
  - The engineer should only grant approval for QA testing if permanent striping is in place
  - The engineer should also consider if additional roadside work is required
  - Ask: *Is this the final experience users of the roadway will encounter*
    - If the answer is no, delay QA testing
    - Specifications might need to be changed, or general notes provided

Future Work

- Online portal for data submission
  - Assist with randomness
  - Assist with verification on concrete projects
- Modify the specification to begin the verification clock upon data submission
- Online reporting platform
  - Map based
  - Data repository for year-over-year verifications
- Analysis of ride quality longevity

Ride Quality Longevity

Construction Scope	No. of Sections	Avg. LT WP IRI (in./mi.)	Avg. RT WP IRI (in./mi.)	Avg. WP IRI (in./mi.)
Mill & Fill in Outside Lane of C&G	188	55.2	83.0	69.6
Mill & Fill not Constrained by Gutter	535	52.6	57.6	55.1
Scarify & Reshape Base with Overlay ≥ 1.5 in.	228	52.2	55.9	54.1
Overlay ≥ 1.5 in.	4259	45.9	48.1	47.0
Mill & Overlay with HMA ≥ 1.5 in.	1805	48.8	49.4	49.1
Overlay < 1.5 in.	918	50.0	53.0	51.5
Multiple Lifts of HMA ≥ 1.5 in.	515	35.4	37.4	36.4
Continuously Reinforced Concrete	318	92.9	93.8	93.0

Comments or Questions

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Thank you!

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