



# Case Study on Friction Management

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- Federal Mandate
  - “Every State shall have a program of design, construction and maintenance to improve highway safety.”
  
- Frictional Management
  
- Department Responsibility
  - Wet Surface Crash Reduction Program



- Skid Data Collection (Macrotexture)
- Aggregate Selection (Microtexture)
- Wet Surface Crash Analysis
- Safety Projects and Cost Effective Treatments

# Skid Data Collection (Macrotexture)

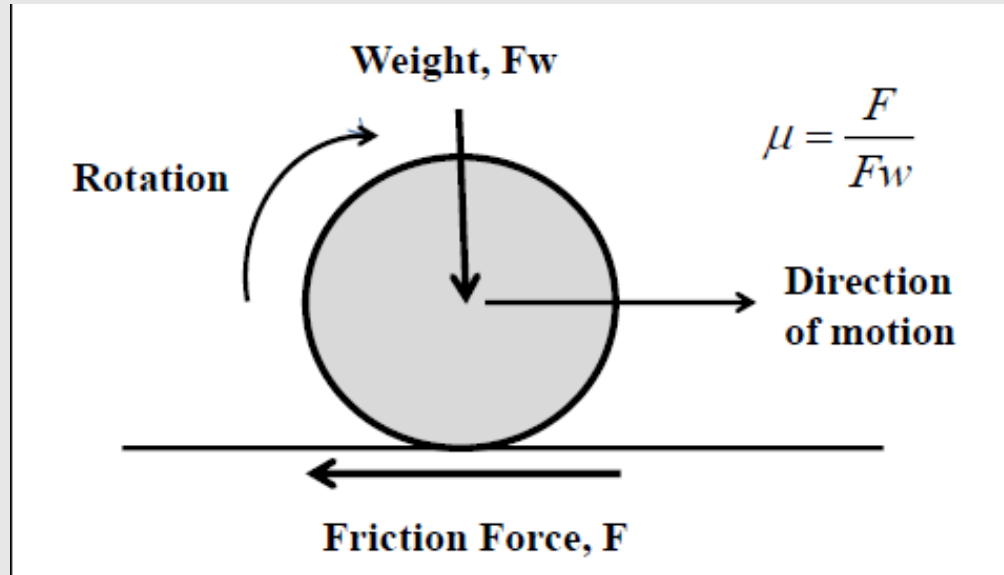


- Locked Wheel Skid Truck ASTM E-274





- Smooth Tire (ASTM E-528)
- Speed 50 mph (SN50)
- Sample Size
  - 50 percent of the interstate
  - 25 percent of all other systems
  - Recently completed projects identified by districts



The skid number equals the horizontal tractive force divided by the vertical load, multiplied by 100.



# Skid Number





# Interpreting Skid Number



Category	Definition
Blue	Mean and Above
Green	-0.5 - 0.0 Std. Dev.
Yellow	-1.0 - -0.5 Std. Dev.
Orange	-1.5 - -1.0 Std. Dev.
Red	Less Than -1.5 Std. Dev.

# Aggregate Selection (Microtexture)





# Aggregate Selection (Microtexture)



- Rainfall (inches per year)
- Traffic volume (ADT, vehicles per lane, etc.)
- Posted speed
- Geometrics (both number and severity of horizontal and vertical curves, super elevation, etc.)
- Frequency of vehicle stops (driveways, crossroads, etc.)



- Amount of cross traffic
- Amount of truck traffic (percent, number ESALs)
- Surface texture (rough, smooth, etc.)
- Drainage characteristics (cross slope, ponding, rutting, etc.)
- Visibility restrictions (sight distance)
- Crash history

# Friction Demand



Demand for Friction	Low (1)	Medium (2)	High (3)	Designer's Rating (1,2, or 3)
Rainfall (in./yr.)	$\leq 20$	$>20 \leq 40$	$>40$	
Traffic (AADT)	$\leq 5,000$	$>5,000 \leq 15,000$	$>15,000$	
Posted Speed (mph)	$\leq 35$	$>35 \leq 60$	$>60$	
Truck (%)	$\leq 8$	$>8 \leq 15$	$>15$	
Vertical Grade (%)	$\leq 2$	$>2 \leq 5$	$>5$	
Horizontal Curve	$\leq 3^\circ$	$>3^\circ \leq 7^\circ$	$>7^\circ$	
Driveways (per mi.)	$\leq 5$	$>5 \leq 10$	$>10$	
Intersecting Roadways (ADT)	$\leq 500$	$>500 \leq 750$	$>750$	
Wet Surface Crashes (%)	$\leq 5$	$>5 \leq 15$	$>15$	
<b>Summary of Total Friction Demand</b>				

# Available Friction



Available Friction	Low (1)	Medium (2)	High (3)	Designer's Rating (2, 5, or 8)
Cross Slope	$\leq 2\%$	$> 2\% \leq 3\%$	$> 3\% \leq 4\%$	
Surface Design Life (yrs.)	$> 10$	$> 5 \leq 10$	$< 5$	
Micro-texture of Proposed Surface	Fine  Examples: HMAC Type D or HMAC Type F	Medium  Examples: Microsurface HMAC Type C, CMHB, Superpave	Coarse  Examples: Seal Coat, PFC, NovaChip, SMA	
Aggregate Micro- texture	SAC C	SAC B	SAC A	
<b>Summary of Total Available Friction</b>				

**Does the total available friction equal to or exceed frictional demand?**



# Wet Surface Crash Analysis



- Identification of Wet Surface Crash Sites
  - Wet Surface to Total Crash Ratio
  - Rural Roadway Section - Three (3)
  - Urban Roadway Section - Six (6)
  
- Wet Surface Crash Site Review

# Wet Surface Crash Analysis



- Office Review Process
  
- Field Review Process
  - Site evaluation
  
  - Resulting actions and recommendations



# Wet Surface Crash Site Review



- Rutting or wheel path channelization
- Build up on shoulder edges that causes ponding on the road surface
- Bleeding of pavements



# Wet Surface Crash Site Review



- Drainage issues that result in water on the pavement
- Geometrics (grade & curvature)
- Traffic flow interactions (intersections, ramps, access drives)





- Re-surface
  - Overlays (PFC, SMA, Ultra Thin Bounded Overlay, TOM mix)
  - Chip Seal/Seal Coat
  - Microsurfacing
  
- Re-texture
  - Grinding & Grooving
  - Skid Abrador

# Wet Surface Crash Analysis Data in PA



Secure | [https://txpms.agileassets.com/PMS\\_TX/Kernel/w\\_main.jsp?AA\\_SID=8959c350-ccf8-4f25-980c-6d1b5c50dc73](https://txpms.agileassets.com/PMS_TX/Kernel/w_main.jsp?AA_SID=8959c350-ccf8-4f25-980c-6d1b5c50dc73)

Pavement Mgmt | Database ▾ Analysis ▾ Reports ▾ Setup ▾ Utilities ▾ GIS ▾

MMIKHAI

Save Data Retrieve Data

- Condition Data ▾
- Construction ▾
- Crash Information System Data ▾**
  - Crash Data
  - Wet Surface Crash Reduction Data
  - Wet Surface Crash Reduction Map Data
- Inventory ▾
- Static Tables ▾
- TxPROS Permits

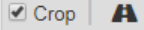
# Wet Surface Crash Analysis in PA



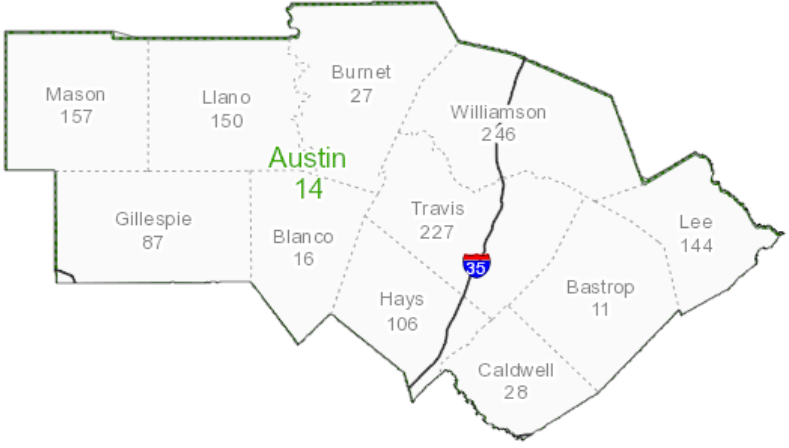
Wet Surface Crash 4YP



DISTRICT\_NAME = 14 - A...



- Layers
- + Layer + Group Map Filter
  - FY2016-TOTAL WET PAVEMENT CRASHES
  - FY2016-TOTAL CRASHES
  - FY2016-PCT Wet surface Crashes
  - FY2016-RAW SKID DATA
  - FY2015-RAW SKID DATA
  - FY2014-RAW SKID DATA
  - FY2013-RAW SKID DATA
  - REFERENCE MARKERS
  - TXDOT ROUTES



Base Map: TxDOT Basemap



# PA Skid Data and Report



## Skid Data Table

The screenshot shows the 'Pavement Mgmt' software interface. The 'Database' menu is expanded, and the 'Skid Data' option is highlighted. The sub-menu for 'Skid Data' includes the following items:

- Condition Summary
- Rut Data
- Ride Data
- Skid Data** (highlighted)
  - Skid Data Table
  - Skid Graph Down the Road
  - Skid Sections Overdue
  - Skid Data Collection Status Table
  - Skid Data Collection Status View
- Structural Strength Data
- Automated Distress

## Critical Value Ratings and Scores Report

MSEC	HIGHWAY	RDBD	REFERENCE MARKERS				PAVE TYPE	RUT AUTO SHAL	RUT AUTO DEEP	PAT	FAL	BLK	ALG	LNG	TRN	RAV	FLU	ADT (RDBD)	18K (K)	MAINT COST (K)	DATE LAST SURF	PMIS SCORES				
			BEGIN	END	BEGIN	END																DIS	RIDE	SSI	SN	CON
03	██████	K1	0228	+00.5	0228	+01.0	5	2	0	0	0	0	0	3	0	0	0	4760	3443	5		100	4.4	23	100	
03	██████	L1	0220	+00.0	0220	+00.5	5	19	1	0	0	0	6	1	0	3	3	1951	1552	3		77	3.3	20	77	
03	██████	L1	0222	+01.0	0222	+01.5	5	5	4	10	0	0	3	0	0	2	3	2161	1498.5	3		89	3.3	15	89	




Browser: <http://txdot4azpvap1/pathweb/?cycle=FY%202017&route=FM> PathWeb

File Edit View Favorites Tools Help  
Share Browser WebEx

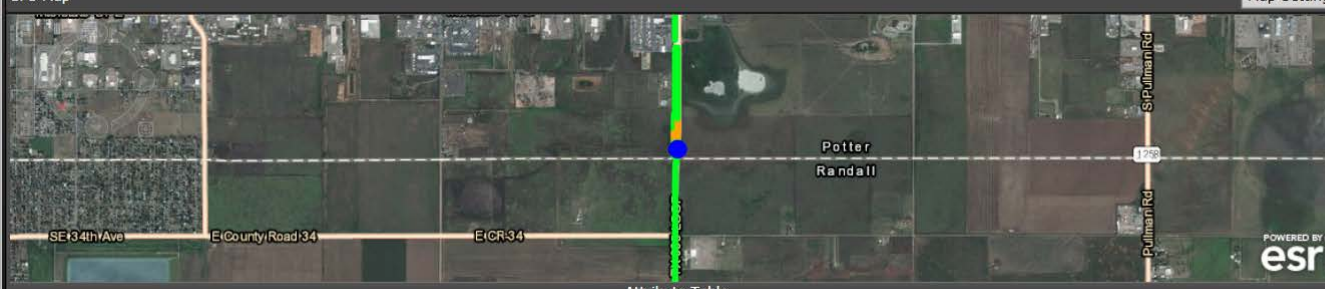
Find Road Section Help Change Direction Share this Location Save Current Images

Roadway




Route SL0335 L | County 188 | Milepost 26.853 | Dir Decreasing | Date 09/24/17

GPS Map Map Settings



Attribute Table

Road Surface



Surface Elevation

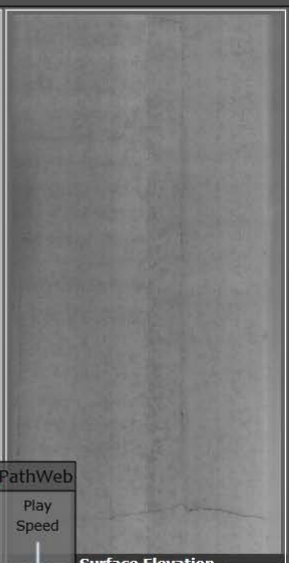


Image Control PathWeb

- Perspective
- Right Shoulder
- Left Shoulder
- Rear View
- Road Surface
- IRI Graph
- Trans Profile Graph
- GPS Map

Play Speed

0.0 ft. Change Skip

Route: SL0335 L  
Direction: Decreasing  
Milepost: 26.853  
Latitude: 35.18383193  
Longitude: -101.74224883  
Ver. 2.6.10.0

# Skid Data With 4 Year Projects



PingOne x NGM / Entire Organization / ZLI x

https://txpms.agileassets.com/PMS\_TX/Kernel/w\_main.jsp?AA\_SID=23e5473a-6f0a-4217-a997-e0a4ff7847be&window\_id=ngm\_window

Pavement Mgmt Database Analysis Reports Setup Utilities GIS

Pavement Mgmt > GIS > GIS Explorer Save Reload

4-year Skid Data with Combined 4-year Projects 2019

Layers: + Layer + Group Map Filter

- FY2019 DCIS 4-YEAR Projects
- FY2019 MMS 4-YEAR Projects
- FY2018-RAW SKID DATA
- FY2017-RAW SKID DATA
- FY2016-RAW SKID DATA
- FY2015-RAW SKID DATA
- TXDOT ROUTES
- REFERENCE MARKERS

Base Map: TxDOT Basemap

60km  
30mi



