Pub 638 Updates
First Contact

I guarantee the next 25 minutes will be a first time experience for each of you.

2018 Transportation Engineering and Safety Conference
Session 2A: Highway Safety – The Final Frontier
December 4, 2018; 3:30-5:30PM

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Preparing for Warp Drive

We are going to talk about PennDOT Pub 638A or the…

Statewide

Predictive

Analysis

Methods

Manual

Manual

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Preparing for Warp Drive

- Who has tried SPAM?

“DON’T KNOCK IT ‘TIL YOU’VE FRIED IT”

- What does SPAM stand for?

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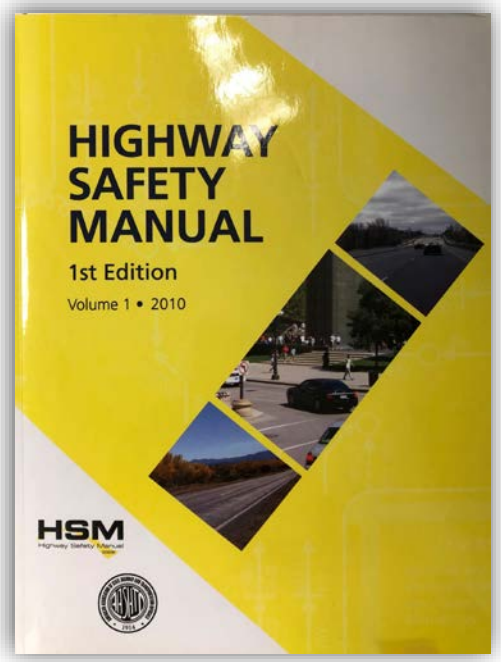
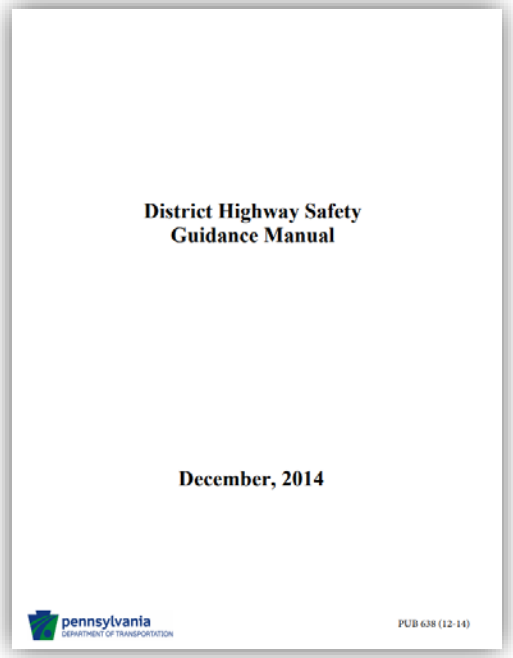
Preparing for Warp Drive

- Who has never seen an episode of Star Trek?
- Who has ever opened the AASHTO Highway Safety Manual?
- Who has ever heard of the PennDOT Publication 638: District Highway Safety Guidance Manual?





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The Bridge of the Starship USS Enterprise (i.e. Agenda)

- PA Highway Safety: Past, Present, Future
- Publication 638 Series Overview
- Safety Performance Functions?
- PA's Safety Tools and Resources
- Uses/Limitations/Expectations

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PA Highway Safety: Past, Present, Future

Reactive Decision Making

Audits, observed crashes, crash rates, and homogeneous comparisons

Table 1. Primary Analysis Application for Safety Assessment Methods

Application	Basic				Intermediate		Advanced
	Site Evaluation or Audit	Historical Crash Data Evaluation	CMFApplied to Observed Crashes	CMF Relative Comparison	AADT-Only SPF	SPF with CMF Adjustment	SPF with CMF Weighted with Observed Crashes
	Observed Crashes				Predicted Crashes		Expected Crashes
Performance of an Existing Road	1	1, 2	1, 2, 3	1, 3	1, 4	1, 3, 4	1, 2, 3, 4
Future Impact of Minor Geometric Changes to Existing Road			1, 2, 3	1, 3		1, 3, 4	1, 2, 3, 4
Future Impact of Major Geometric Changes to Existing Road						1, 3, 4	
Future Performance for a New Facility					1, 4	1, 3, 4	

Note: AADT = average annual daily traffic. CMF = crash modification factor. SPF = safety performance function.
Basis for Analysis: 1 = site characteristics, 2 = crash history, 3 = CMF values, and 4 = AADT.

FHWA, Scale and Scope of Safety Assessment Methods in the Project Development Process, November 2016

Predictive Decision Making

Statistics, baseline facilities, site specific adjustments, location calibrations, benefit comparisons, prioritizations

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PA Highway Safety: Past, Present, Future

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Publication 638 Content Overview

Table of Contents (Today)

- Chapter 1 – Introduction
- Chapter 2 – Plans, Programs, Activities
- Chapter 3 – Safety Related Functions
- Chapter 4 – Crash Data
- Chapter 5 – Studies and Countermeasures
- Chapter 6 – Other Safety Topics
- Appendix A – District Safety Plans
- Appendix B – Yield to Pedestrian Devices
- Appendix C – Crash Data Resources
- Appendix D – Resources
- Appendix E – SPF Guide
- Appendix F – Crash Modification Factors
- Appendix G – SPF Equations, CMF Guide

617 Pages

Table of Contents (Soon)

- Chapter 1 – Introduction
- Chapter 2 – Plans, Programs, Activities
- Chapter 3 – Safety Related Functions
- Chapter 4 – Crash Data
- Chapter 5 – Studies and Countermeasures
- Chapter 6 – HSIP Guidance
- Chapter 7 – District Safety Plans
- Chapter 8 – Other Safety Topics
- Appendix A – Yield to Pedestrian Devices
- Appendix B – Safety POCs
- Appendix C – Resources

258 Pages

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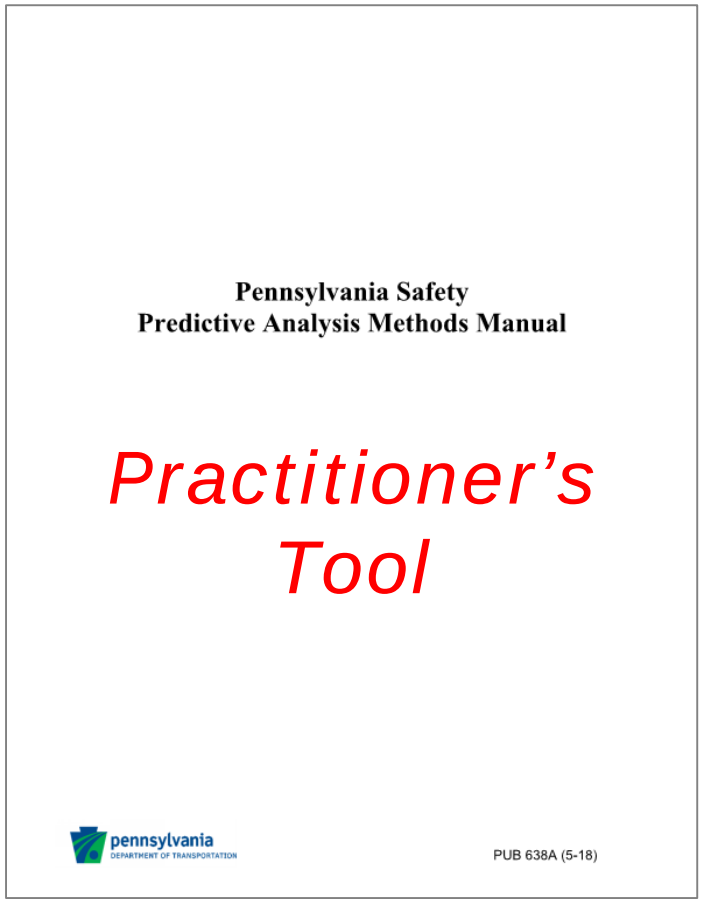
Publication 638A Content Overview

- **Table of Contents**
  - Chapter 1 – Basics
    - Predictive Method
    - Empirical Bayes Method
    - PA vs. AASHTO Differences
    - Defining Analysis Sections
    - CMF Evaluations
  - Chapter 2 – Utilizing Pennsylvania Regionalized Safety Performance Functions for the HSM Part C Predictive Method
  - Appendices
    - A – Roadside Hazard Rating Determination
    - B – Degree of Curvature per Mile Determination
    - C – Example Calculations



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638A, Chapter 2: Safety Performance Functions?

- **Safety Performance Function (SPF)**: a statistically derived equation that estimates (or predicts) the average number of crashes per year likely to occur on a roadway of a particular type.
- Penn State University developed Pennsylvania Regionalized SPFs. 90 total SPFs were developed for 15 (19) different intersection and segment types. 20 now in 638A to include rural freeway segment.

Predicted Number of Crashes using SPF = Short Preliminary Equation x Base Condition Adjustment Factors

The PennDOT Regionalized SPF equations typically take the following form:

$$N_{spf} = (e^{x} \times AADT^{x} \times L) \times e^{0.0115 \times RHR4} \times e^{0.16 \times PZ_x} \times e^{0.01 \times AD} \ldots\ldots$$

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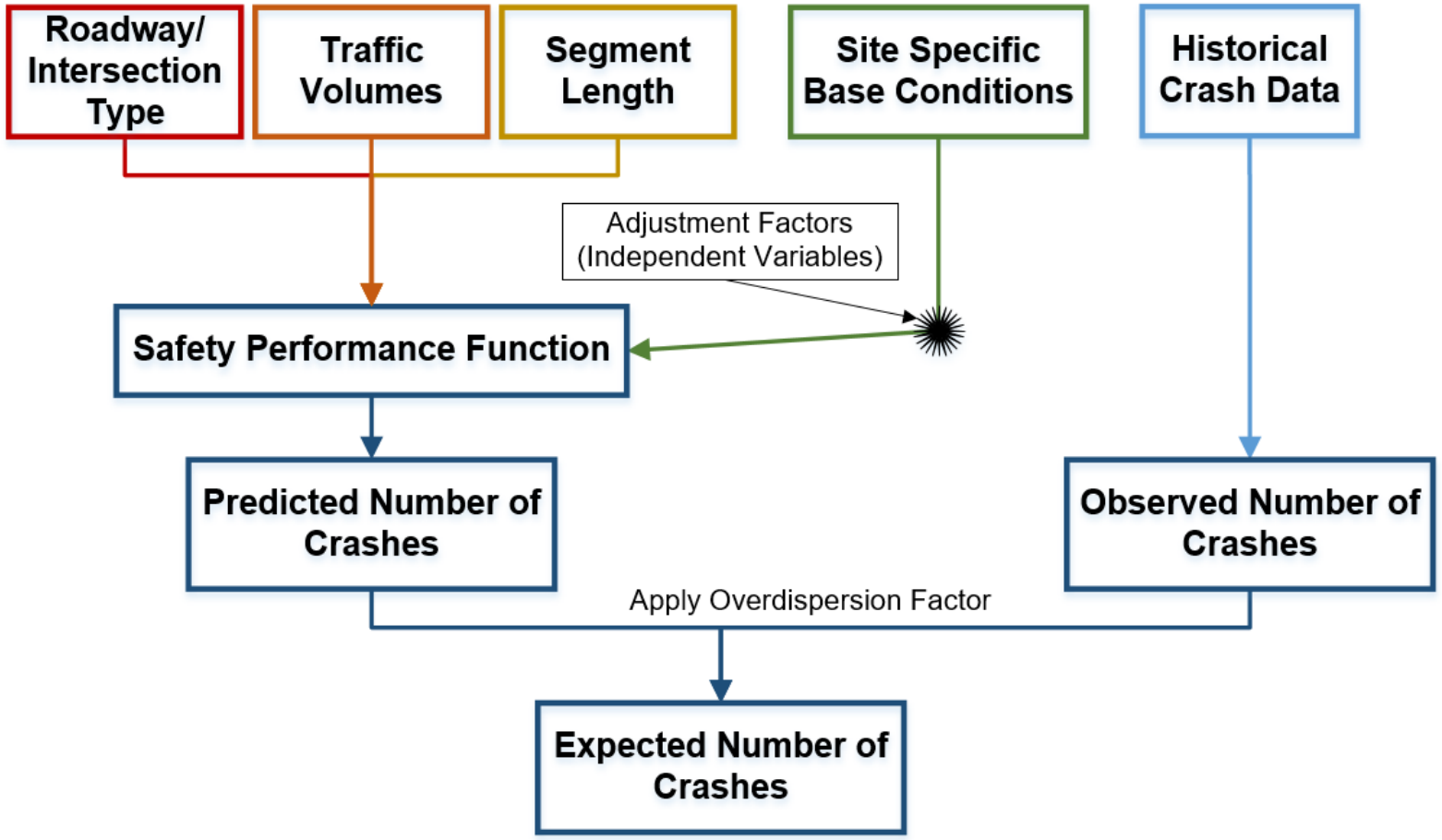
Role of the SPF



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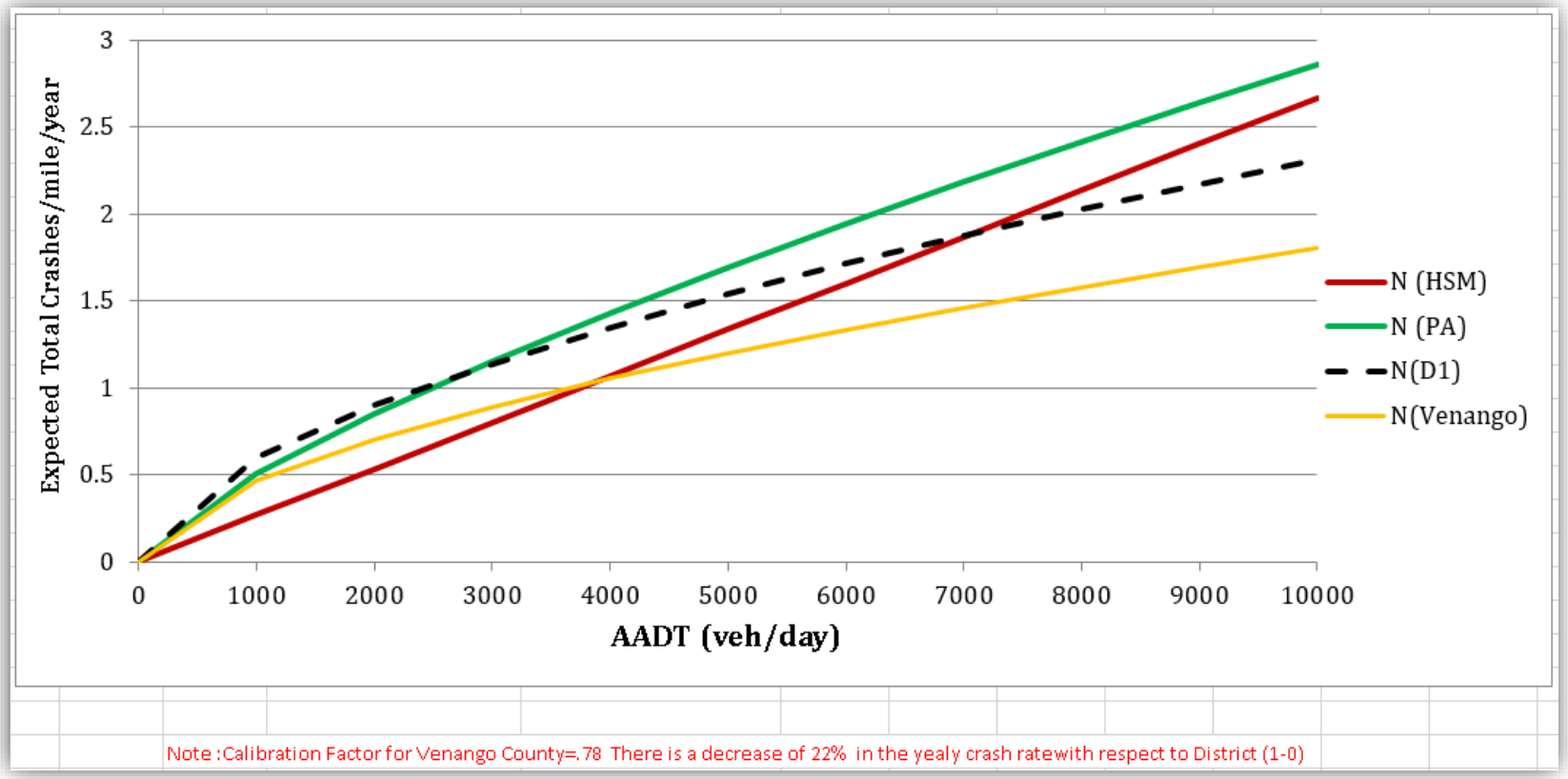
Why Regional Safety Performance Functions?

- There can be a major difference in values between the National, State, District, and County level SPFs.



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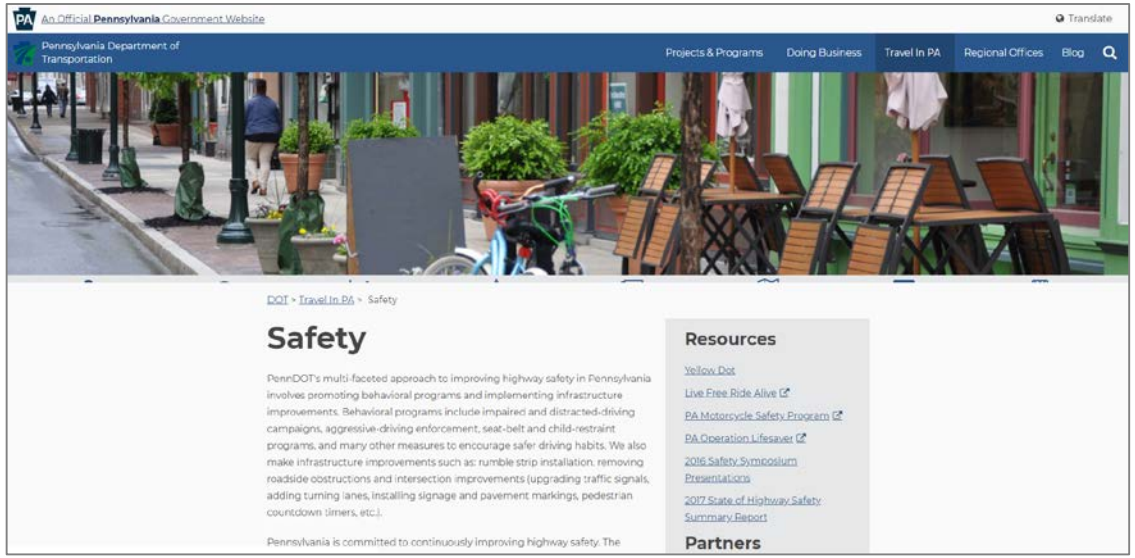
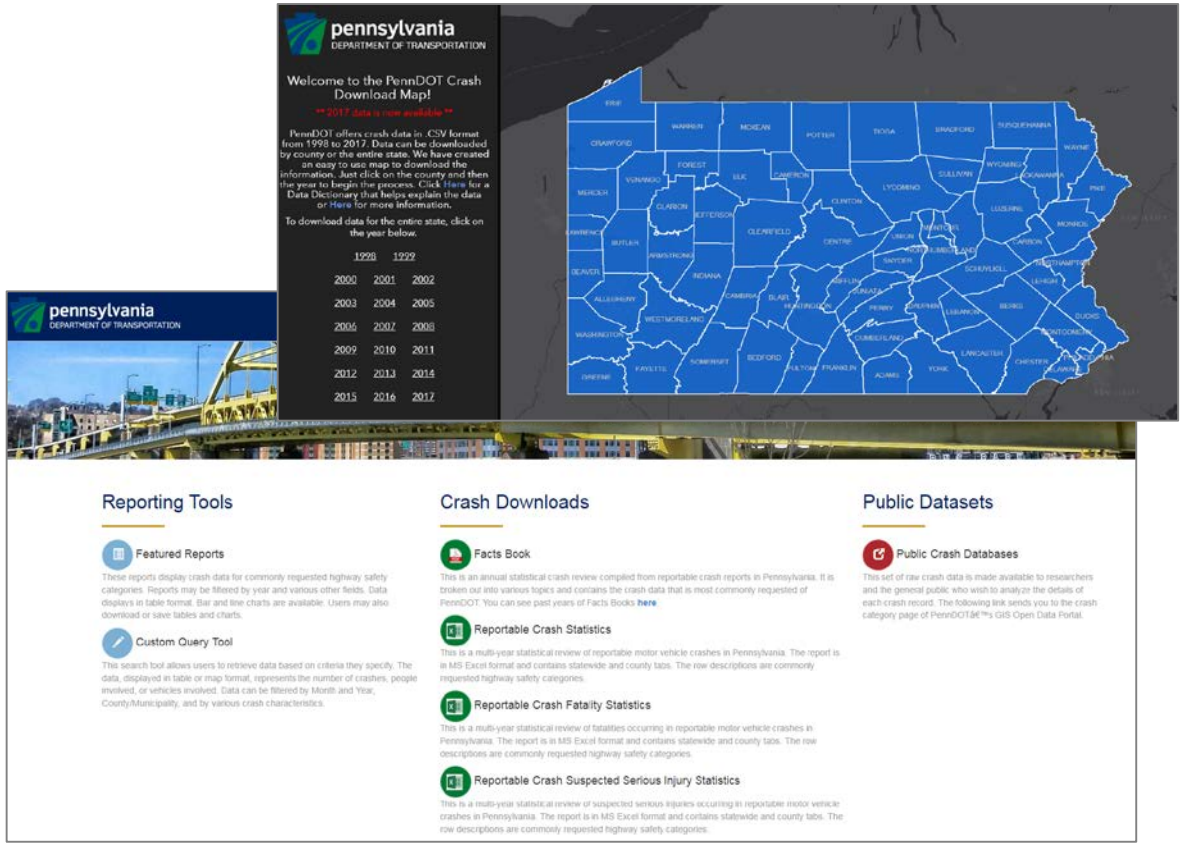
Supporting Safety Tools



https://www.penndot.gov/TravelInPA/Safety/Pages/default.aspx



https://crashinfo.penndot.gov/PCIT/welcome.html

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Supporting Safety Tools

PA HSM tools & resources are available at:

- ECMS website's references/file cabinet or
- PennDOT's Safety Website

Centerline, Edgeline and Shoulder Rumble Strips

Rumble strips are raised or grooved patterns that differ in texture from the road surface and produce a rumbling sound and cause the vehicle to vibrate when a vehicle's tires pass over them. The noise and vibration produced by rumble strips are effective alarms for drivers who are leaving their lane of the roadway. The number of fatalities in head-on crashes has declined by 50 percent since 2000 thanks to the installation of more than 6,000 miles of centerline rumble strips.

Warning of Curve Ahead

PennDOT enhances advanced curve warning through the use of pavement markings applied directly to the roadway, as well as signs indicating curve ahead.

PENNSYLVANIA HIGHWAY SAFETY MANUAL (HSM) TOOLS & DATA

PennDOT HSM Analysis Tools
(LAST UPDATED OCTOBER 2018)
Tool A (Existing Condition Analysis) (EXCEL)
Tool B (Alternatives Analysis) (EXCEL)
User Manual (PDF)
Pennsylvania CMF Guide (PDF)

Supplements (Part D CMFs)
Tool B Lane & Shoulder Width (EXCEL)
Tool B Intersection Skew(EXCEL)

Data
State Road Horizontal Curve Inventory (2017) (EXCEL)
Local Road Traffic Counts (2018) (EXCEL)

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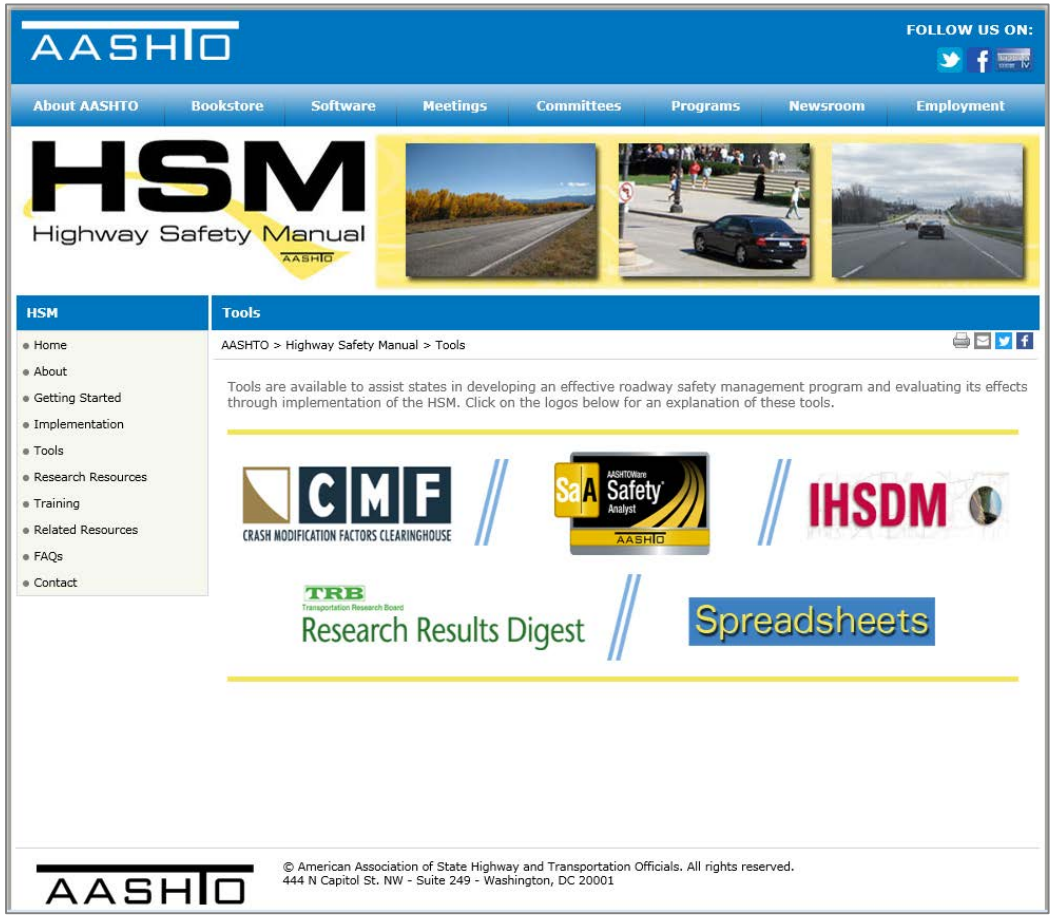
Supporting Safety Tools

National Options

- CMF Clearinghouse
- IHSDM
- ISATe
- HSM Spreadsheets



Free & available at:

http://www.highwaysafetymanual.org/Pages/Tools.aspx

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Uses & Limitations

- Not all facilities have a regionalized SPF or AASHTO SPF
- Freeways, ramps, and ramp terminals = 2014 HSM supplement
  - Currently working to have these SPFs calibrated for use (circa Feb. 2019)
- Definitions of ‘segment’ depending on HSM vs PA SPFs
- EB formulas differ because of differences calculating over-dispersion parameter (i.e. where ‘L’ is part of calculation)
- One-way facilities are excluded
- Developing Urban/Suburban Collector Facility SPFs (no other state nor AASHTO have these at this time)
- Adjustment Factors can change between counties (i.e. a passing zone adjustment factor)
- Urban area with tight intersection spacing can lead to inappropriate segment calculations

Expectations

- HSM2 anticipated for release in 2020
  - The following measures will be removed:
    - Average Crash Frequency
    - Crash Rate
    - Equivalent Property Damage Only (EPDO) Average Crash Frequency
    - Relative Severity Index
  - The following will be changed in the HSM2
    - Level of Service of Safety
- Policy and guidance for when to use the HSM on projects is included Chapter 5 and Chapter 6.

Questions

- Jason Hershock, PennDOT Highway Safety Section
  717-705-1437, jhershock@pa.gov
- Todd Trautz, P.E., PTOE, Michael Baker International
  717-254-0544, Todd.Trautz@mbakerintl.com

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