WisDOT's Safety Certification Process

2019 TZD Conference

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TOWARD ZERO DEATHS

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Agenda

- Why performance-based practical design (PBPD)?
- What is PBPD?
- WisDOT Safety Certification Process
  - Application of PBPD
- Status of Safety Certification Process

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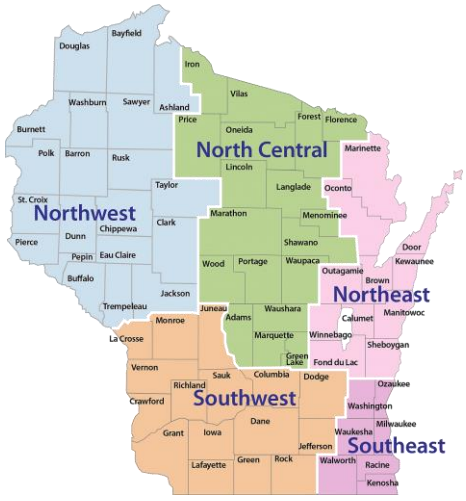
Wisconsin Department of Transportation



- 5 regions
- 72 counties
- Maintains 1,600 CL miles of freeway
- Maintains 10,200 CL miles of non-freeway roads
- $1.2B annual construction budget

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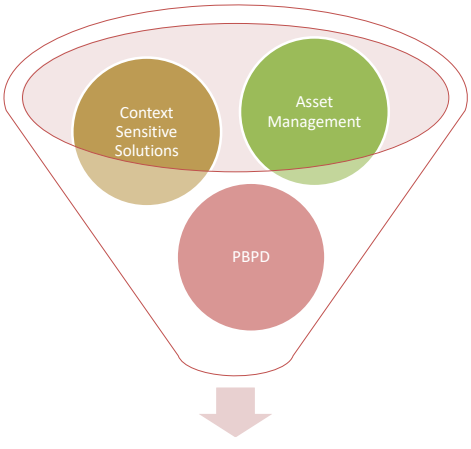
Why Performance Based Practical Design (PBPD)?



System Performance

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Asset Management

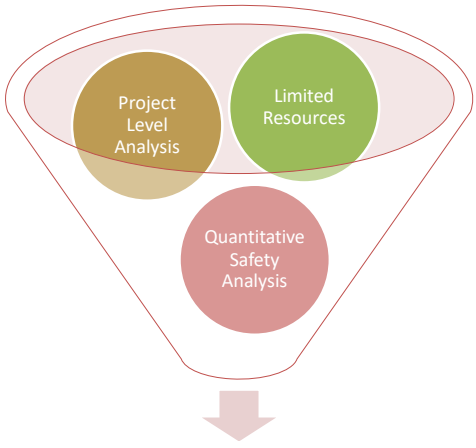
"Asset": if you own it and spend public dollars to maintain, improve, or replace it, it's an asset that needs to be managed

How each public agency decides to manage those assets is a fundamental core responsibility

Renewed Focus on Efficient Asset Management

- Blend financial realities with analysis to prioritize improvements
- Goal is to be more efficient with transportation dollars
- Eliminate nonessential project design elements
- Focus on data-driven decision making

What is Performance Based Practical Design?



Performance Based Practical Design

Performance–Based Practical Design

- Breaks from traditional design by “fixing only what is broken”
- Substandard ≠ deficient
- Uses data to drive the decision making process
- Focus on cost-effective solutions
- Safety:
  - Uses **substantive safety** instead of nominal safety

Substantive Safety vs Nominal Safety

Nominal Safety – Assumes if you utilize standard values published in reference resources (e.g. AASHTO "Green Book") the roadway will be "safe"

Substantive Safety – relies on data-driven tools like databases and the Highway Safety Manual (HSM) to perform predictive analysis of safety performance

FHWA PowerPoint (Every Day Counts) "Data-Driven Safety Analysis –Nominal vs. Substantive Safety" by John McFadden, P.E.

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Quantitative Analysis vs Standards

WisDOT moved from a standard-based (nominal safety) approach to an analysis-based (substantive safety) approach

- No longer uses a "cook book" approach that starts with desirable design values
- Solutions will be specifically designed for individual situations to focus on meeting a project's **specific** purpose and need

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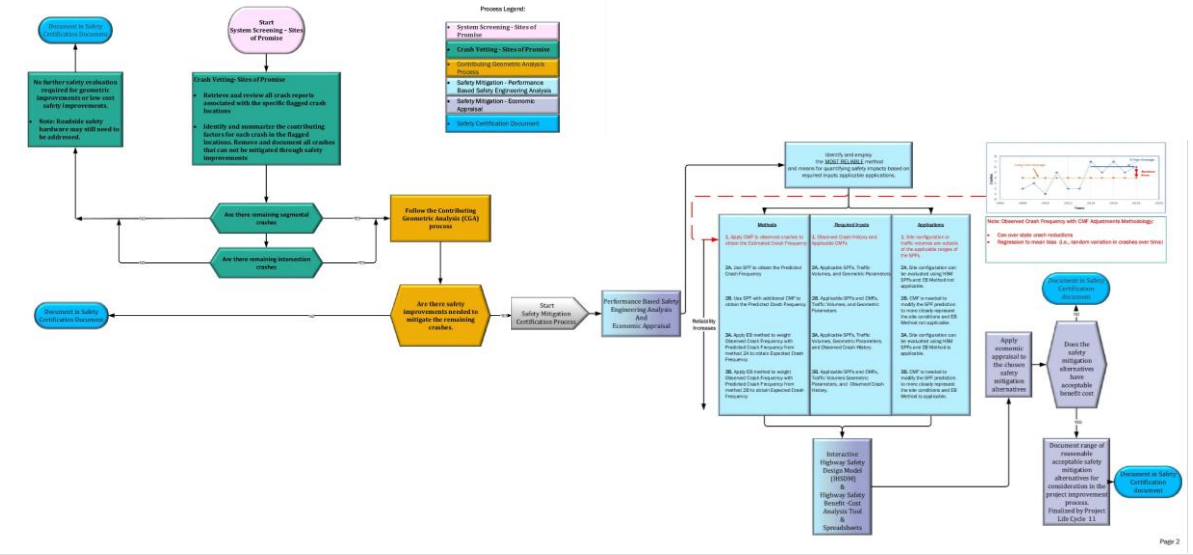
WisDOT Safety Certification Process – PBPD Application



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WisDOT Safety Certification Process (FDM 11-38)

Facilities Development Manual
Chapter 11 Design
Section 38 Safety Certification Process
Wisconsin Department of Transportation

Created to outline WisDOT SCP processes and procedures

- Completed for all highway improvement projects at the scoping level to determine need for safety improvements
- Perpetuate existing conditions if no safety problems
- Evaluate range of mitigation alternatives
- Quantify economic feasibility of alternatives

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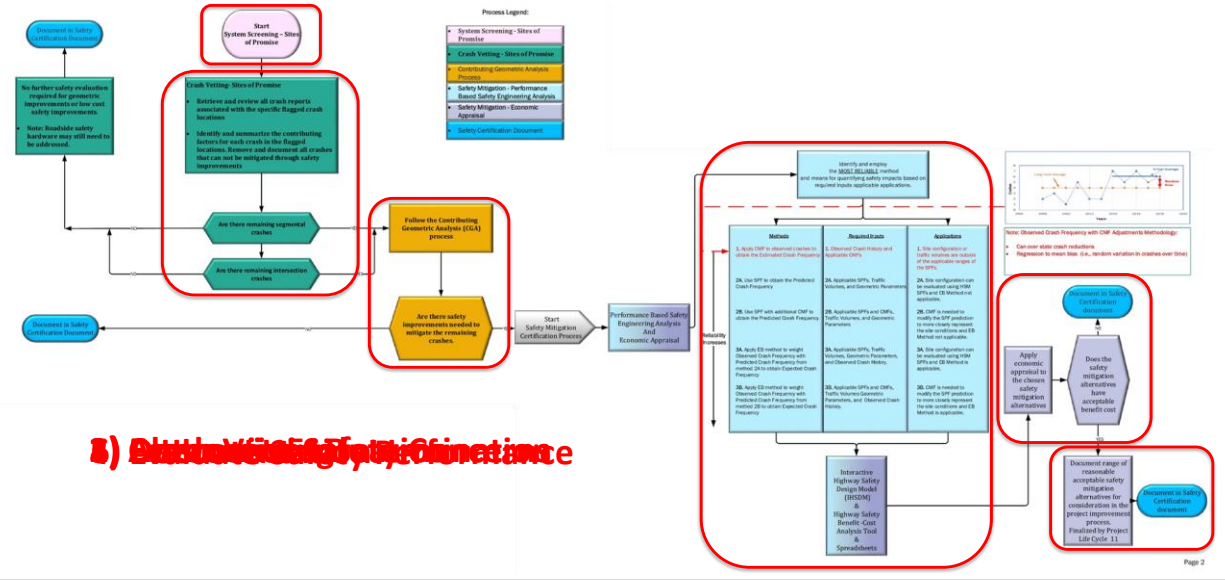
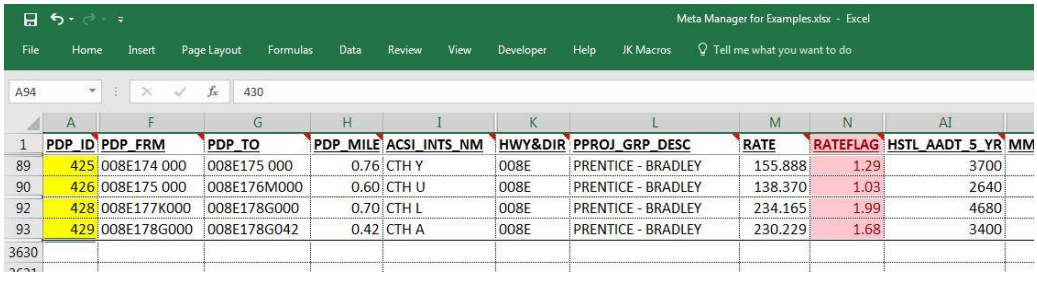
WisDOT Safety Certification Process (SCP)



1) Determine Potential Safety Concerns

- Project segment(s) or intersection(s) that require crash data analysis due to statistically-significant high crash rates and/or high KAB rates
- WisDOT – Meta-Manager database flags segments and/or spot locations



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90	426	008E175 000	008E176M000	0.60	CTH U	008E	PRENTICE - BRADLEY	138.370	1.03	2640
92	428	008E177K000	008E178G000	0.70	CTH L	008E	PRENTICE - BRADLEY	234.165	1.99	4680
93	429	008E178G000	008E178G042	0.42	CTH A	008E	PRENTICE - BRADLEY	230.229	1.68	3400
3630										

2) Crash Vetting

- Focus on crashes that can be mitigated with engineering solutions
- Review crash data for each flagged site to determine crash causation
  - Remove crashes without engineering solutions
- Identify crash trends and patterns

3) Alternatives Determination

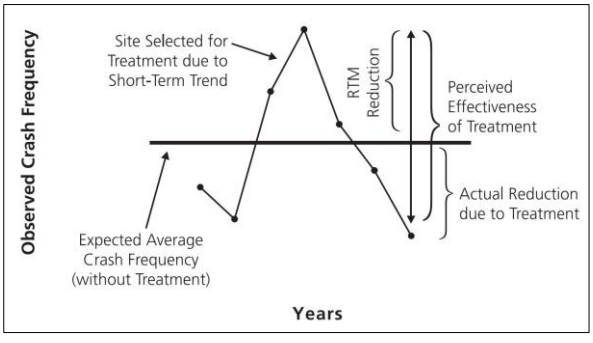
- Focus on practical mitigation alternatives
- Evaluate how geometric features may contribute to crash history
  - Functions as a secondary crash vetting
- Determine practical mitigation alternative(s) to evaluate

4) Evaluate Safety Performance

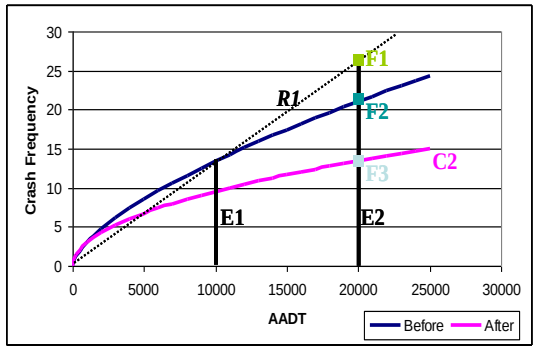
- Quantify future safety performance for comparison of the base (no-build) condition to the identified mitigation alternatives
- Use predictive crash modeling methods when applicable
- Concentrates on long-term average crashes rather than short-term trends (regression-to-the-mean bias)

4) Challenges with Past Safety Engineering Practices

- Regression to the mean bias



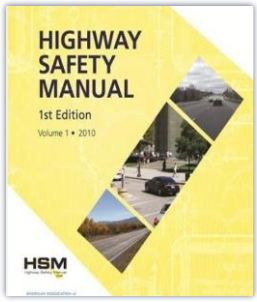
- Use of short-term rates and projects them into the future



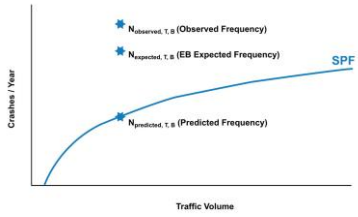
4) Evaluate Safety Performance

Use HSM methodologies to perform safety engineering analysis

- Use IHSDM to perform base and mitigation alternative crash prediction evaluations
- Estimated vs predicted vs expected crash frequency
- When CMF adjustments can be used and how they are applied to IHSDM results



IHSDM
Interactive Highway Safety Design Model



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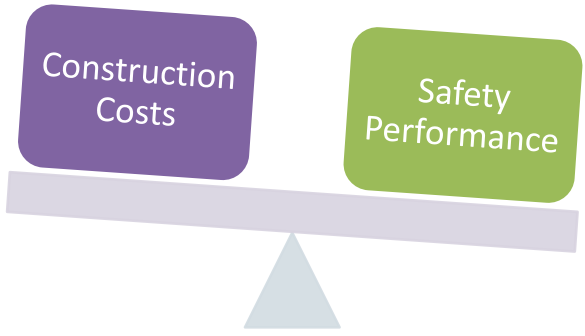
5) Economic Appraisal

- Quantify monetary change of crash frequency and severity changes
- Quantify benefit-cost of proposed safety mitigation alternatives
  - Construction and ROW costs
- Understand if mitigation makes economic sense from a safety perspective



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Next Steps

- Safety Certification Process completed during scoping
- Safety (via SCP) is not absolute in decision-making process
  - Traffic operations
  - Feasibility / constructability
- Improvements studied further in environmental process to determine preferred alternative
  - Mitigation evaluation should cover range of potential alternatives

Status of PBPD Application

- Rollout of WisDOT FDM 11-38 – November 2018
- PBPD training to WisDOT staff – November 2018
- All Regions are currently using PBPD at the scoping level for programmed projects
- Many Regions are currently using PBPD to study corridors for future project needs

Summary of WisDOT Safety Certification Process

- Renewed focus on asset management
  - Allows WisDOT to stretch available funding further
- Focuses on system performance and project needs
  - Completed at the scoping level
- Quantitative analysis and data driven decision making
  - Substantive safety vs nominal safety
  - Safety analysis uses advanced crash prediction
  - Benefit-cost analysis

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Questions?

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