

Systematic Approach to Intersection Safety Feb 2, 2010



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Safe Roads for a Safer Future Investment in roadway safety saves lives

Why Intersection Safety?

- □ A small part of overall highway system, but -
- □ In 2008 7,772 fatalities related to intersections
 - (21% of Total Highway Fatalities)
- Each year more than 3.17 million intersection crashes occur (over 55% of all reported crashes)





2008 US National Total Crash Characteristics

Crash Type	Total Cra	ashes	Fatal/Injury Crashes		
	Number	%	Number	%	
Non Intersection	2,638,000	45%	722,680	43%	
Stop/No control Intersection	984,000	17%	321,520	19%	
Signalized Intersection	55% 1,182,000	20%	57% 380,511	23%	
Unclassified	1,005,000	17%	240,306	14%	
Total	5,801,228	100%	1,637,476	100%	

Safety and Design National Technical

Source: US DOT: Traffic Safety Facts 2008 Early Edition & Compliation of motor vehicle crash data from FARS and GES, Table 29, Page 52

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2008 Traffic Fatalities (FARS)

	US	Pennsylvania	New Jersey
Total Fatalities	37,261	1,468	590
Roadway	19,794	901	216
Departure	(53%)	(61%)	(37%)
	7,772	260	206
Intersections	(21%)	(18%)	(35%)
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Systematic Approach to Intersection Safety

Rather than focusing on only a few intersections with the highest number of crashes – "Top Down" (typical HSIP program)

Systematic Approach focuses on the intersections with the majority of the crashes – "Bottom Up" Developing and Implementing Intersection Safety Plans

Implementing the "Systematic Approach to Intersection Safety"

South Carolina Louisiana Missouri Florida Indiana Mississippi **Georgia**

Systematic Approach to Intersection Safety by the States: Implementation Plans

□ Identify those intersections that make up 40 to 60% of state total crashes

Improve with low cost signing and marking and signal improvements: warning signs, double up, oversize, markings, Signal head per lane with backplates, etc.

□ Break down the improvements into a series of annual elements over 5 years

Systematic Approach to Intersection Safety

- Application of low cost counter measures:
- □ Signing and
- □ Marking and
- Minor Signal Visibility measures

- Rather than high cost geometric reconstruction of intersections

Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections

Intersection Safety Countermeasures











Safe Roads for a Safer Future

FHWA-SA-09-020

UNSIGNALIZED INTERSECTION SAFETY STRATEGIES





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Systematic Approach to Improving Intersection Safety



Intersection Safety: Clarify and Simplify

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Pennsylvania						
Intersection Crashes	Intersection Crashes			F	Fatalities	
2004-2008	Total		Percentage		Total	Percentage
State Rural		29,543		11.61%	508	29.57%
Signalized		4,018		1.58%	44	2.56%
Stop-Controlled		13,919		5.47%	309	17.99%
Unknown/Other		11,606		4.56%	155	9.02%
State Urban PA		147 100		57.83%	938	54.60%
Signalized		72,793		28.62%	419	24.39%
Stop-Controlled Signaliz	(ep	35,104		13.80%	285	16.59%
Unknown/Other		39,203		15.41%	234	13.62%
Local Rural		7,579		2.98%	32	1.86%
Signalized		551		0.22%	2	0.12%
Stop-Controlled Nationa		3,925		1.54%	8	0.47%
Unknown/Other	עי	3,103		1.22%	22	1.28%
Local Urban 20%		70,162		27.58%	240	13.97%
Signalized		19,986		7.86%	72	4.19%
Stop-Controlled		31,181		12.26%	94	5.47%
Unknown/Other		18,995		7.47%	74	4.31%
Grand Total		254,384		100.00%	1,718	100.00%



CRF = 28% total crashes CRF = 35% right angle crashes

*NCHRP 500, Strategy 17.2 D2: Improve Visibility of Signals

2 head for 2 Lt lanes 2 heads for 2 lanes

CRF = 28% total crashes CRF = 35% right angle crashes

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 D2: Improve Visibility of Signals

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*NCHRP 500, Strategy 17.2

Services Team

1 head for

1 Rt lane



- Place Primary Signal Heads over each Through lane Jackson, MS 4 approach lanes 4 signal heads

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Place Primary Signal Heads over each Through lane

Columbia, SC

Safety and Design National Technical Services Team **CRF = 28%**

total crashes





Add Supplemental Signal Head(s)



Supplemental Signal on span wire

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Add Back Plates



Systematic Approach to Intersection Safety -4. Signal Clearance Intervals:

1. Update Yellow Clearance Interval

NY study: 9% decrease in multivehicle crashes

*NCHRP 500, Objective 17.2 A2 – Optimize Clearance Intervals Yellow Time All-Red Time Table 13–2 Formula to Calculate Change + Clearance Interval Time Matric Values English Values in [1] $CP = t + \frac{V}{2a} + \frac{V}{20} \frac{V}{[64,4]g} + \frac{W+L}{V}$

where:

- CP = non-dilemma change period (Change + Clearance Intervals)
 - t = perception-reaction time (nominally 1 sec)
 - V = approach speed, m/s [ft/s]
 - g = percent grade (positive for upgrade, negative for downgrade)
 - a = deceleration rate, m/s² (typical 3.1 m/s²) [ft/s² (typical 10 ft/s²)]
- W = width of intersection, curb to curb, m [ft]
- L = length of vehicle, (typical 6 m) [ft (typical 20 ft)]

Source: Determining Vehicle Signal Change and Clearance Intervals, Publication IR-073, Washington, D.C.: Institute of Transportation Engineers, 1994. NY study: CRF =8% total crashes CRF = 12% injury crashes CRF = 39% ped crashes

Systematic Approach to Intersection Safety -5. Signal Coordination:

CRF = 12% to 38% of total crashes – 3 studies

CRF = 32% right angle crashes

*NCHRP 500, Objective 17.2 A4 – Employ Signal Coordination



Systematic Approach to Intersection Safety —Signal Example:



Ohio – 90th Worst Intersection for State – 184 crashes in 3 years

Systematic Approach to Intersection Safety Signal Example:

Identify Underlying Crash Cause: AIRS Crash Data identified 85% of Crashes were Red Light Running

Apply two guiding principles for design and operation of an intersection: Clarify Simplify

Systematic Approach to Intersection Safety Signal Example:

Removed 7 signs including 2 overhead
guide signs from overpass
□ Signal Heads Positioned over Lanes into
Driver's Line of Sight
Lowered signal heads on Mast Arms
Added Supplemental Left Hand Signal
Added Back Plates to Signal Heads
Removed two street light poles

Systematic Approach to Intersection Safety Signal Example: After – 3rd St. South of SR16 Entrance

4 month Period Before - 15 Crashes 12 month Period After - 7 Crashes

Systematic Approach to Intersection Safety by the States: Implementation Plans

12 States have developed Implementation Plans for Systematic Approach to Intersection Safety todate

□ 7 States are actively reviewing the identified intersections and conducting engineering field reviews.

□ 7 States have revised their engineering standards to provide for enhanced low cost signing and marking and for signal head per lane with back plates

□ 3 states have let contracts for the first year annual element for systematic improvement

Systematic Approach to Intersection Safety – **Results:**

South Carolina:

A Before (3 years of crash data) and After Study (3 years of crash data) was performed on the first 91 locations improved in 2003.

- □ Crash Rate Reduction of 54.7%
- □ Severity Index Reduction of 54.5%
- □ A Injury percentage reduction of 34.8%
- □ A Fatality percentage reduction of 75%
- □ Average Benefit/Cost ratio was 385.

Questions and Discussion:

