Proactive & Innovative Solutions to Highway Safety

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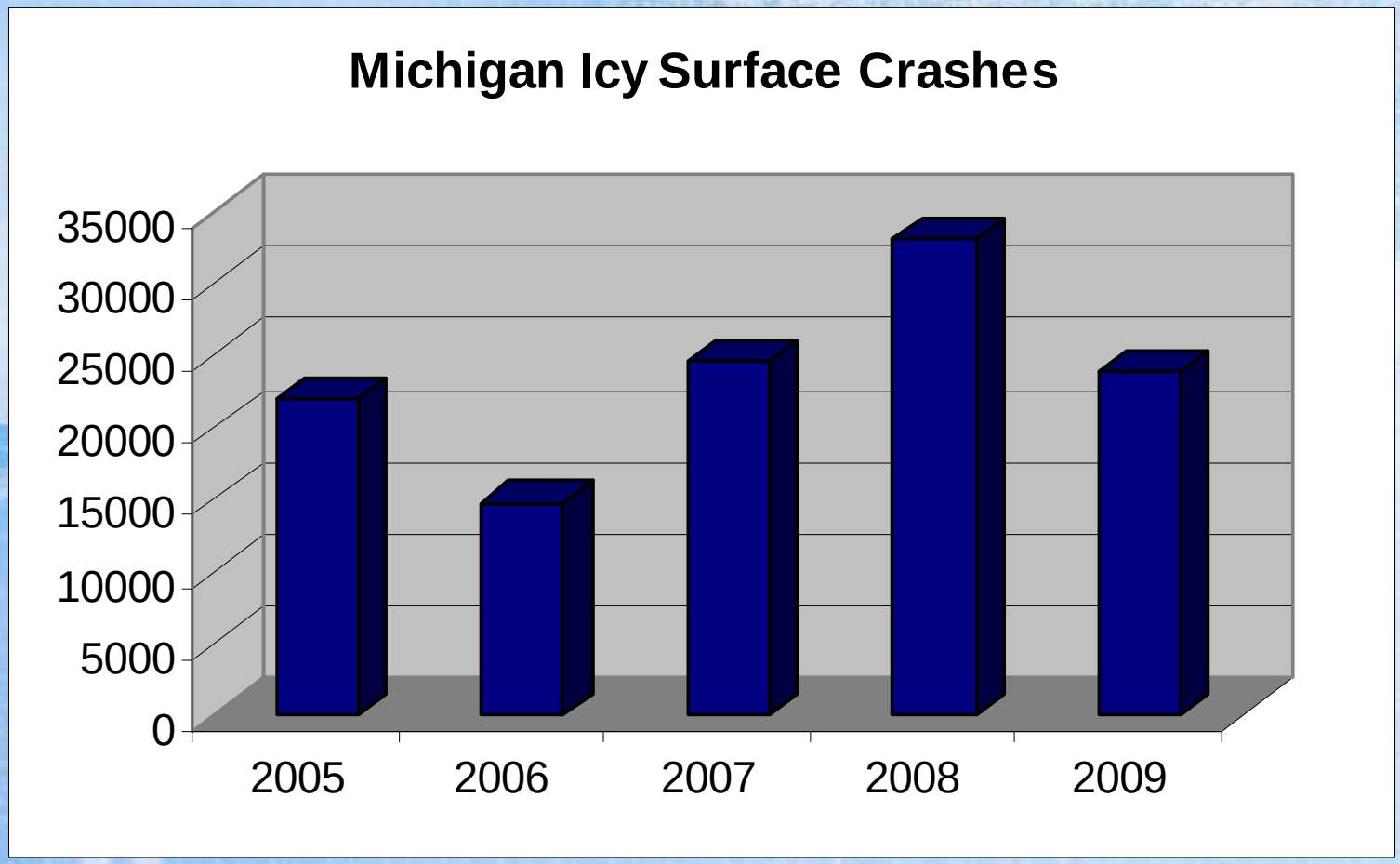
Division of Operations

Michigan Department of Transportation

Points of Discussion

- R&D
- Up and Coming
- In Use
- Region/TSC Perspective
- Good Safety Stuff

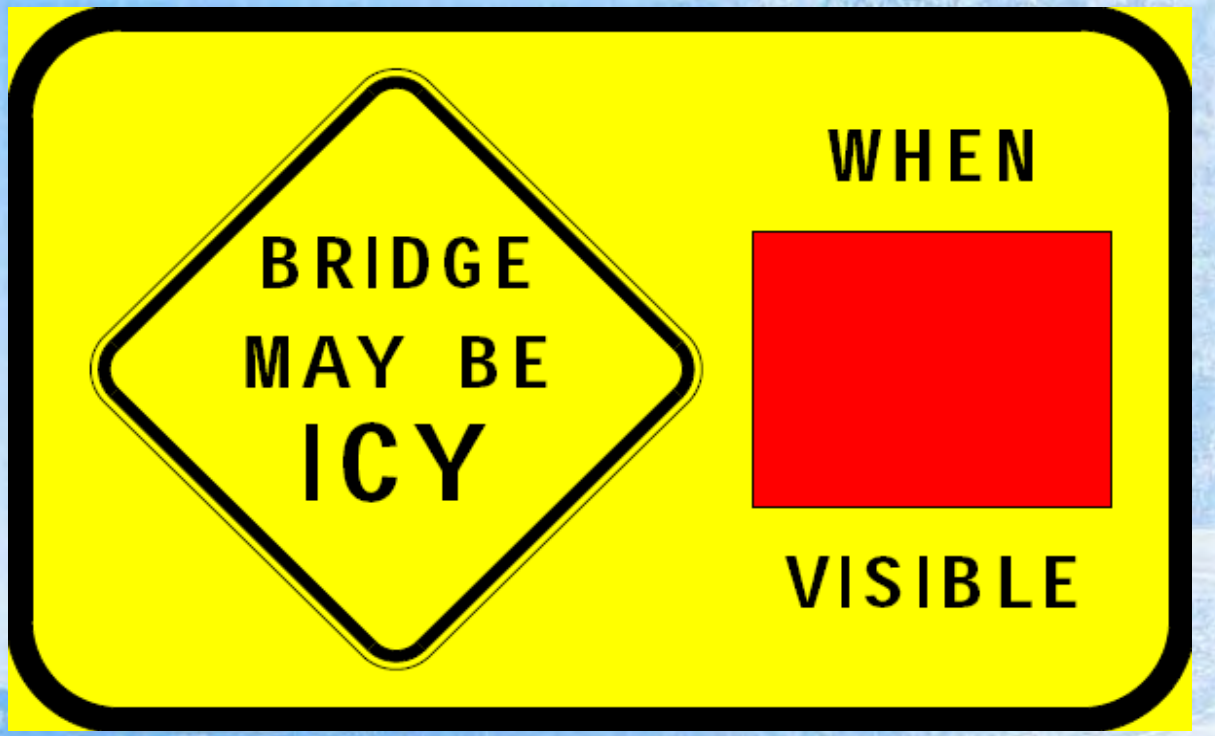
Icy Crashes


Michigan Icy Surface Crashes
35000
30000
25000
20000
15000
10000
5000
0
2005
2006
2007
2008
2009

What do All These Have to do With Highway Safety?

Color Changing Markings

- Under Development in France
  - Durability issues
- White to red
  - At freezing


BRIDGE
MAY BE
ICY
WHEN
VISIBLE

Complete Streets

- New USDOT policy a/o March 15
- Treats non-motorized facilities as equals to motorized facilities
- Going beyond the minimum design
- Protecting facilities the way roads are protected

Road Safety Audits

A **formal safety performance examination** of an **existing or future road** or intersection by an **independent, multi-disciplinary RSA team**.

RSA Steps

RSA Team
Design Team / Project Owner

RSA Training

- 4, 2-day sessions
  - Mt. Pleasant, Southfield, Gaylord, Grand Rapids
- 87 Trainees
  - Design, Construction, Enforcement, Safety, Communications and MORE!

RSA Deployment

- Upcoming safety projects
  - Minimum of 1 RSA per MDOT Region
  - Any projects exceeding $750K
  - 2013 Call for Projects

“Renamed my iPod as 'the titantic' so when I plug it in it's says 'the titantic is syncing.‘”

“I'm at the airport and there's a guy wearing all camoflash to go hunting .. Should I bump in to him and say woahh sorry didn't see you there?”

MDOT & Social Media

- Facebook, Twitter, YouTube

- Shared Info:
  - Safety Reminders & Tips
  - Traffic & Construction Alerts
  - News Releases
  - Links of Interest to MDOT web site

blissmonger: Follow MDOT Metro Detroit on Twitter: http://twitter.com/MDOT_MetroDet

5/15/09

cameronb: @bennyCrampton That MDOT account is actually super handy. One day I was going to a Tigers game, and sent directions around the construction

11/4/09

lindawadman: @mmogan you might want to follow @MichiganDOT; weather related road reports

1/6/10

KristenaMorse: Good tip! RT @MichiganDOT Safety tip - clear snow & ice off your brake lights. If u don't, people behind u won't know you're trying to stop.

1/8/10

scampbell622: My hat is off to @MichiganDOT. The noon news showed nasty roadways, but by 12:30 I thought they looked pretty good!

1/11/10

LTAP Training Courses

- Common Sense Solutions…

  …To Intersection Safety Problems
- What Elected Officials Need to Know About Traffic/Safety
- Over 500 trainees
- 23 training sessions

PROACTIVE AND INNOVATIVE SOLUTIONS TO HIGHWAY SAFETY

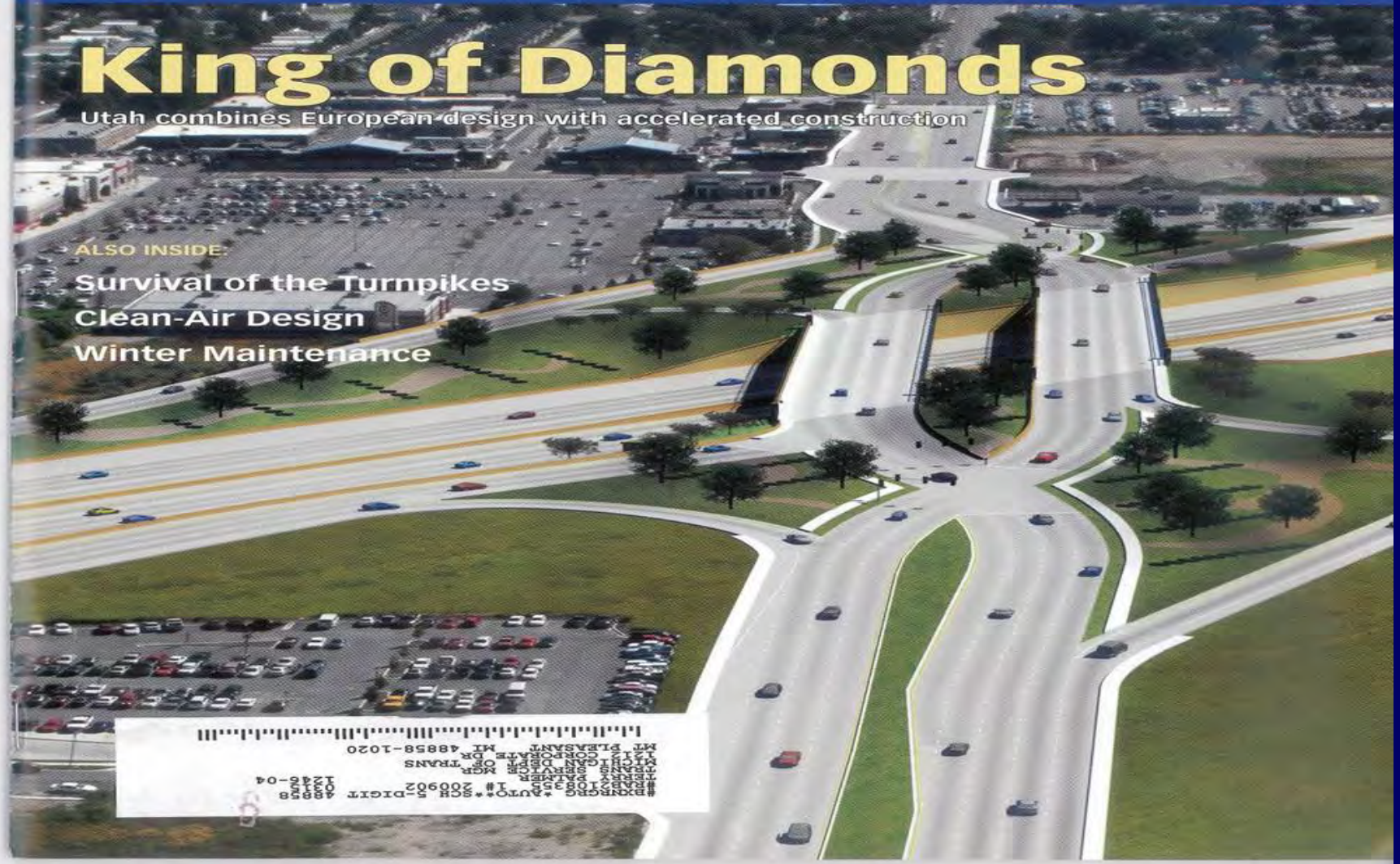
- Intersections
- Roadways
- Road Diet or Complete Streets
- Pedestrian/Bike Safety

March 2010

ROADS & BRIDGES

Scranton Gillette Communications

www.RoadsBridges.com



King of Diamonds

Utah combines European design with accelerated construction

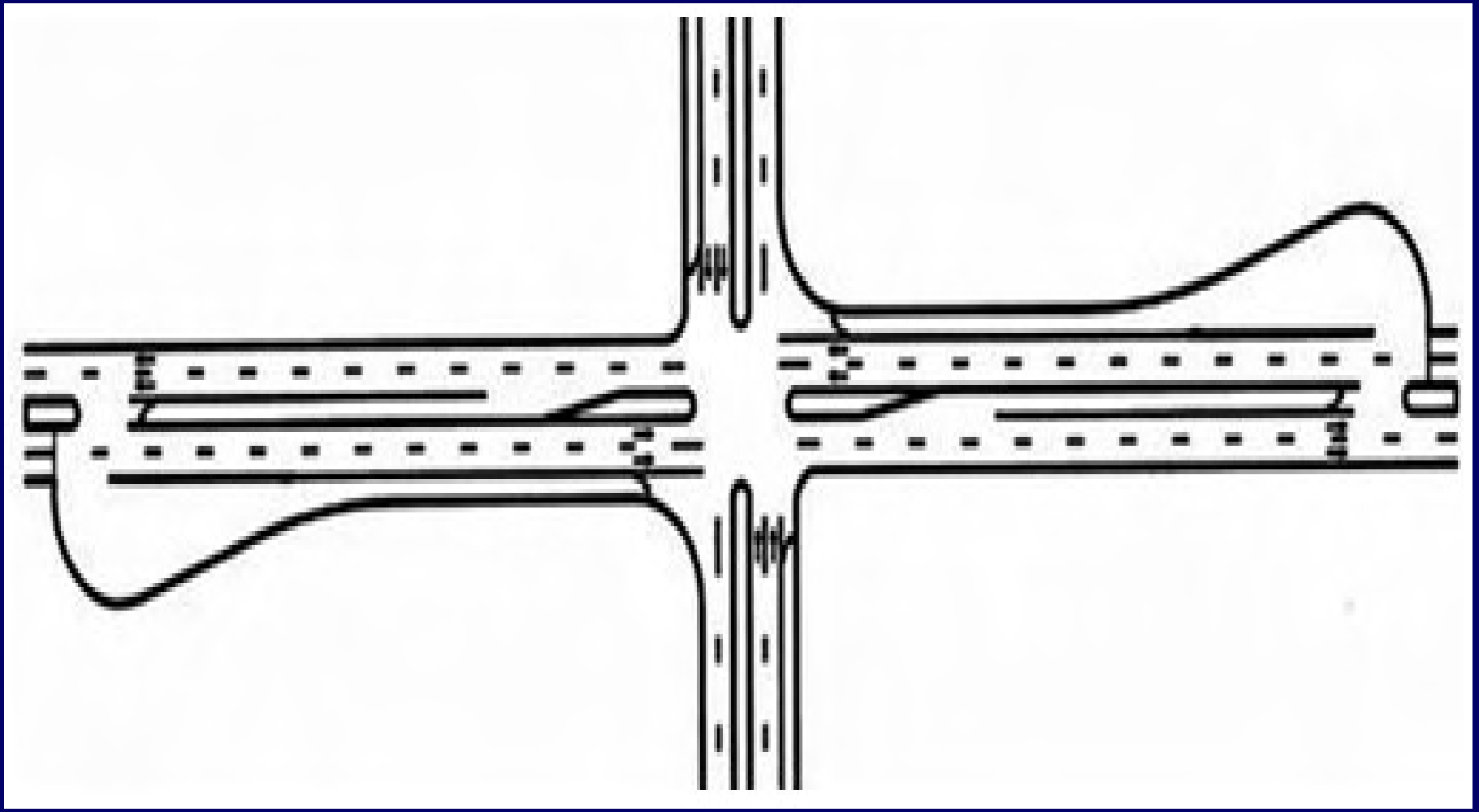
ALSO INSIDE:

Survival of the Turnpikes

Clean-Air Design

Winter Maintenance

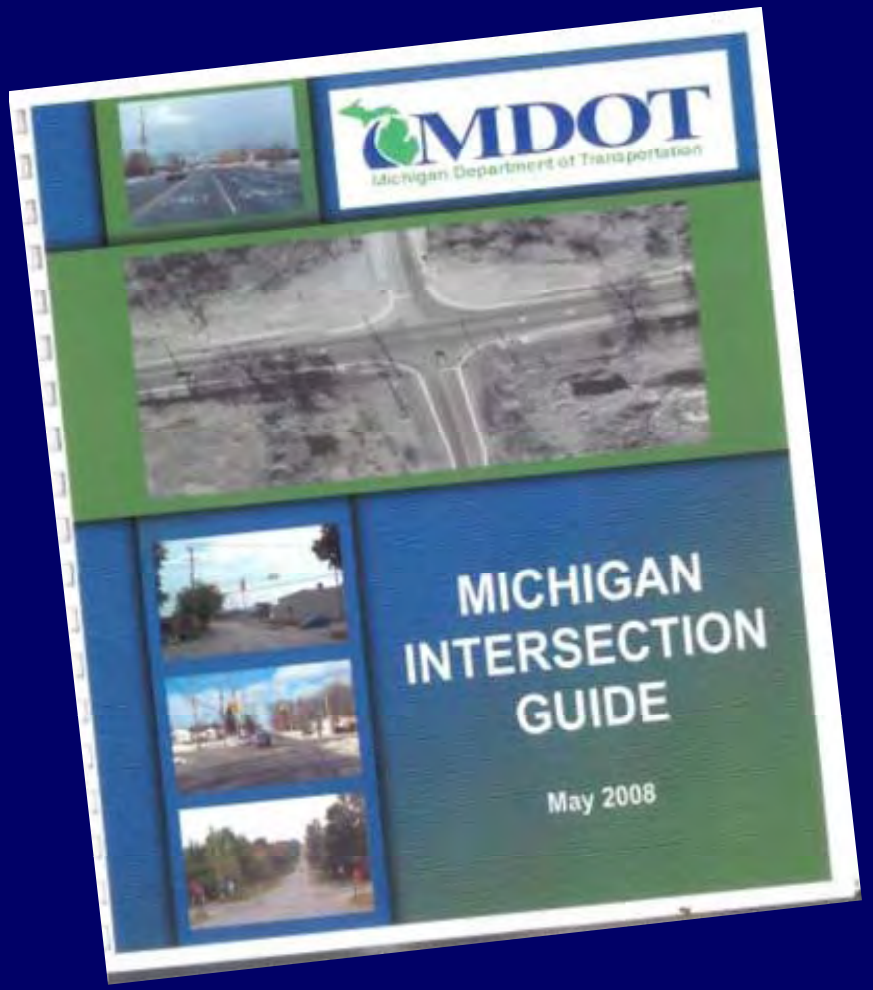
BOULEVARD WITH INDIRECTS



SIMPLE SOLUTIONS

INTERSECTION SAFETY

- Basic Type of Intersection With Capacities
- Types of Intersections
- Comparison Matrix
- Strategies to Improve Safety
- Intersection Crash Reports



ROUNDABOUT INTERCHANGE

Table 2. MDOT Intersection Comparison Matrix Tool (For Safety, Scoping, and EPE Studies)*

Road Improvement Alternatives/Options	Total Cost Estimate*	Control Delay**	Level of Service	Design Life	Cos R

* Additional information regarding this matrix can be found on the next page.
** Roundabout delays from Rodel are stop delay, while delay for other intersections in HCS/Synchro are control delay. See MDOT's *Roundabout Guidance Document* for more information on calculating rounda
***For more information regarding C/B methodology, see the last page of this document.

The following criteria may also be helpful for comparing alternatives:

- Is funding available?
- Are traffic counts/projections available (existing, 10-year, or 20-year)?
- Does the alternative create the potential for enhancements?
- Are bike/pedestrian facilities present or planned?
- Are bike accommodations required?
- What is the percentage of heavy truck traffic?
- Is the intersection designed for trucks?
- Is the intersection located within a system of progressed traffic signals?

Michigan Intersection Guide

2004-2006 4 LANE 2 WAY UNSIGNALIZED INTERSECTIONS
Average Annual Crash Frequency
ADT GREATER THAN 20,000
GRAND, BAY, SOUTHWEST, UNIVERSITY AND METRO REGIONS

AVG ADT = 23,812 TOT INTERSECTIONS = 192

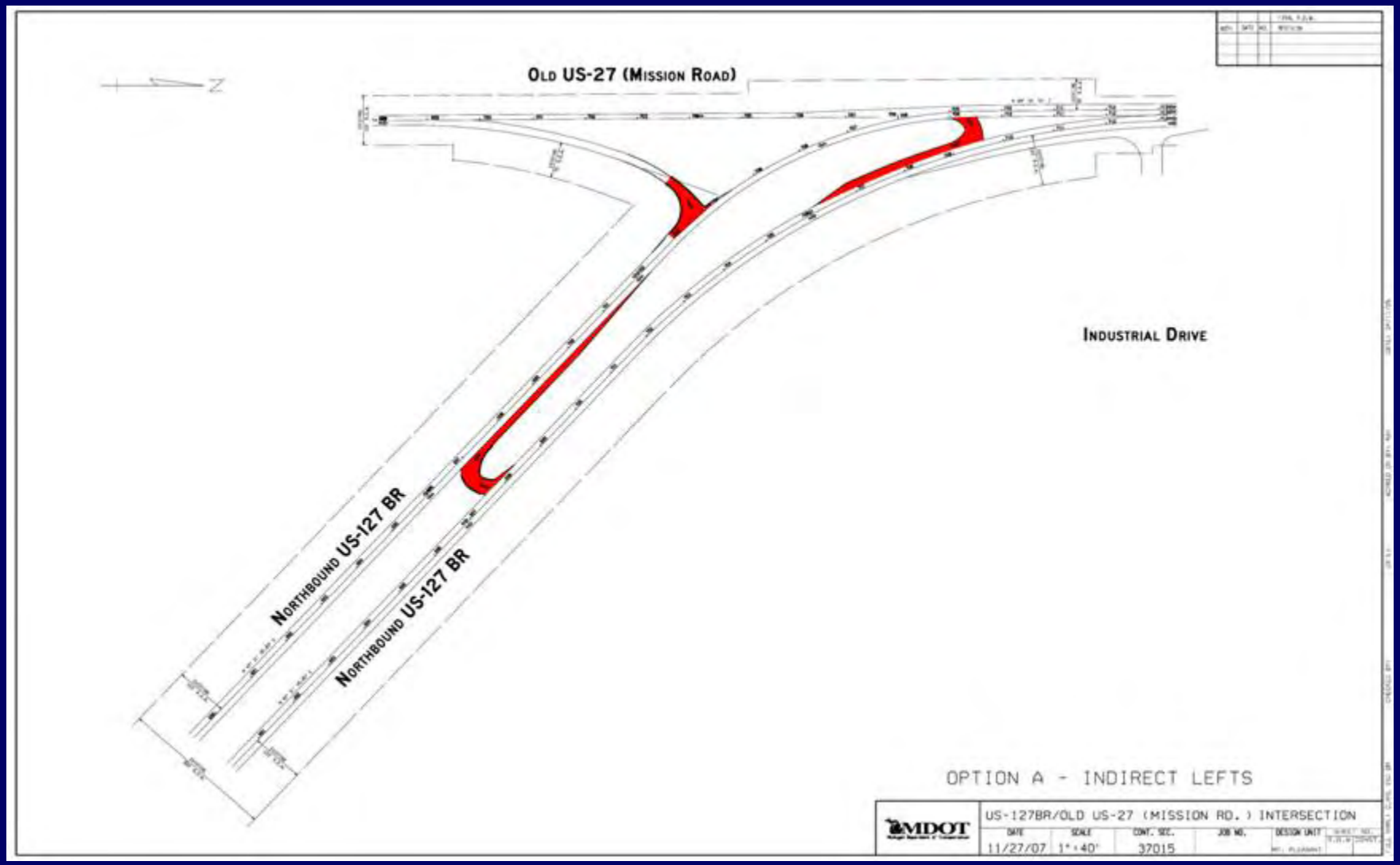
CRASH TYPE	AVERAGE ANNUAL FREQ	AVG ANNUAL CRASHES/INT	% OF TOTAL
TOTAL	675	3.52	100.0%
INJURY ACC	156	0.81	23.1%
FATAL ACC	1	0.01	0.1%
WET	185	0.96	27.4%
ICY	12	0.06	1.8%
DARK	137	0.71	20.3%
MISC SINGLE VEH	3	0.02	0.4%
OVERTURNED	1	0.01	0.1%
TRAIN	0	0.00	0.0%
PRKED VEHICLE	1	0.01	0.1%
MISC MULTI VEH	21	0.11	3.1%
BACKING	9	0.05	1.3%
PARKING	2	0.01	0.3%
PEDESTRIAN	4	0.02	0.6%
FIXED OBJ	27	0.14	4.0%
ON ROAD OBJ	2	0.01	0.3%
ANIMAL	0	0.00	0.0%
BICYCLE	7	0.04	1.0%
HEAD ON	8	0.04	1.2%
ANGLE STRAIT	69	0.36	10.2%
REAR-END	261	1.36	38.7%
ANGLE TURN	56	0.29	8.3%
SIDESWIPE SAME	65	0.34	9.6%
REAR-END LEFT	29	0.15	4.3%
REAR-END RIGHT	10	0.05	1.5%
OTHER DRIVEWAY	9	0.05	1.3%
ANGLE DRIVEWAY	19	0.10	2.8%
REAR-END DRIVE	32	0.17	4.7%
SIDESWIPE OPP	13	0.07	1.9%
HEAD ON LEFT	24	0.13	3.6%
DUAL LEFT TURN	2	0.01	0.3%
DUAL RIGHT TURN	2	0.01	0.3%

DATA SOURCE:
Traffic Count Data (ADT)
Roadway Features
Bureau of Transportation Planning (Sufficiency)

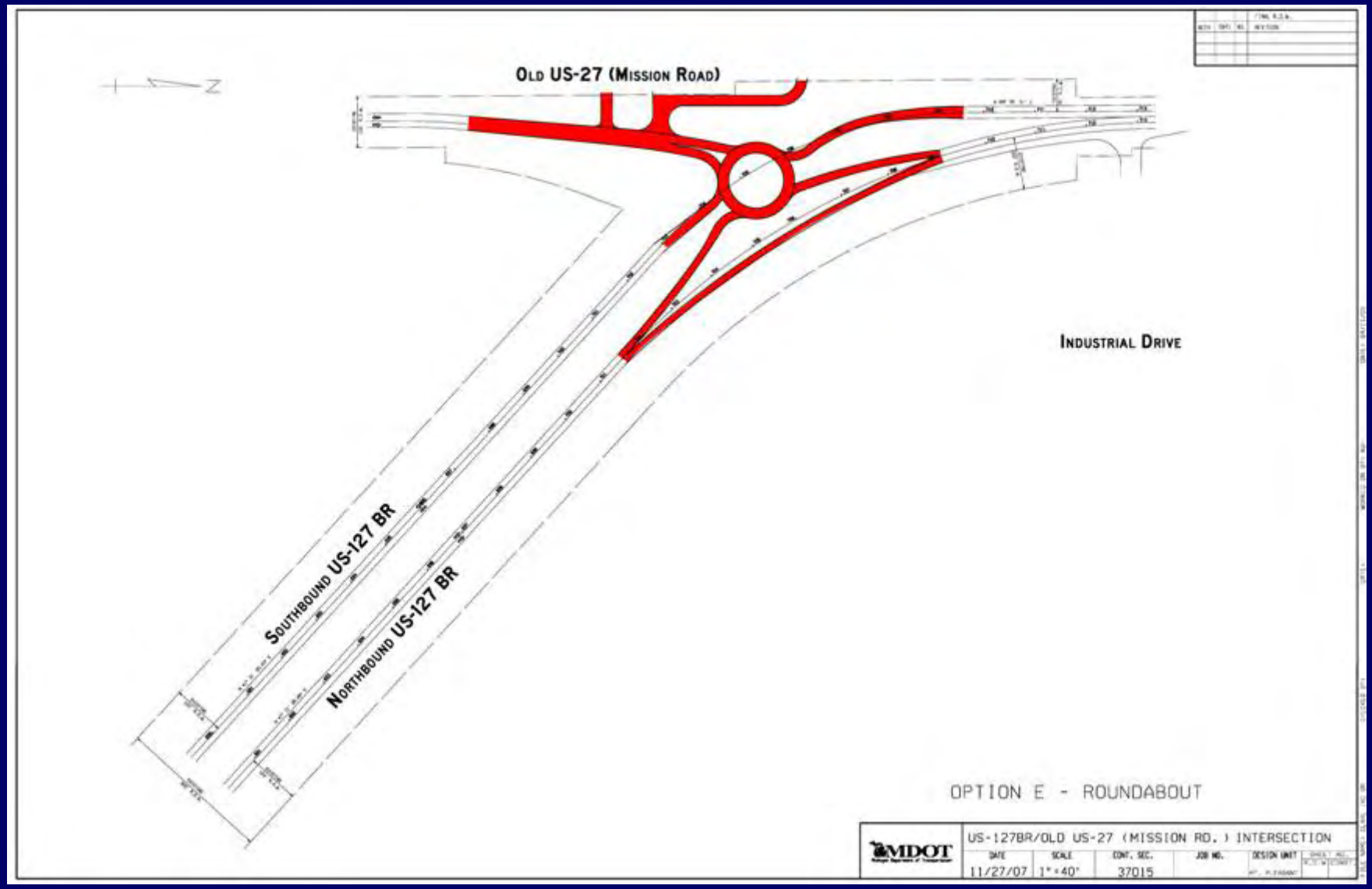
Intersection Data (Location, Traffic Control, Influence Zone)
Traffic and Safety Division

Crash Data
Department of State Police
Analysis includes intersection related crashes only
Animal crashes excluded

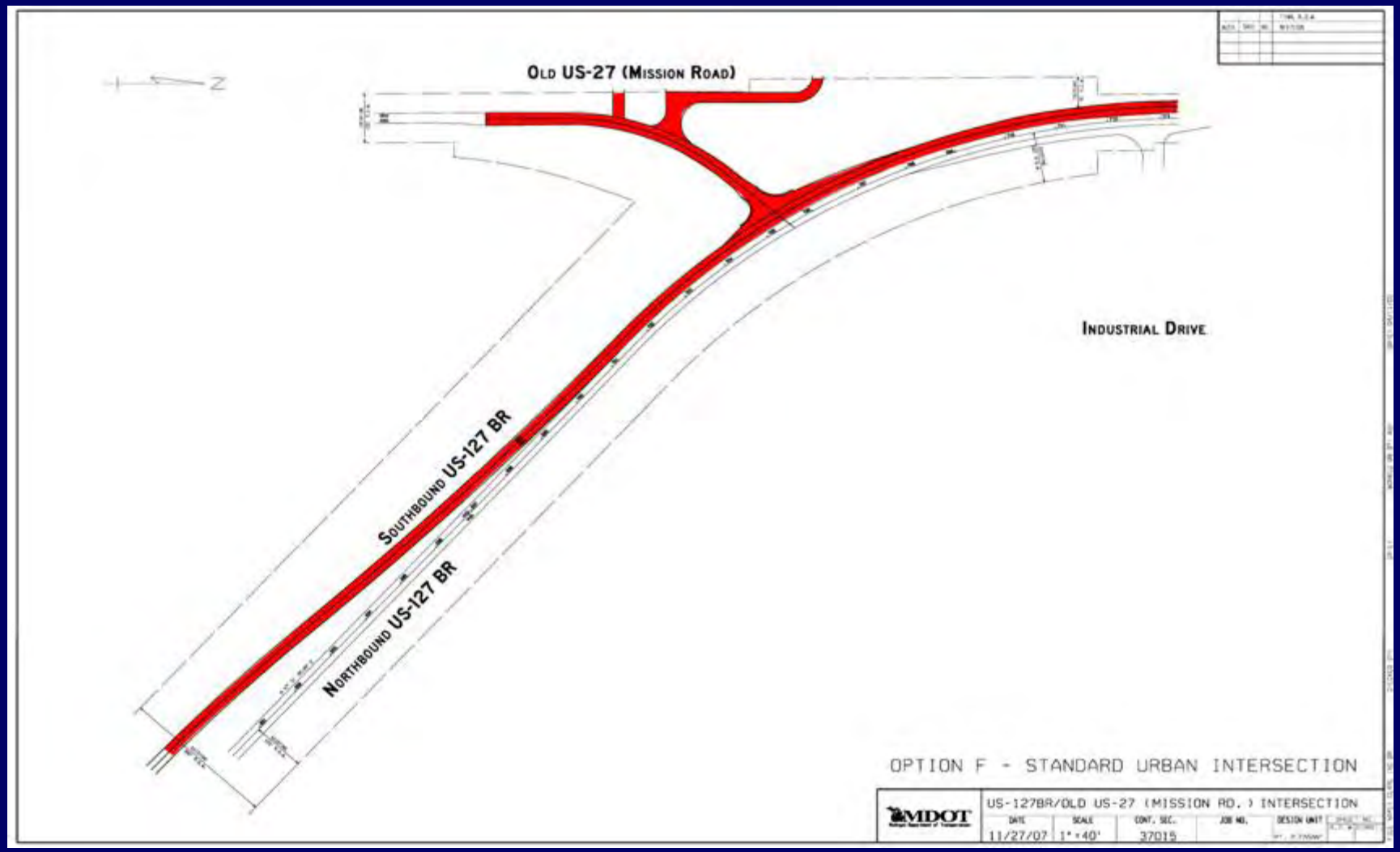
OPTION A – INDIRECT LEFT TURNS



OPTION E - ROUNDABOUT



OPTION F – STANDARD URBAN INTERSECTION



Intersection Design Alternative Comparison Matrix

Location: US-127 BR at Mission Road

Road Improvement Option/Alternative	Cost Estimate	Annual Benefit	TOR	Funding Available	Traffic Counts Available	Design Life	Safety Benefits	ROW Im
Option A Indirect Lefts	$217,320	$207,440	1.05	yes	yes	20 years	6, 11, 12	
Option B "T" Intersection for SB Only	$472,714	$297,877	1.59	yes	yes	20 years	1, 6, 11, 12	
Option C "T" Intersection for NB & SB	$528,730	$327,231	1.62	yes	yes	20 years	1, 6, 8	
Option D Perpendicular Intersection	$178,490	$108,273	1.65	yes	yes	20 years	10, 12	
Option E Roundabout	$897,350	$539,087	1.66	no	yes	20 years	1, 2, 3, 4	Minimal (g for d
Option F Standard Urban Intersection	$679,479	$366,315	1.85	no	yes	20 years	1, 6, 4	

Prepared By: Wade Trim
3933 Monitor Road
Bay City, MI 48706
27-Nov-07
Updated 17-Jan-08

1. Significant reduction in head on collisions
2. Significant reduction in angle collisions
3. Significant reduction in rear end collisions
4. Significant reduction in other types of collisions

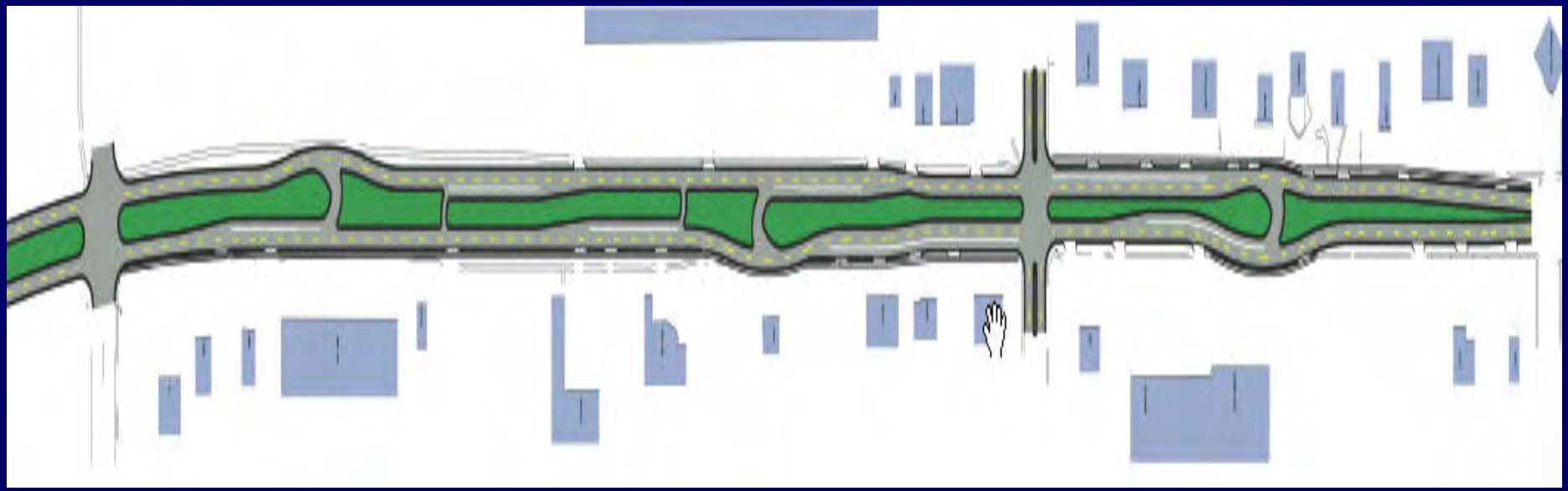
Safety B

5. Moderat
6. Moderat
7. Moderat
8. Moderat

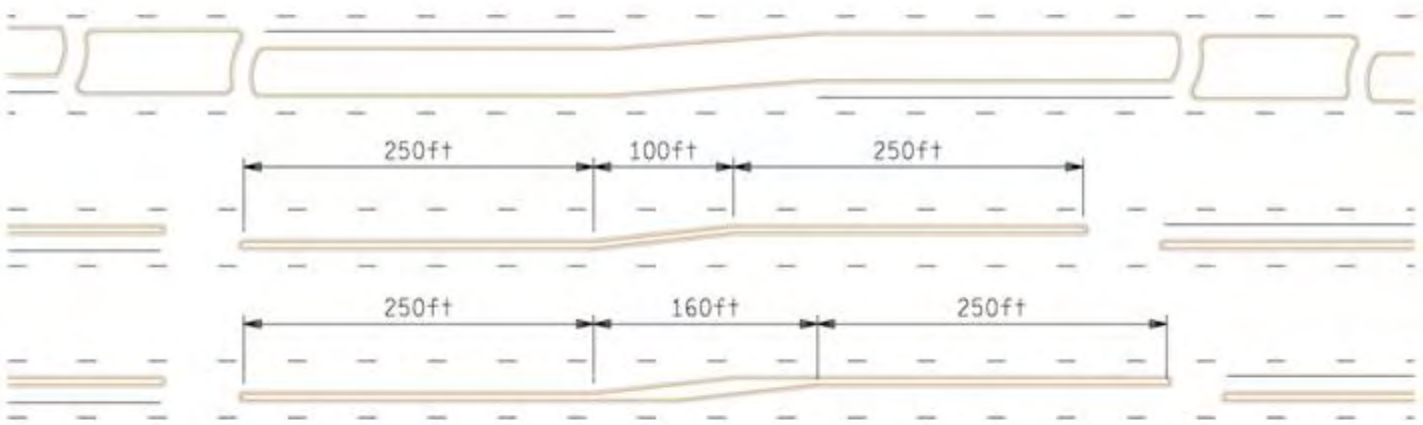
ROADWAY SAFETY

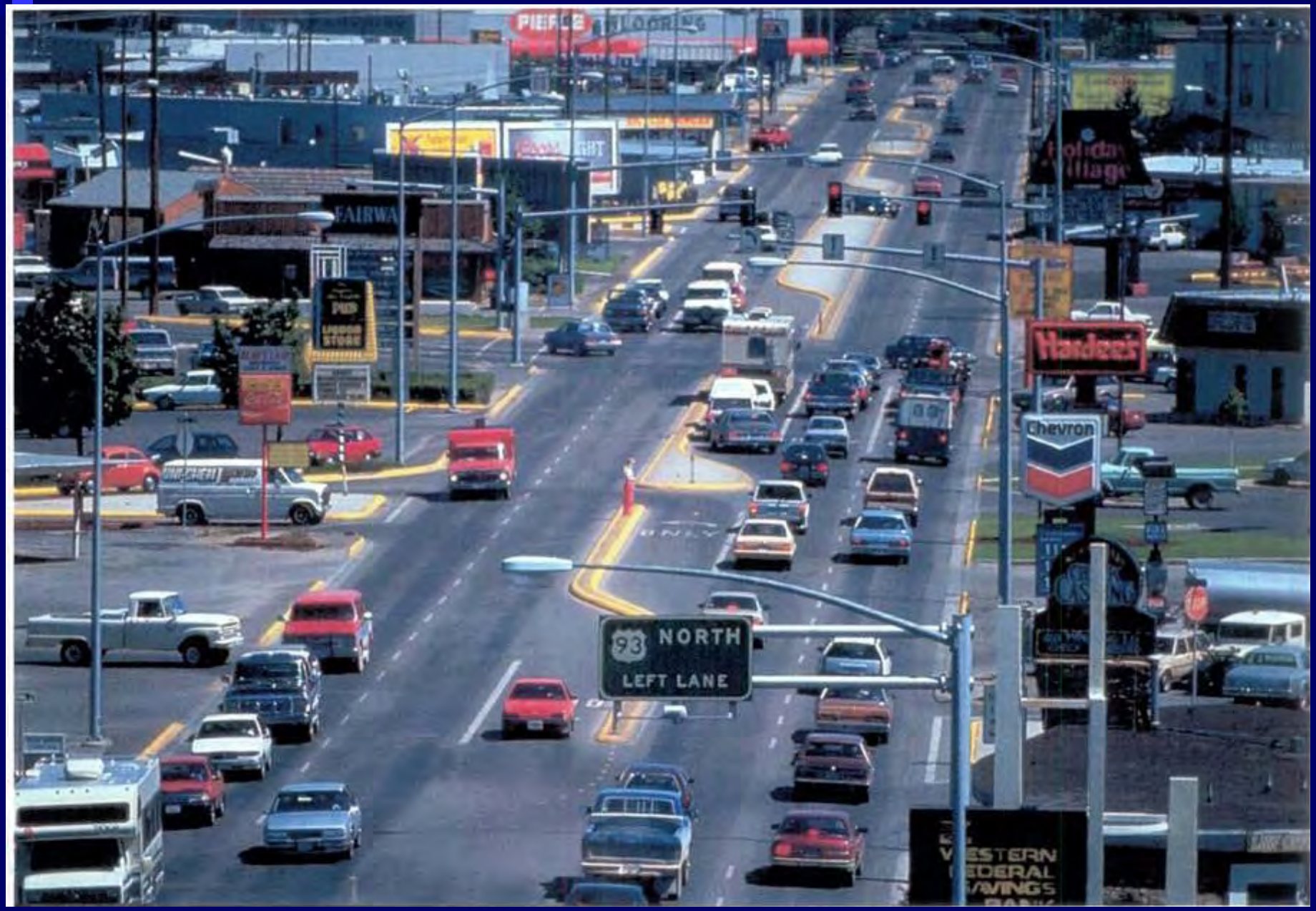
BOULEVARD WITH INDIRECT LEFTS

- Increase Pedestrian Safety
- Increase Traffic Safety (40% typical)
- Designed to Slow Traffic With Curves
- Access Management
- Opportunity for Landscaping, Bike Lanes, and Lighting With Enhancement Grant



ACCESS MANAGEMENT MEDIAN




93 NORTH
LEFT LANE
Hardee's
Chevron

FHWA WEBSITE HIGHWAY INNOVATIONS

MEDIAN OPTIONS

Road Diet or Complete Streets

- Planning Including Networks
- Design From Main Streets to Road Diets and Includes Information on:
  - Parking
  - Medians
  - Bike Lanes
  - Pedestrian
  - Bus Stops
  - Channelized Lanes
  - Roundabouts, etc.

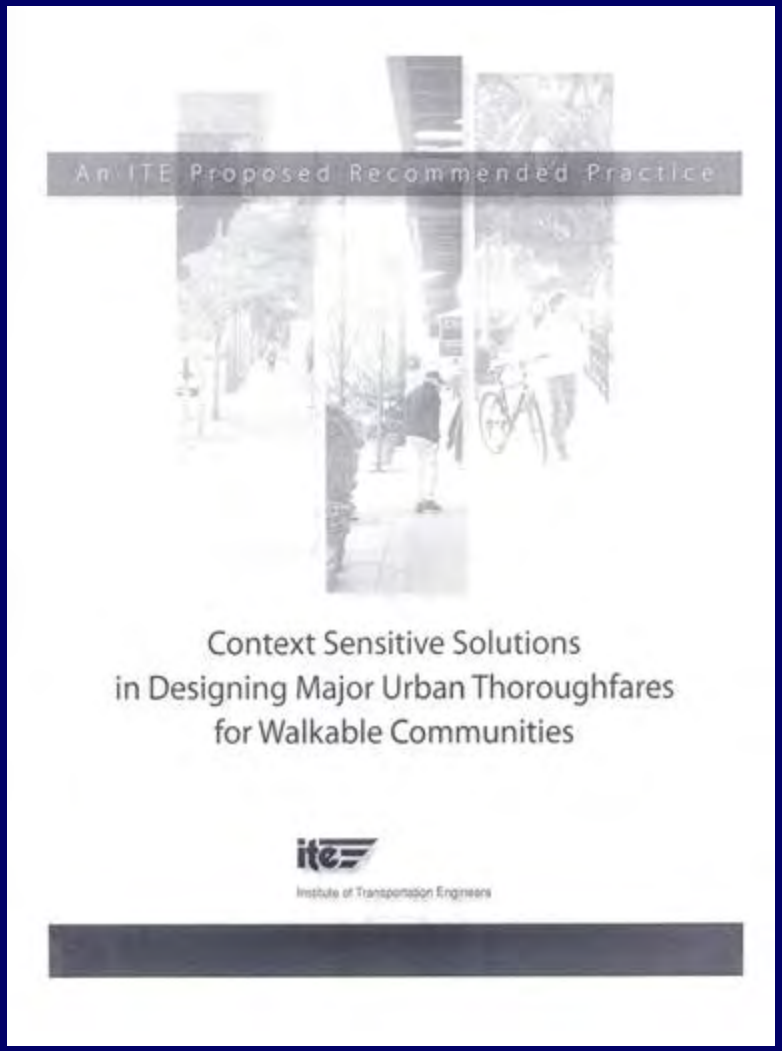
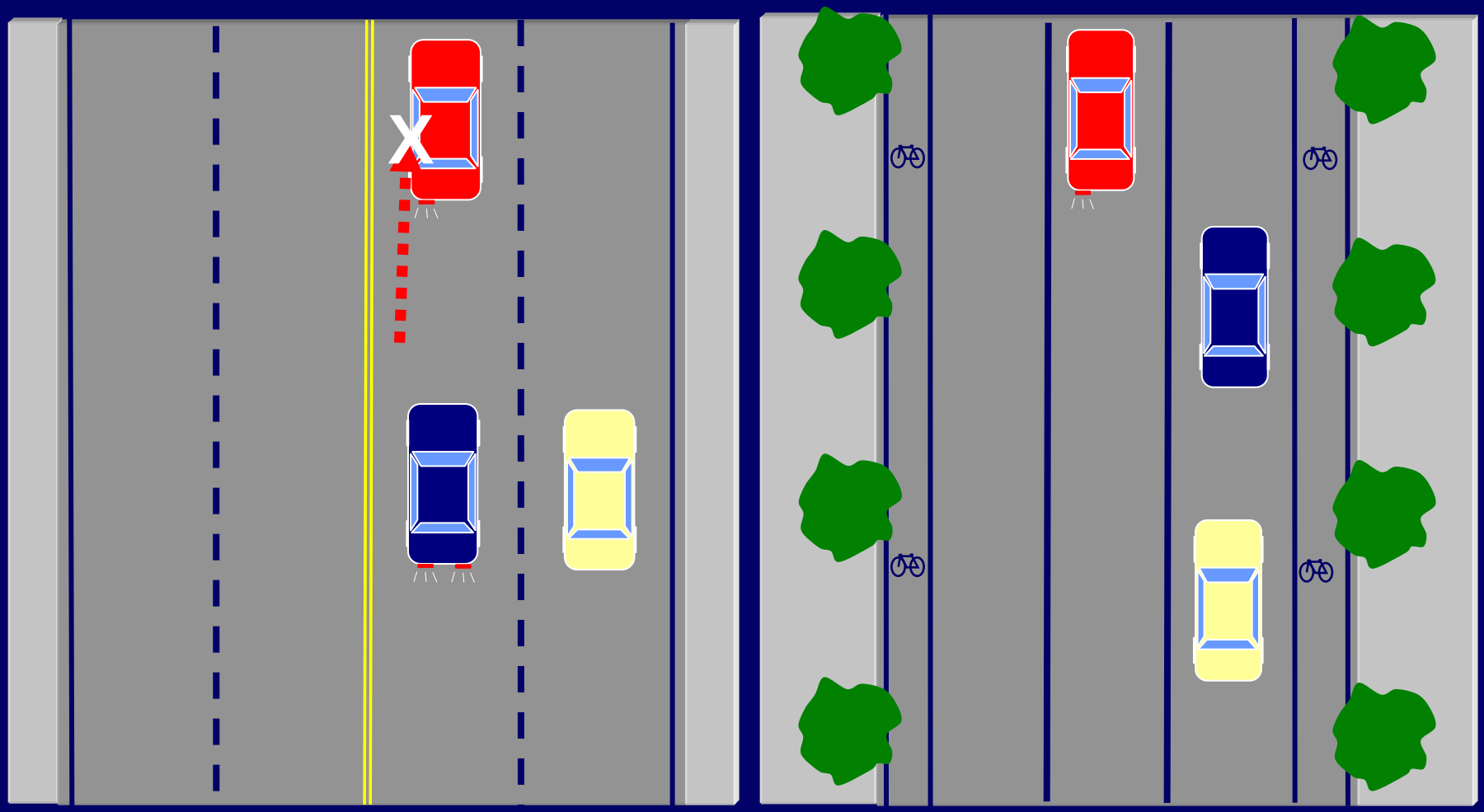


Table 6.2 General Parameters for Arterial Thoroughfares

	Suburban (C-3)				General Urban (C-4)				Urban Center/Core (C-5/6)			
	Residential		Commercial		Residential		Commercial		Residential		Commercial	
Context	Boulevard	Avenue	Boulevard	Avenue	Boulevard	Avenue	Boulevard	Avenue	Boulevard	Avenue	Boulevard	Avenue
Building Orientation (entrance orientation)	front, side	front, side	front, side	front, side	front	front	front	front	front	front	front	front
Maximum Setback [1]	20 ft.	20 ft.	5 ft.	5 ft.	15 ft.	15 ft.	0 ft.	0 ft.	10 ft.	10 ft.	0 ft.	0 ft.
Off-Street Parking Access/Location	rear, side	rear, side	rear, side	rear, side	rear, side	rear, side	rear, side	rear, side	rear	rear	rear	rear
Roadside												
Recommended Roadside Width [2]	14.5 ft.	12.5 ft.	16 ft.	15 ft.	16.5 ft.	12.5 ft.	19 ft.	16 ft.	21.5 ft.	19.5 ft.	21.5 ft.	19.5 ft.
Pedestrian Buffers (planting strip exclusive of travel way width) [2]	8 ft. planting strip	6-8 ft. planting strip	7 ft. tree well	6 ft. tree well	8 ft. planting strip	6-8 ft. planting strip	7 ft. tree well	6 ft. tree well	7 ft. tree well	6 ft. tree well	7 ft. tree well	6 ft. tree well
Street Lighting	For all arterial thoroughfares in all context zones, intersection safety lighting, basic street lighting and pedestrian-scaled lighting is recommended. See Chapter 8 (Roadside Design Guidelines) and Chapter 10 (Intersection Design Guidelines).											
Traveled Way												
Target Speed (mph)	35	25-30	35	35	35	25-30	35	25-30 [3]	35	25-30	30	25-30 [3]
Design Speed	Design speed should be a maximum of 5 mph over the operating speed. Design speed is used as a control for certain geometric design elements including sight distance and horizontal and vertical curvature.											
Number of Through Lanes [4]	4-6	2-4	4-6	2-4	4-6	2-4	4-6	2-4	4-6	2-4	4-6	2-4
Lane Width [5]	10-11 ft.	10-11 ft.	10-12 ft.	10-11 ft.	10-11 ft.	10-11 ft.	10-12 ft.	10-11 ft.	10-11 ft.	10-11 ft.	10-11 ft.	10-11 ft.
Parallel On-Street Parking Width [6]	7 ft.	7 ft.	8 ft.	8 ft.	7 ft.	7 ft.	8 ft.	8 ft.	7 ft.	7 ft.	8 ft.	8 ft.
Min. Combined Parking/Bike Lane Width	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.
Horizontal Radius (per AASHTO) [7]	762 ft.	510 ft.	762 ft.	762 ft.	762 ft.	510 ft.	762 ft.	510 ft.	762 ft.	510 ft.	510 ft.	510 ft.
Vertical Alignment	Use AASHTO minimums as a target, but consider combinations of horizontal and vertical per AASHTO Green Book.											
Medians (which will accommodate single left-turn lanes at intersections) [8]	14-16 ft.	Optional 14 ft.	14-16 ft.	Optional 14 ft.	14-16 ft.	Optional 14 ft.	14-16 ft.	Optional 14 ft.	14-16 ft.	Optional 14 ft.	14-16 ft.	Optional 14 ft.
Bike Lanes (min./preferred width)	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.
Access Management [9]	Moderate	Low	High	Moderate	Moderate	Low	High	Low	Moderate	Low	High	Low
Typical Traffic Volume Range (vpd)	20,000-35,000	15,000-25,000	20,000-50,000	10,000-35,000	10,000-30,000	10,000-20,000	15,000-40,000	5,000-30,000	15,000-30,000	10,000-20,000	15,000-40,000	5,000-30,000
Intersections												
Roundabout	Consider urban single-lane roundabouts at intersections on arterial avenues with less than 20,000 entering vehicles per day, and urban double-lane roundabouts at intersections on Boulevards and Avenues with less than 40,000 entering vehicles per day.											
Curb Return Radii	Refer to Chapter 10 (Intersection Design Guidelines) for details											


CENTER
LANE
ONLY

THREE CRASH TYPES CAN BE REDUCED BY GOING FROM FOUR TO THREE LANES



1. Rear Enders


Hopkins Crt.
STOP
STATE LAW
STOP

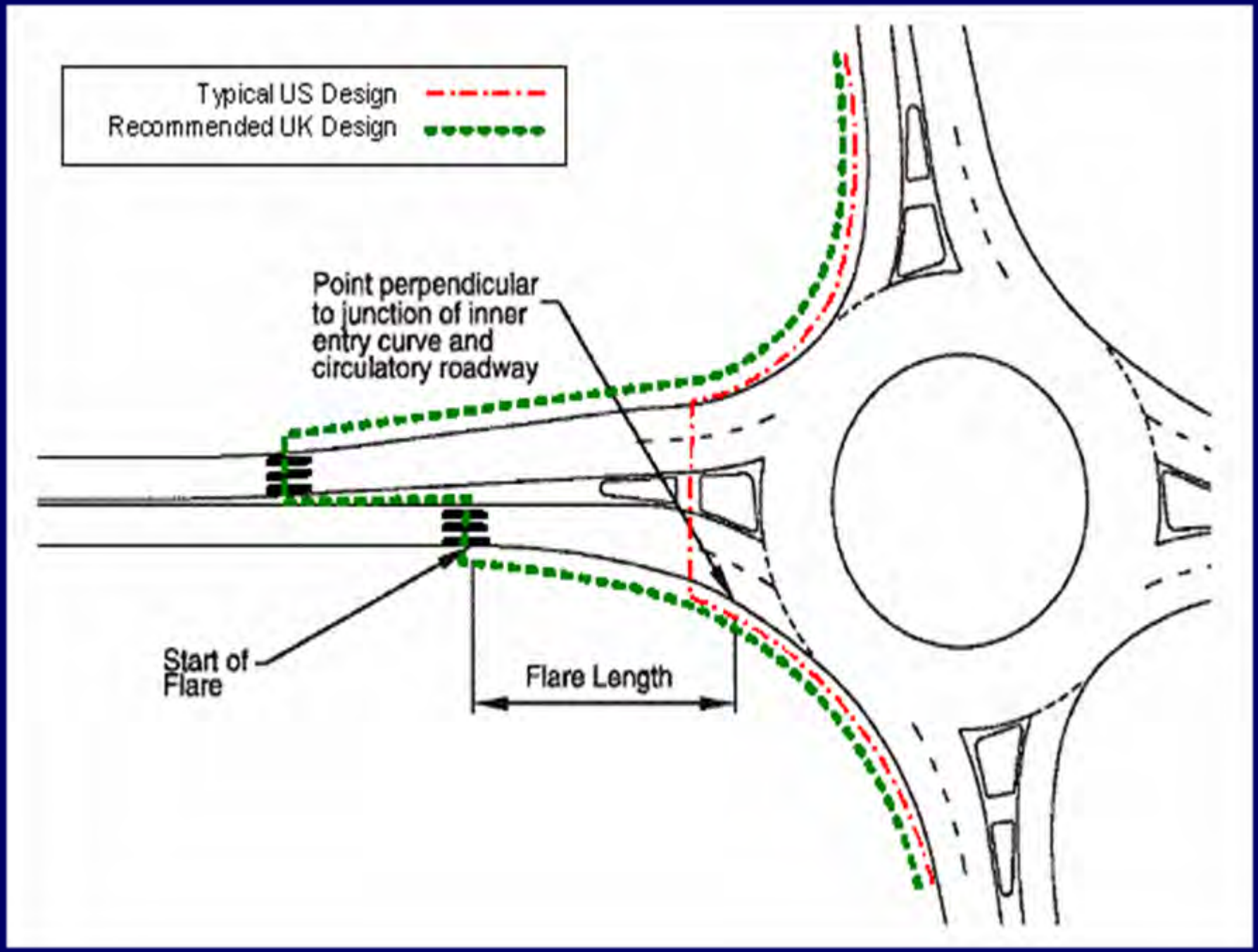
PEDESTRIAN BIKE SAFETY

PEDESTRIAN ISLAND @ APPIAN WAY

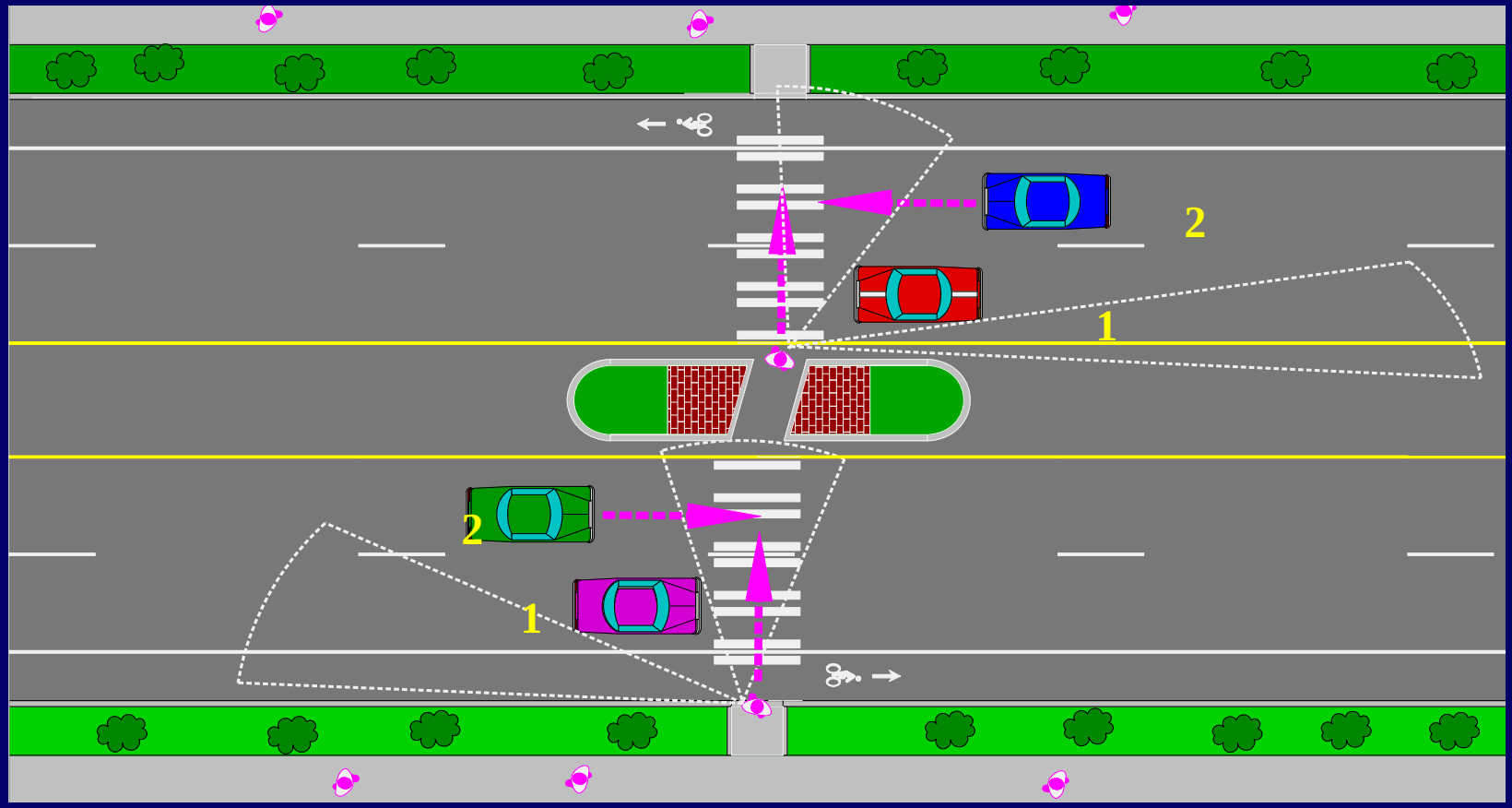

CROSS WALK
OUT

WHAT IF A CYCLIST DOESN'T WANT TO ENTER THE ROUNDABOUT?


Slow Speed Allows Cyclists to Share Roadway


Typical US Design
Recommended UK Design
Point perpendicular to junction of inner entry curve and circulatory roadway
Start of Flare
Flare Length

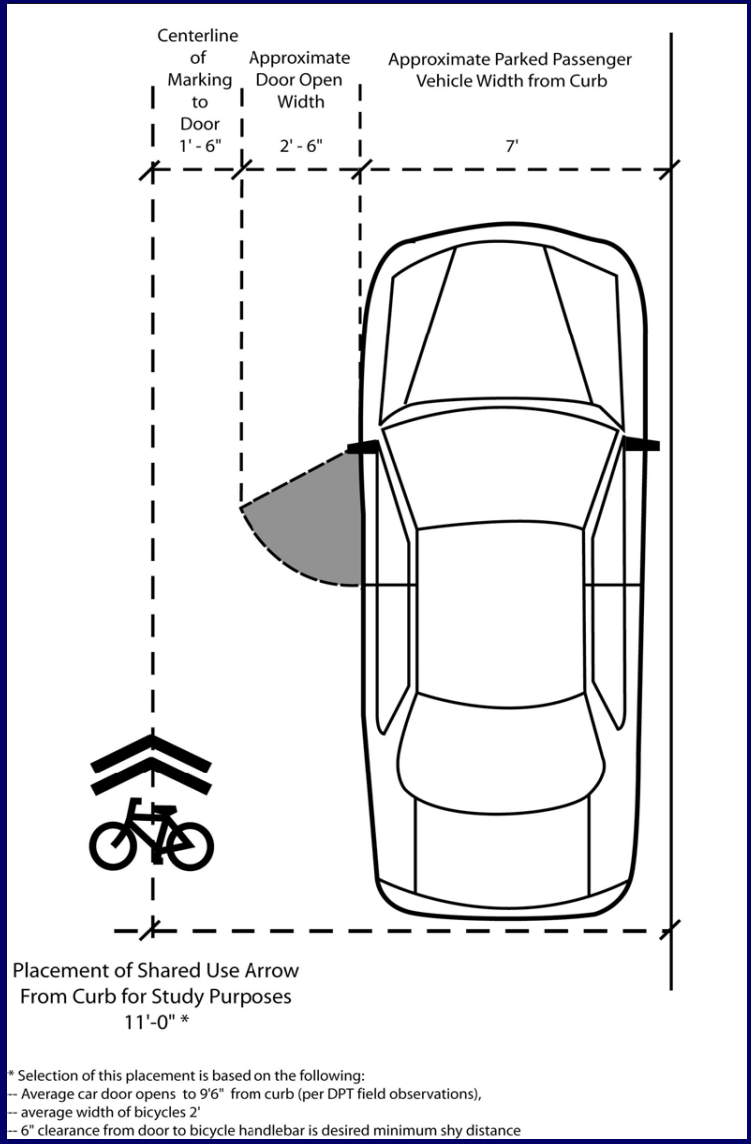
TRAIL CROSSINGS -MIDBLOCK



Problem: Car 1 - stops to let bicyclist cross; car 1 - masks car 2, which doesn't stop and hits bicyclist at high speed.

SHARE LANE MARKINGS

- "Sharrow"
  - Reinforces Shared Lane Concept
  - Keeps Bikes Away From Door Zone
- Where to Use:
  - Narrow Shared Use Road Where Bicyclists Tend to Ride too Close to Parked Cars
  - Low Roadway Speeds With High Parking Turnover



BIKE LANE SURFACES

- Drainage Grates Should Be Bicycle Safe.

wait until the children and crossing guard are completely out of the crossing.

Hawk Signal System

QUESTIONS?