## Guidelines for Pedestrian Treatments at Uncontrolled Locations

#### Yan Qi Southern Illinois University Edwardsville

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# Outline

- Introduction
- Identify appropriate locations for uncontrolled pedestrian crossings
- Select appropriate treatment(s) at uncontrolled locations
- Other non-treatment factors that affect pedestrian safety at uncontrolled locations

# Introduction

- Problem Statement
  - Pedestrian safety is a global issue, particularly pedestrian safety at uncontrolled crossings

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• No systematic guidelines are available

#### Objective

 To identify the best practices and develop guideline for approving pedestrian crossings and selecting pedestrian treatments at uncontrolled locations (midblock locations and intersection approaches without traffic signals or stop/yield signs are considered as uncontrolled locations)



# Introduction (Cont.)

- Research Approach
  - Literature review
  - Survey and interview
  - Crash data analysis
  - High Crash Corridors (HCC) field review
  - Engineering judgement and local experience
- Project Outcome
  - Guidelines for Improving Pedestrian Safety at Uncontrolled Locations

# Guidelines

- An informational resource to supplement, not to replace or supersede, existing standards and manuals
- Serve state and local agencies
- A large variety of treatments
- Quantities/thresholds and flexibility
- Can be used to
  - Evaluate candidate sites
  - Select appropriate treatments
  - Assess existing treatments

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### Identify Appropriate Locations for Uncontrolled Pedestrian Crossings

# 'Yes' Situations for Considering a Marked Crosswalk

#### Crosswalk usage

- Request from the local government or community
- Along a walking path towards identified pedestrian generator/destinations

#### Crash record

 Two B or A- injury crashes in two years or one fatal crash

A – Incapacitating Injury: Any injury, other than a fatal injury, which prevents the injured person from walking, driving, or normally continuing the activities he/she was capable of performing before the injury occurred.

B – Non-incapacitating Injury: Any injury, other than a fatal or incapacitating injury, which is evident to observers at the scene of the crash.

# 'No' Situations for a Marked Crosswalk

- Speed limit
  - Speed limit>40 mph
- Traffic volume
  - ADT >35,000 vpd
- Crossing distance
  - Undivided roadways > 4 lanes
  - Divided roadways > 6 lane

# 'No' Situations (Cont.)

- Crosswalk spacing
  - An alternative crossing location, marked or unmarked, is within 300 feet (recommended) or 200 feet (minimum).
  - <100 ft. away from the nearest side street or driveway</p>
- Sight distance
  - Inadequate stopping sight distance or pedestrian sight distance

# Appropriate Locations for Uncontrolled Crossings

- If a location meet any one of the "No" situations
  - Don't recommend to install an uncontrolled crossing
- If a location doesn't meet any of the "No" situations, and meet any of the "Yes "situations

- An uncontrolled crossing can be considered
- A final decision also depends on an engineering study and location conditions

Example (1)

#### SW Jefferson St. with Harrison St. Peoria, IL



C – Reported/Not evident: **Any injury reported** or claimed which is not fatal, A, or B injury.

Crash History	A- Injury =1 C-Injury =2
Established pedestrian generator/attractor	Bus hub, bank, Peoria civic center
Traffic Speed, mph	30
Adequate sight distance & lighting	Yes
Proposed crosswalk location ≥ 300 ft. away from the nearest crosswalk**	Distance between two adjacent intersections are 770 ft.
Number of lanes	Undivided three lanes (one way )
Traffic Volume	9200 (2012)
Conclusion	Crosswalk is recommended

# 12 Example (2)

#### Illinois Rte. 29 with Taft Dr. Rochester, IL



Solutions: Conduct a study to check if a controlled pedestrian crossing (Pedestrian Hybrid Beacon/Traffic signal) or separate grade crossing is possible. Review appropriate speed limit.

Crash History	Fatal =1
Established pedestrian generator/attractor	Trail, hospital, and residential units
Speed Limit, mph	45
Adequate sight distance	Yes
Proposed crosswalk location ≥ 300 ft. away from the nearest crosswalk	Yes
Number of lanes	divided Five lanes (one LT lane)
Traffic Volume	13,000(2015)
Conclusion	<ul> <li>Speed limit is over 40 mph</li> <li>Uncontrolled crosswalk is not recommended</li> </ul>

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### Select Appropriate Treatment(s) at Uncontrolled Locations

#### At-grade Pedestrian Crossing Treatments for Uncontrolled Locations

At-grade pedestrian treatment categories	Example
Basic Treatments	Marked crosswalk with warning sign
	Advanced stop line and sign
Enhanced Treatments	In-street crossing sign
	Overhead crossing sign
	Curb Extension
Coomotric Flomonte	Road diet
	Raised median
	Raised crosswalk
	FB (Flashing Beacon)
Warning Beacon	FS (Flashing Pedestrian Crossing sign)
Control Beacon	PHB (Pedestrian Hybrid Beacon)

# 15 Basic Treatments

Marked crosswalk + pedestrian sign



Pedestrian Crossing and Warning Signs (FHWA, 2009)

## 16 Enhanced Treatments



R1-9a

STATE LAW

The legend STATE LAW is optional. A fluorescent yellow-green background color may be used instead of yellow for this sign.



Uncontrolled pedestrian crosswalk signs



Advanced Stop Line and Sign (PEDSAFE, 2017)

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### Geometric Elements



Curb extensions (Turner and Carlson, 2000)



#### Road Diet (Knapp, et al., 2014)



Raised Crossing (PEDSAFE, 2017)



a) Raised median (Pulugurtha, et al., 2012);b) Split pedestrian crossover (VDOT, 2004)

b.



a) Pole Mounted and b) Overhead Flashing Beacons (Fitzpatrick, et al., 2006)

#### Warning Beacons

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Flashing Pedestrian Crossing Sign (lightguardsystems.com, last accessed Jan 3, 2018)

# 19 Control Beacon-Pedestrian Hybrid Beacon (PHB)



PHB treatment at Arizona (Fitzpatrick, et al., 2014)

# 20 In-Roadway Warning Lights (IRWL)

• IRWL is included in MUTCD. May be considered as a safety countermeasure. May also have high maintenance costs particularly for high-volume roadways.



#### Recommended minimum treatments at uncontrolled pedestrian crossings

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2 lanes or 3 lanes <u>with</u> raised median	вт	In- street sign	FB (or FS) + ASLS	g is not	BT	FB	FB (or FS) + ASLS	j is not	In- street sign	FB	FB (or FS) + ASLS	y is not	In-street sign	FB (or FS) + ASLS	FB (or FS) + ASLS	y is not	y is not	
3 lanes <u>without</u> raised median	BT	In- street sign	FB (or FS) + ASLS	rian crossing nended	BT	FB (or FS) + ASLS	FB (or FS) + ASLS	rian crossing nended	FB	FB (or FS) + ASLS	FB (or FS) + ASLS	rian crossing nended	FB (or FS) + ASLS	FB (or FS) + ASLS	**PHB+ CSOR	irian crossing nended	irian crossing nended	
4 lanes <u>with</u> raised median	In- street sign	ASLS	FB (or FS) + ASLS	rolled pedest recomn	ASLS	ASLS (consider FB or FS)	FB (or FS) + ASLS	rolled pedest recomn	FB (or FS) + ASLS	FB (or FS) + ASLS	**FB or FS (consider PHB)+ ASLS	rolled pedest recomn	FB (or FS)+ ASLS	** PHB + CSOR	**PHB+ CSOR	rolled pedest recomn	rolled pedest recomn	
5 or 6 lanes <u>with</u> raised median	ASLS	FB (or FS) + ASLS	FB (or FB) + ASLS	unconti	ASLS	FB (or FS)+ ASLS	PHB+ CSOR	Unconti	overhead FB or FS + ASLS	overhead FB or FS + ASLS	**PHB+CS OR	Unconti	PHB+ CSOR	** PHB + CSOR	**PHB+ CSOR	Unconti	Uncontr	
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4, 5, or 6 lanes <u>without</u> raised median	follow below cross	w the i w for 4 sings o	recom -lane of mor	me witi e th	ndatio hout ra 1an fou	ns for the lised med r lanes wi	above l ian to d thout a	ane c ecide raise	onfigura pedestr d media	tions, o ian cros n is not	ther wise ssing trea recomm	e foll itme ende	ow the ro nts, prov d.	ecomme riding ur	ndation acontrol	led		
4 lanes, raised median not feasible	ASLS	ASLS	PHB+ CSOR		ASLS C	overhead FB or FS + ASLS	PHB +CSOR		overhead FB or FS+ ASLS	PHB +CSOR	** PHB+ CSOR		PHB +CSOR	** PHB+ CSOR	**PHB +CSOR			

Recommende d minimum treatments at uncontrolled pedestrian crossings (cont.) BT= Basic Treatment (W11-2 with W16-7P) In-street sign= In-street stop for pedestrian sign (R1-6a); Overhead sign= Overhead crossing sign (R1-9a) may be used based on engineering judgment ASLS= Advanced stop line and sign (R1-5b and R1-5c) FB= Pedestrian activated flashing beacon (pole mounted) FS= Flashing Pedestrian Crossing Sign PHB=Pedestrian Hybrid Beacon; CSOR=Crosswalk Stop on Red line and sign

 \*= Lane configuration includes turn lanes, through lane, and bi-directional lanes.
 \*\*= Check IL MUTCD signal warrants and consider the feasibility of a grade-separated crossings. Pedestrian hybrid beacons, when installed, create a controlled crossing. Check PHB warrants and comply with IL MUTCD. If PHB is not warranted then consider signal or grade separated crossing.
 Notes:

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- 1. These treatments are recommended for existing uncontrolled crossings where enhancement is sought, and for new uncontrolled crossings where an engineering study indicates a clear warrant for a crossing.
- 2. Provision of lighting is recommended at midblock crossings.
- 3. Ensure that adequate sight distance is provided for both drivers and pedestrians at uncontrolled crossings.
- 4. At densely developed urban areas and on multi-lane roadway (4 or more lanes), curb extension should be considered when street parking is allowed and posted speed limit is ≤ 35 mph.
- 5. Uncontrolled crosswalk is not recommended if the speed limit is above 40 mph.
- 6. At places where motorists do not expect crossing (mid-blocks and crossings in rural areas) and in school zones, advanced warning signs with AHEAD/distance plaque (W16-9P or W16-2P) should be considered.

#### Peoria Civic center ADT 9200 (2012) Crash Spot/site Speed Limit, 30 Example (3) mph Undivided three lanes Number of (one way) lanes SW Jefferson St. with Conclusion Signalized Crossing Harrison St. Peoria, IL ADT≤ 9,000 9,000<ADT<15,000 15,000<ADT ≤ 25,000 ADT>35.0 25,000< ADT<35,000 posted speed, mph 6 33 5 vi 🕅 9 45 vi B VI S 35 2 45 ≤ 30 30 45 9 2 lanes or 3 FB FB FB FB In-In-In lanes with (or вт street (orFS) (or FS) + (or FS) BT FB not street FB (or FS) + not street is not FS) + raised sign + ASLS sign ASLS sign ASLS + ASLS ASLS S S ŝ median sing 3 lanes FB In-FB FB FB FB FB (or \*\*PHB without (or CKO вт (or FS) + street (orFS) FB (orFS) (orFS) + (or FS) FS) + 5 ..... FS) + raised sign ASLS + ASLS + ASLS ASLS ASLS ASLS CSOR Uncontrolled pedestrian ASLS median recomm \*\*FB or FB pede ASLS FB (or In-FB (or FB (or FB (or 4 lanes with \*\*PHB FS \*\* **PHB** (or ă street ASLS ASLS (consider FS) + FS) + FS) + (consider FS)+ 7 + CSOR raised FS) CSOR sign FB or FS) ASLS ASLS ASLS PHB)+ ASLS ASLS median ASLS 5 or 6 lanes FB FB overhea Jnc overhead \*\*PHB with raised (or (or FB (or PHB+ FB or \*\*PHB+ PHB+ \*\* **PHB** ASLS ASLS FB or FS median FS) + FB) + FS)+ ASLS CSOR FS +CSOR CSOR + CSOR + ASLS CSOR ASLS ASLS ASLS 4, 5, or 6 Consider pedestrian refuge island or road diet, if feasible. If raised median, or road diet is lanes feasible then follow the recommendations for the above lane configurations, other wise follow without the recommendation below for 4-lane without raised median to decide pedestrian crossing raised treatments, providing uncontrolled crossings of more than four lanes without a raised median is median not recommended. 4 lanes, overhead РНВ overhead PHB \*\* PHB+ \*\*PHB raised FB or PHB PHB \*\* PHB+ ASLS ASLS ASLS FB or FS + +CSOR CSOR +CSOR FS+ +CSOR +CSOR CSOR median not CSOR ASLS ASLS feasible

#### Example (4)

Illinois Rte. 29 with Taft Dr. Rochester, IL

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ADT	13,000(2015)	XXX
Traffic Speed, mph	40	A
Number of lanes	Divided Four lanes (one LT lane)	
Conclusion		



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2 lanes or 3 lanes <u>with</u> raised median	вт	In- street sign	FB (or FS) + ASLS	g is not	BT	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In- street sign	FB	FB (or FS) + ASLS	g is not	In- street sign	FB (orFS) + ASLS	FB (orFS) + ASLS	Uncontrolled pedestrian crossing is not recommended	g is not			
3 lanes <u>without</u> raised median	BT	In- street sign	FB (or FS) + ASLS	trian crossin nended	вт	FB (or FS) + ASLS	FB (or FS) + ASLS		FB	FB (orFS) + ASLS	FB (orFS) + ASLS	trian crossin nended	FB (orFS) + ASLS	FB (or FS) + ASLS	**PHB + CSOR		Uncontrolled pedestrian crossin. recommended	nended		
4 lanes <u>with</u> raised median	In- street sign	ASLS	FB (or FS) + ASLS	rolled pedes	ASLS	ASLS (consider FB or FS)	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**FB or FS (consider PHB)+ ASLS	Uncontrolled pedes recomr	FB (or FS)+ ASLS	** PHB + CSOR	**PHB + CSOR			recomi		
5 or 6 lanes <u>with</u> raised median	ASLS	FB (or FS) + ASLS	FB (or FB) + ASLS	uncont	ASLS	FB (or FS)+ ASLS	PHB+ CSOR		overhead FB or FS + ASLS	overhead FB or FS + ASLS	**PHB+ CSOR		PHB+ CSOR	** PHB + CSOR	**PHB + CSOR					
4, 5, or 6 lanes <u>without</u> raised median	Cons feas: the r treat not r	sider ible ti ecom iment ecom	pede: hen fo imeno is, pro imeno	stri ollo dat ovic ded	an ref w the r ion bei ling u	uge islan recomme low for 4- ncontrolle	d or roa ndatio lane wi ed cros	id di ns fo ithou sing	et, if fea r the ab t raised s of mor	sible. 1 ove lan media e than	lf raised le config in to dec: four land	med urat ide p es w	lian, or ions, otl oedestri ithout a	road die her wise an cross raised 1	et is follow sing nediar	, ı is				
4 lanes, raised median not foogible	ASLS	ASLS	PHB + CSOR		ASLS	overhead FB or FS + ASLS	PHB +CSOR		overhead FB or FS+ ASLS	PHB +CSOR	** PHB+ CSOR		PHB +CSOR	** PHB+ CSOR	**PHB +CSOR					

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### Other Non-treatment Factors That Affect Pedestrian Safety At Uncontrolled Locations

## 26 Crosswalk Pattern



Recommended Crosswalk Patterns at Uncontrolled Locations (Zegeer, et al., 2005(b))

# 27 Bus Stop Location



Placement of bus stop on the far side of the crossing (PEDSAFE, 2017)

# 28 Crosswalk Lighting



Midblock crosswalk lighting layout (Gibbons, et al., 2008)

#### Use of Retroreflective Sign Posts and Dual Backto-Back Display



Pedestrian Crossing Sign (Dual back-to-back Display) at North Clark St, Chicago



Retroreflective Signpost along IL 23, Rochester, IL.

## 30 Education Program



#### Sequence for a Pedestrian Hybrid Beacon (FHWA, 2009)

## 31 Contact Information

If you have any questions related to this presentation, please contact:

Kyle Armstrong – <u>Kyle.Armstrong@illinois.gov</u>

Yan Qi - yqi@siue.edu

#### **Final Report Link**

https://apps.ict.illinois.edu/projects/getfile.asp?id=5292

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### Thank You !