Guidelines for Pedestrian Treatments at Uncontrolled Locations

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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
  - 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

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
- **Sight distance**
  - Inadequate stopping sight distance or pedestrian sight distance

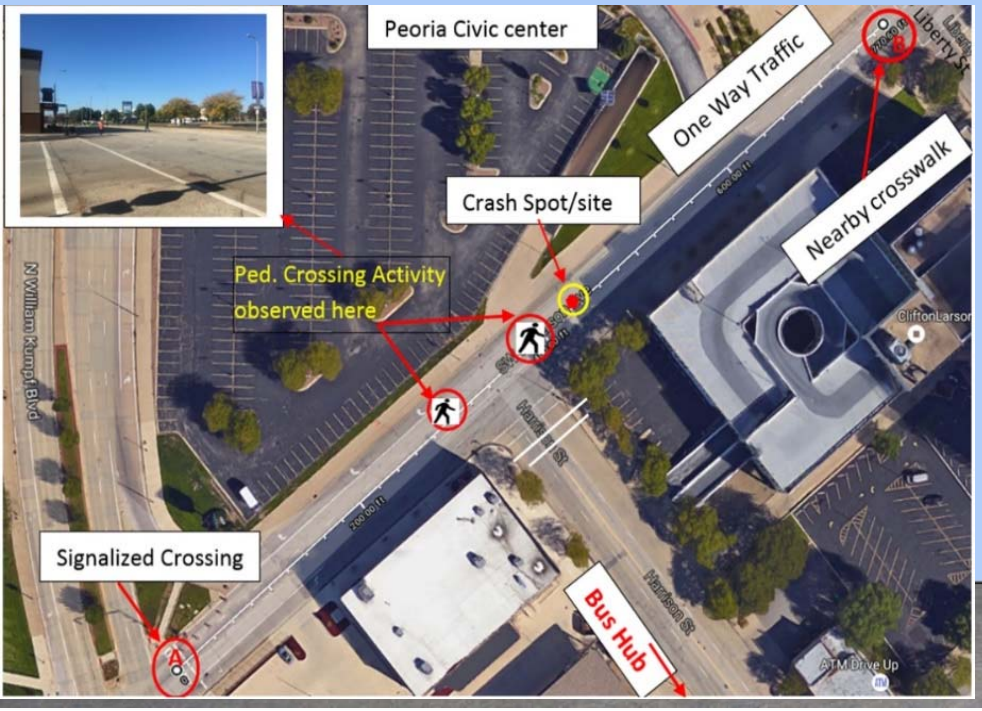
Appropriate Locations for Uncontrolled Crossings

- 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)

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

SW Jefferson St. with
Harrison St. Peoria, IL



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

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	▪ **Speed limit is over 40 mph** ▪ Uncontrolled crosswalk is not recommended

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
Enhanced Treatments	Advanced stop line and sign
	In-street crossing sign
	Overhead crossing sign
Geometric Elements	Curb Extension
	Road diet
	Raised median
	Raised crosswalk
Warning Beacon	FB (Flashing Beacon)
	FS (Flashing Pedestrian Crossing sign)
Control Beacon	PHB (Pedestrian Hybrid Beacon)

Basic Treatments

- Marked crosswalk + pedestrian sign

Pedestrian Crossing and Warning Signs (FHWA, 2009)

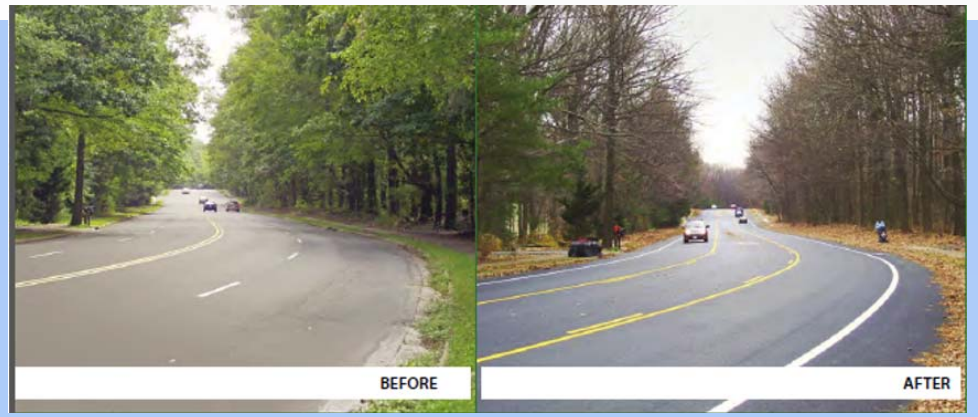
Enhanced Treatments

Uncontrolled pedestrian crosswalk signs

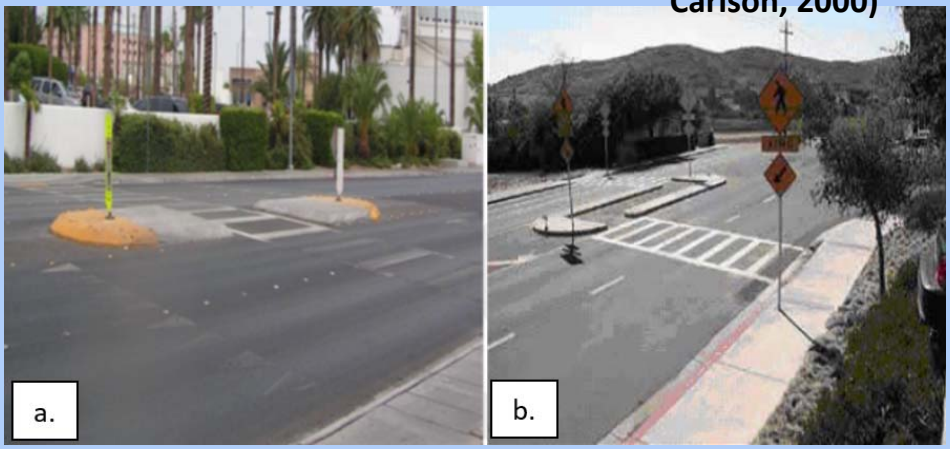
Advanced Stop Line and Sign (PEDSAFE, 2017)

Geometric Elements

Curb extensions (Turner and Carlson, 2000)



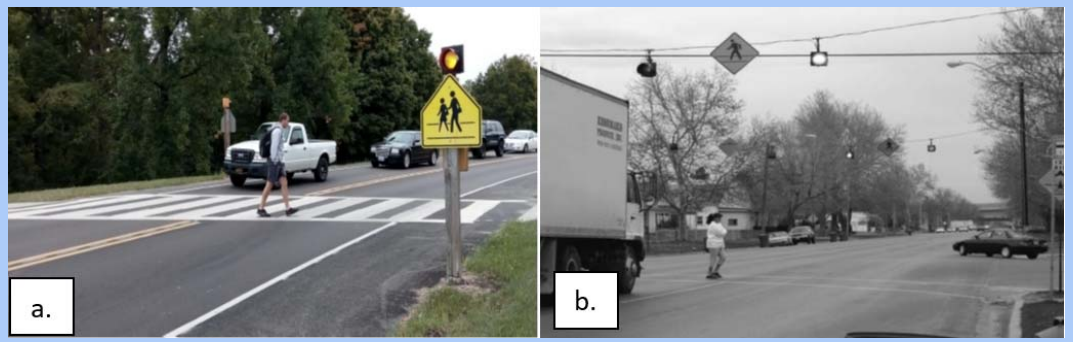
Road Diet (Knapp, et al., 2014)



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

Raised Crossing (PEDSAFE, 2017)

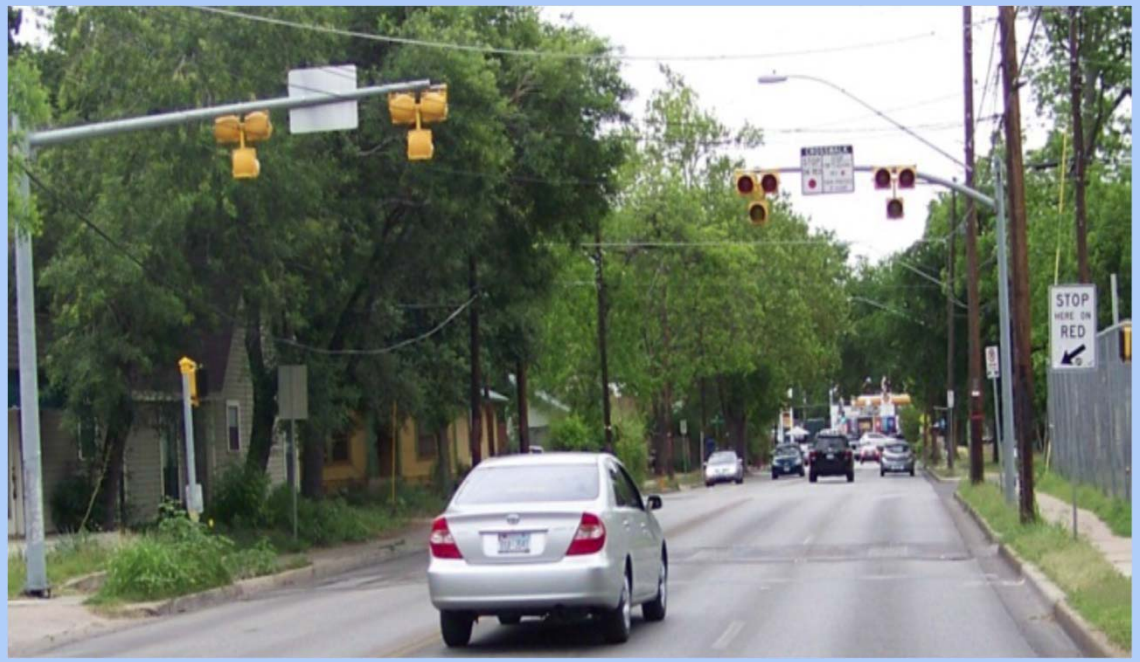
Warning Beacons



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

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

Control Beacon-Pedestrian Hybrid Beacon (PHB)



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

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.

Source: siliconconstellations.com

Recommended minimum treatments at uncontrolled pedestrian crossings

	ADT≤ 9,000				9,000<ADT<15,000				15,000<ADT≤ 25,000				25,000< ADT≤35,000				ADT>35,000
	posted speed, mph																
	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30 to 45
2 lanes or 3 lanes <u>with</u> raised median	BT	In-street sign	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	BT	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In-street sign	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In-street sign	FB (or FS) + ASLS	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	Uncontrolled pedestrian crossing is not recommended
3 lanes <u>without</u> raised median	BT	In-street sign	FB (or FS) + ASLS		BT	FB (or FS) + ASLS	FB (or FS) + ASLS		FB	FB (or FS) + ASLS	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**PHB+ CSOR		
4 lanes <u>with</u> raised median	In-street sign	ASLS	FB (or FS) + ASLS		ASLS	ASLS (consider FB or FS)	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**FB or FS (consider PHB)+ ASLS		FB (or FS)+ ASLS	** PHB + CSOR	**PHB+ CSOR		
5 or 6 lanes <u>with</u> raised median	ASLS	FB (or FS) + ASLS	FB (or FB) + ASLS		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	Consider pedestrian refuge island or road diet, if feasible. If raised median, or road diet is feasible then follow the recommendations for the above lane configurations, other wise follow the recommendation below for 4-lane without raised median to decide pedestrian crossing treatments, providing uncontrolled crossings of more than four lanes without a raised median is not recommended.																
4 lanes, raised median not feasible	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		

Recommended 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:

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.

Example (3)

SW Jefferson St. with Harrison St. Peoria, IL

ADT	9200 (2012)
Speed Limit, mph	30
Number of lanes	Undivided three lanes (one way)
Conclusion	

	ADT≤ 9,000				9,000<ADT<15,000				15,000<ADT≤ 25,000				25,000< ADT≤35,000				ADT>35,000
	posted speed, mph																
	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30 to 45
2 lanes or 3 lanes with raised median	BT	In-street sign	FB (or FS) + ASLS	uncontrolled pedestrian crossing is not recommended	BT	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In-street sign	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In-street sign	FB (or FS) + ASLS	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	Uncontrolled pedestrian crossing is not recommended
3 lanes without raised median	BT	In-street sign	FB (or FS) + ASLS		BT	FB (or FS) + ASLS	FB (or FS) + ASLS		FB	FB (or FS) + ASLS	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**PHB + CSOR		
4 lanes with raised median	In-street sign	ASLS	FB (or FS) + ASLS		ASLS	ASLS (consider FB or FS)	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**FB or FS (consider PHB)+ ASLS		FB (or FS)+ ASLS	** PHB + CSOR	**PHB + CSOR		
5 or 6 lanes with raised median	ASLS	FB (or FS) + ASLS	FB (or FB) + ASLS		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 without raised median	Consider pedestrian refuge island or road diet, if feasible. If raised median, or road diet is feasible then follow the recommendations for the above lane configurations, other wise follow the recommendation below for 4-lane without raised median to decide pedestrian crossing treatments, providing uncontrolled crossings of more than four lanes without a raised median is not recommended.																
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Example (4)

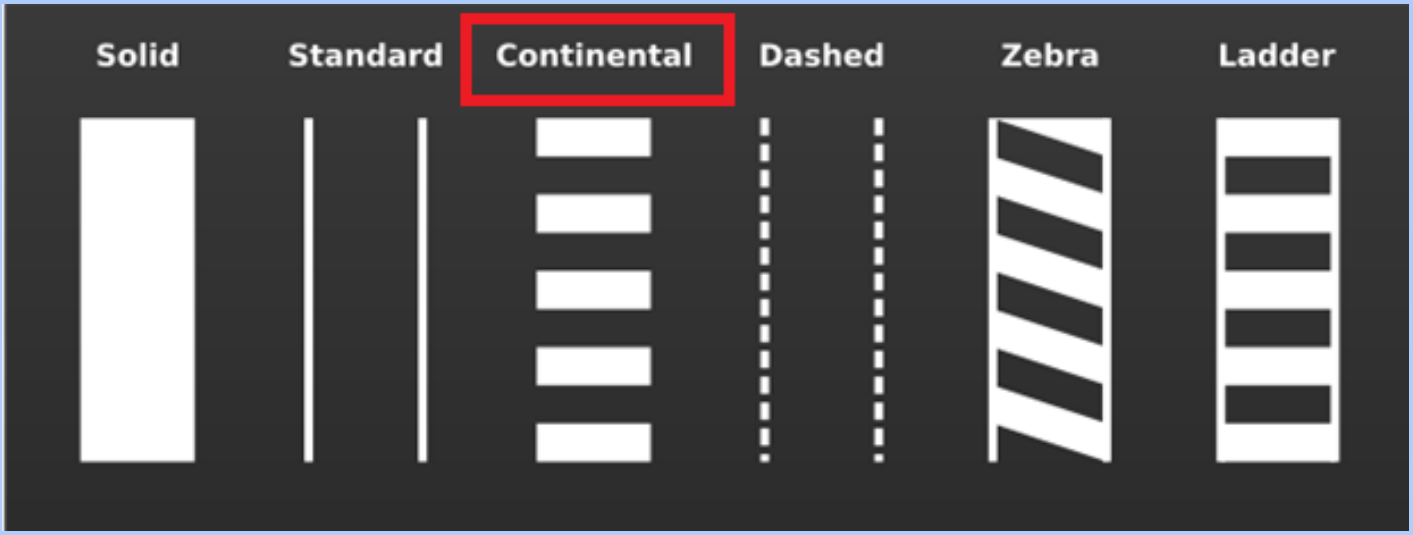
Illinois Rte. 29 with Taft Dr.
Rochester, IL

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

	ADT≤ 9,000				9,000<ADT<15,000				15,000<ADT≤ 25,000				25,000< ADT≤35,000				ADT>35,000
	posted speed, mph																
	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30	35	40	45	≤ 30 to 45
2 lanes or 3 lanes with raised median	BT	In-street sign	FB (or FS) + ASLS	uncontrolled pedestrian crossing is not recommended	BT	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In-street sign	FB	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	In-street sign	FB (or FS) + ASLS	FB (or FS) + ASLS	Uncontrolled pedestrian crossing is not recommended	Uncontrolled pedestrian crossing is not recommended
3 lanes without raised median	BT	In-street sign	FB (or FS) + ASLS		BT	FB (or FS) + ASLS	FB (or FS) + ASLS		FB	FB (or FS) + ASLS	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**PHB + CSOR		
4 lanes with raised median	In-street sign	ASLS	FB (or FS) + ASLS		ASLS	ASLS (consider FB or FS)	FB (or FS) + ASLS		FB (or FS) + ASLS	FB (or FS) + ASLS	**FB or FS (consider PHB)+ ASLS		FB (or FS)+ ASLS	** PHB + CSOR	**PHB + CSOR		
5 or 6 lanes with raised median	ASLS	FB (or FS) + ASLS	FB (or FB) + ASLS		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 without raised median	Consider pedestrian refuge island or road diet, if feasible. If raised median, or road diet is feasible then follow the recommendations for the above lane configurations, other wise follow the recommendation below for 4-lane without raised median to decide pedestrian crossing treatments, providing uncontrolled crossings of more than four lanes without a raised median is not recommended.																
4 lanes, raised median not feasible	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		

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

Crosswalk Pattern

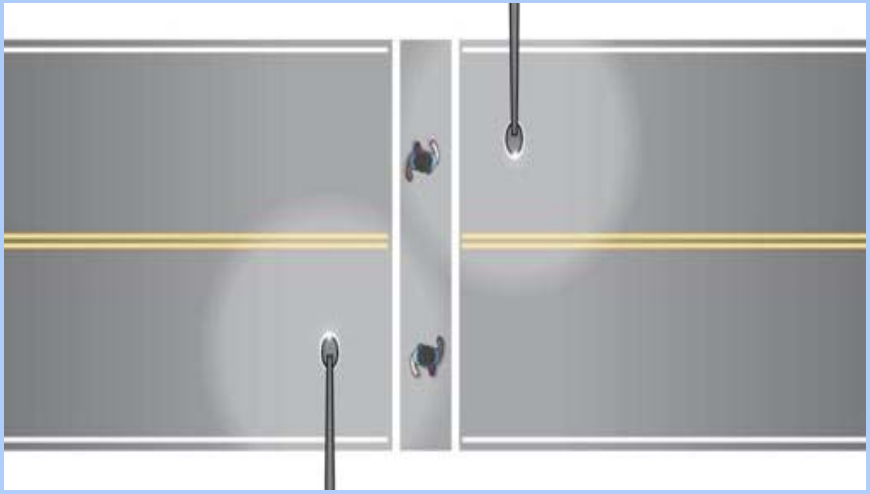


Recommended Crosswalk Patterns at Uncontrolled Locations
(Zegeer, et al., 2005(b))

Bus Stop Location

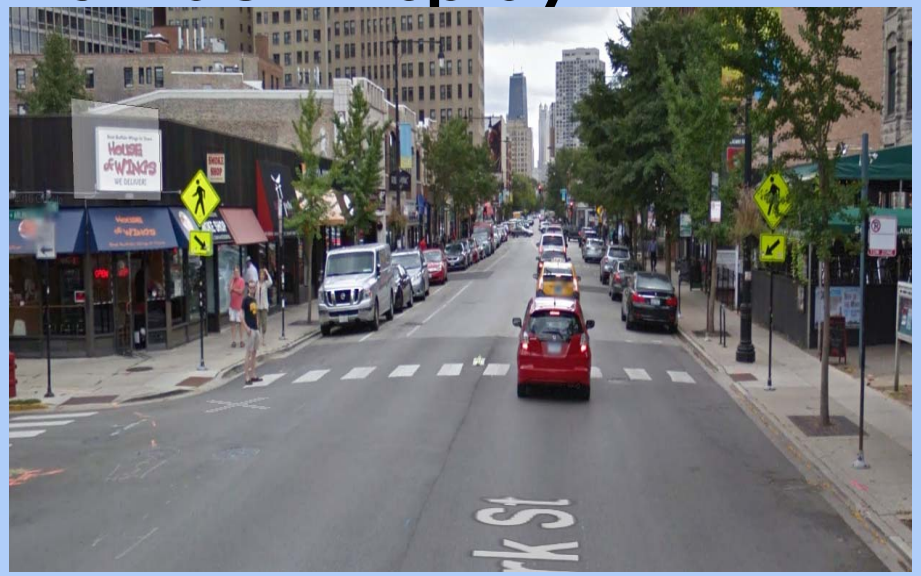
Placement of bus stop on the far side of the crossing
(PEDSAFE, 2017)

Crosswalk Lighting



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

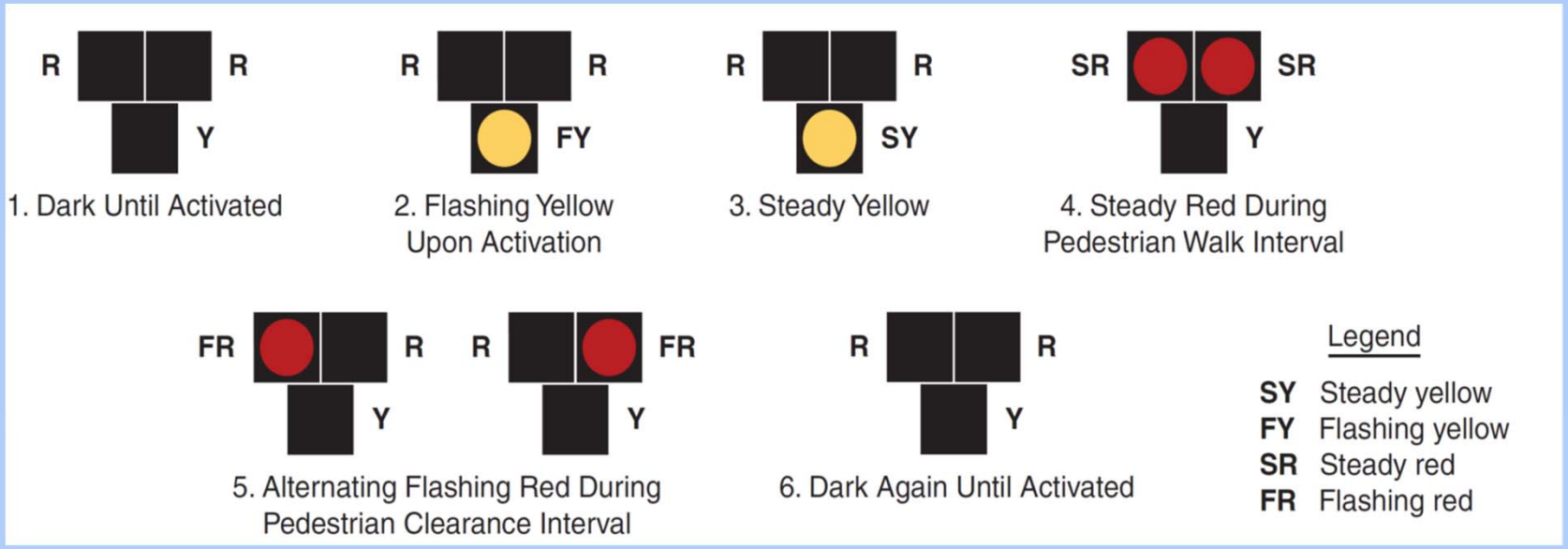
Use of Retroreflective Sign Posts and Dual Back-to-Back Display



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

Retroreflective Signpost along IL 23, Rochester, IL.

Education Program



Sequence for a Pedestrian Hybrid Beacon (FHWA, 2009)

Contact Information

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

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Final Report Link

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

Thank You !