

# NCHRP Project 03-141 Guidance on Midblock Pedestrian Signals

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TRB Highway Safety Performance Committee

June 28, 2023

Texas A&M Transportation Institute

## Team Introductions

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## Project Objective

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- ...summarize the effectiveness of midblock pedestrian signal (MPS) installations and propose language suitable for inclusion in the Manual on Uniform Traffic Control Devices (MUTCD) Part 4
- Preference – measure effectiveness using crashes (safety analysis)

## Safety Analysis

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- Cross-sectional analysis
  - Considered before-after analysis; however, most MPS installed several years prior
  - Included both treated and control sites
- Control sites
  - Goal = 2 to 3 control sites per treated site
  - Control site to be as similar as possible to treated site but without treatment
  - Control sites include both signalized intersections and unsignalized intersections
- For each site
  - Roadway characteristics, traffic control device, vehicle volume, **pedestrian volume**, crashes

## Find Midblock Pedestrian Signal Sites

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- Asked those with known installations (Los Angeles)
- Request to AASHTO Committee on Traffic Engineering / Panel
- Post on ITE Community (6/29/21)
- Research team member had collected pedestrian counts at several sites in San Antonio, Texas
- Responses from **California**, Florida, **Texas**, Delaware, **Utah**

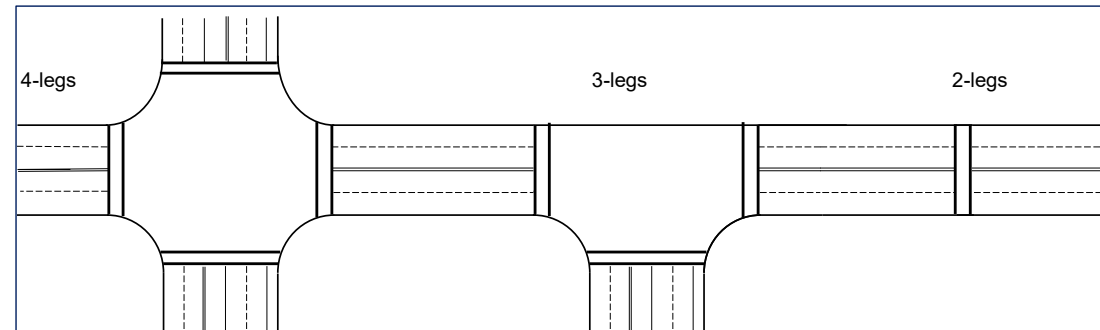
## Geometric Data

### Main street:

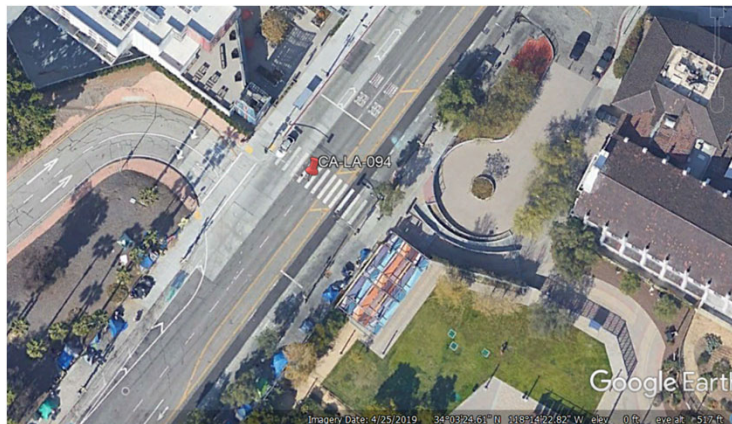
- One-way or two-way
- Number of lanes
- Crossing distance (includes median, longer of two approaches if at intersection)
- Median type
- Parking lane presence
- Bike treatment presence
- Advance stop lines
- Posted speed limit

### Intersection:

- Treated or control
- Traffic control device type
- Number of legs



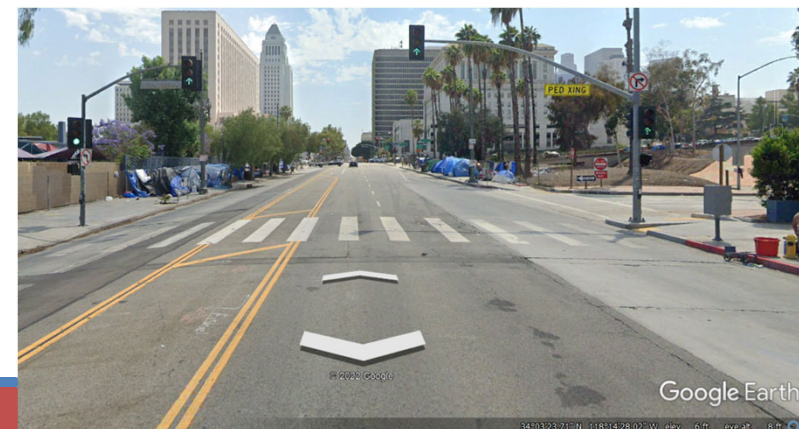
## Is it a Signal or is it a Midblock Pedestrian Signal (MPS)?



If driveway was within a few feet of crossing, what is the control at the driveway?

- Stop sign for this example

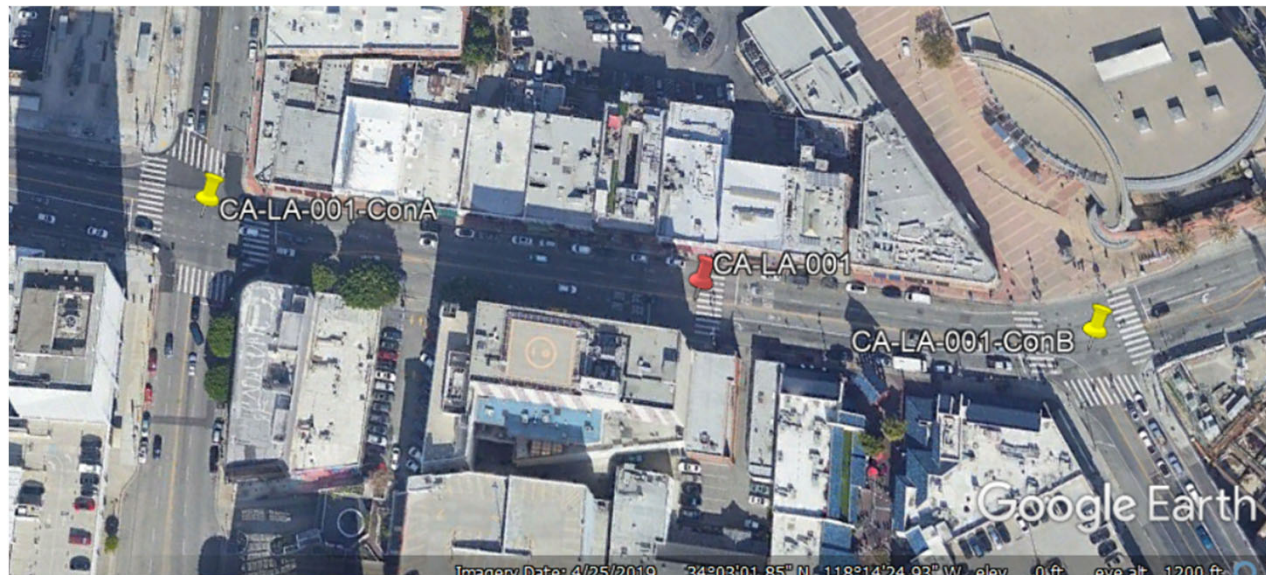
Research team called it MPS



## Study Sites – Example of Control Sites

Red pin = treated site

Yellow pin = control sites





## Study Sites – Example of Control Sites

Had to go to California cities other than Los Angeles to find 2-leg non-signalized control sites



## Study Sites Traffic Control (Device)

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CBoverhead-24/7 = circular beacon overhead flashing 24/7

CBoverhead-PedAct = circular beacon overhead pedestrian activated

CBroadside-24/7 = circular beacon roadside flashing 24/7

CBroadside-PedAct = circular beacon roadside pedestrian activated

CW&Sign = crosswalk markings and sign

LED-Em = LEDs embedded in the sign

LED-Em & Flags = LEDs embedded in the sign with flags

***MPS = midblock pedestrian signal***

NoPedTCD = no pedestrian traffic control devices, including no crosswalk, etc.

PHB = Pedestrian hybrid beacon

RRFB = Rectangular rapid flashing beacon

Signal = traffic control signal

Stop-AllWay = all approaches have stop control

Stop-Cont = stop sign at crosswalk

Stop-ContwCB = stop sign at crosswalk with CB

Stop-OneWayTraffic = stop control at crosswalk with one-way traffic

## Signals

Kay Fitzpatrick

	Type of Traffic Control	Device Group	CA	TX	UT	Total
<b>Treated</b>	<b>MPS</b>	<b>Red</b>	<b>150</b>	<b>11</b>	<b>32</b>	<b>193</b>
<b>Control</b>	CBoverhead-24/7	Yellow		1		1
<b>Control</b>	CBoverhead-PedAct	Yellow	2		2	4
<b>Control</b>	CBroadside-24/7	Yellow	4			4
<b>Control</b>	CBroadside-PedAct	Yellow	1	1	4	6
<b>Control</b>	CW&Sign	Grey	61	18	19	98
<b>Control</b>	CW_only	Grey	1			1
<b>Control</b>	LED-Em	Yellow		2	2	4
<b>Control</b>	LED-Em & Flags	Yellow			4	4
<b>Control</b>	NoPedTCD	Grey		32	2	34
<b>Control</b>	PHB	Red		4	10	14
<b>Control</b>	RRFB	Yellow	23	2	2	27
<b>Control</b>	RRFB-Overhead	Yellow	9			9
<b>Control</b>	Signal	Red	198	220	61	479
<b>Control</b>	Stop-AllWay	Red	3			3
<b>Control</b>	Stop-Cont	Red	7			7
<b>Control</b>	Stop-ContwCB	Red	1			1
<b>Control</b>	Stop-OneWayTraffic	Red	3			3
<b>Subtotal</b>	For control sites		313	280	106	699
<b>Total</b>			<b>469</b>	<b>292</b>	<b>138</b>	<b>892</b>

## Crash Data

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- Crash data obtained from state-maintained databases:
  - California: Transportation Injury Mapping System (TIMS) Database
    - No PDO crash data, only Fatal and Injury (FI) crashes
  - Utah: Numetric Database
  - Texas: Crash Records Information System (CRIS) Database
- Crash data period:
  - Wanted about 7 years of crash data per site
  - COVID pandemic restrictions started April 2020 therefore focus on pre-pandemic (more data)
  - Typical dates = January 2014 to March 2020
  - Dates for a site adjusted if historical aerial or street views identified major changes at site (e.g., treatment installed, construction)

## Example of Crashes at an Intersection

Used 250 ft around intersection to identify crashes



## Examples of Crashes at Midblock

Used 150 ft for 26 midblock crossings to identify crashes as 250 ft included crashes on neighboring intersections or roads



## Observations for All Sites

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- More pedestrian fatal and injury (Ped FI) crashes when:
  - More vehicle volume
  - More pedestrian volume
  - More legs
  - More lanes on main street
- Less Ped FI crashes when:
  - Posted speed limit is less than 30 mph
  - On-street parking is present
  - Bike lane is present
  - One-way traffic and 2 legs

## Observations on Evaluations

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- Considered several **crash types**: pedestrian, total, rear-end
- Focused on severity level of **fatal and injury**
- Considered several **control groups**:
  - 2-leg, Grey traffic control device group
  - 2-leg, All traffic control device groups (i.e., grey, yellow, and red device groups)
  - Multiple legs, All traffic control device groups



## Sample Size of Treated and Control Groups ...2-Leg Control Sites Provided Best Results

Treated Or Control	Traffic Control Device Group	2 Legs	3 Legs	4 Legs	Grand Total
<b>Treated</b>	Red Device	193			193
<b>Control</b>	Grey Device	130		3	133
	Red Device*	24	36	447	507
	Yellow Device**	35	6	18	59
<b>Subtotal</b>		189	42	468	699
<b>Grand Total</b>		383	42	468	892

\*Red devices = 13 PHBs, 7 Stop-Cont, 1 Stop-ConwCB, 3 Stop-OneWayTraffic

\*\*Yellow devices = 12 RRFBs, 4 LED-Em, 4 LED-Em & Flags, 1 CB\_Overhead-24/7, 4 CB\_Overhead-PedAct, 4 CB\_Roadside-24/7, 6 CB\_Roadside-PedAct

## Key Findings – Crashes

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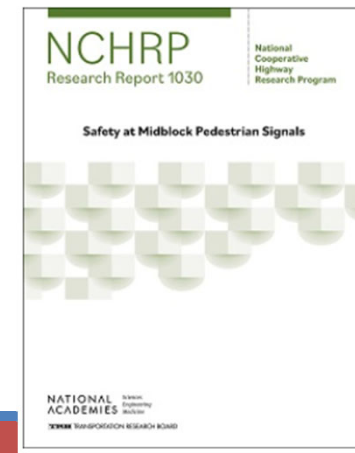
- When control group = Multiple legs, All device groups or 2-leg, All device groups (i.e., grey, yellow, and red device groups)
  - Treatment not significant
- When control group = 2-leg, Grey traffic control device group, MPS reduces the number of...
  - Ped FI crashes, treatment significant: **Ped F&I MPS CMF = 0.554**
  - All F&I crashes, treatment significant: **Total F&I MPS CMF = 0.660**
  - Rear-end F&I crashes, treatment not significant

Sites	PHB CMF 2017 NCHRP	PHB CMF 2019 ADOT Study	MPS CMF NCHRP 3-141, This Study
All crash types, all severity levels	<ul style="list-style-type: none"> <li>0.820</li> </ul>	<ul style="list-style-type: none"> <li>0.818</li> </ul>	<ul style="list-style-type: none"> <li>Not Generated</li> </ul>
All crash types, FI only	<ul style="list-style-type: none"> <li>Not Generated</li> </ul>	<ul style="list-style-type: none"> <li>0.748</li> </ul>	<ul style="list-style-type: none"> <li><b>0.660</b> (confidence interval = 0.445, 0.978)</li> </ul>
Pedestrian crashes, all severity levels	<ul style="list-style-type: none"> <li>0.432</li> </ul>	<ul style="list-style-type: none"> <li>0.543</li> </ul>	<ul style="list-style-type: none"> <li>Not Generated</li> </ul>
Pedestrian crashes, FI	<ul style="list-style-type: none"> <li>Not Generated</li> </ul>	<ul style="list-style-type: none"> <li>0.550</li> </ul>	<ul style="list-style-type: none"> <li><b>0.554</b> (confidence interval = 0.328, 0.936)</li> </ul>
Treated sites – count	<ul style="list-style-type: none"> <li>27 PHB with advance stop markings and signs sites</li> </ul>	<ul style="list-style-type: none"> <li>52 PHB Sites</li> </ul>	<ul style="list-style-type: none"> <li>193 MPS Sites (used for all CMFs)</li> <li>122 MPS Sites (used for Ped CMF)</li> </ul>
Treated sites – leg distribution	<ul style="list-style-type: none"> <li>Not provided</li> </ul>	<ul style="list-style-type: none"> <li><b>2-legs = 11 sites (21%)</b></li> <li>3-legs = 17 sites (33%)</li> <li>4-legs = 24 sites (46%)</li> </ul>	<ul style="list-style-type: none"> <li><b>2-legs = 193 (100%)</b></li> <li><b>2-legs = 122 (100%)</b></li> </ul>
Treated sites – posted speed limit distribution	<ul style="list-style-type: none"> <li>Not provided</li> </ul>	<ul style="list-style-type: none"> <li>35 mph or less = 22 sites (42%)</li> <li><b>40-45 mph = 30 sites (57%)</b></li> </ul>	<ul style="list-style-type: none"> <li>193 Sites                             <ul style="list-style-type: none"> <li>35 mph or less = 179 sites (93%)</li> <li><b>40-45 mph = 14 sites (7%)</b></li> </ul> </li> <li>122 Sites                             <ul style="list-style-type: none"> <li>35 mph or less = 115 sites (94%)</li> <li><b>40-45 mph = 7 sites (6%)</b></li> </ul> </li> </ul>

## Post Research

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- Developed draft language for possible inclusion in MUTCD
  - Research team provided initial draft material to NCUTCD Task Force
  - Research team assisted the NCUTCD Task Force with refinements
  - Material will be presented to and discussed by NCUTCD Signal Technical Committee in 2023
- Research report published February 2023  
<https://www.trb.org/Publications/Blurbs/182920.aspx>
- Tech transfer activities (like this presentation!)





**Questions....**

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**Texas A&M Transportation Institute  
(Kay Fitzpatrick, Srinivas Geedipally,  
Boniphace Kutela) with Peter Koonce**