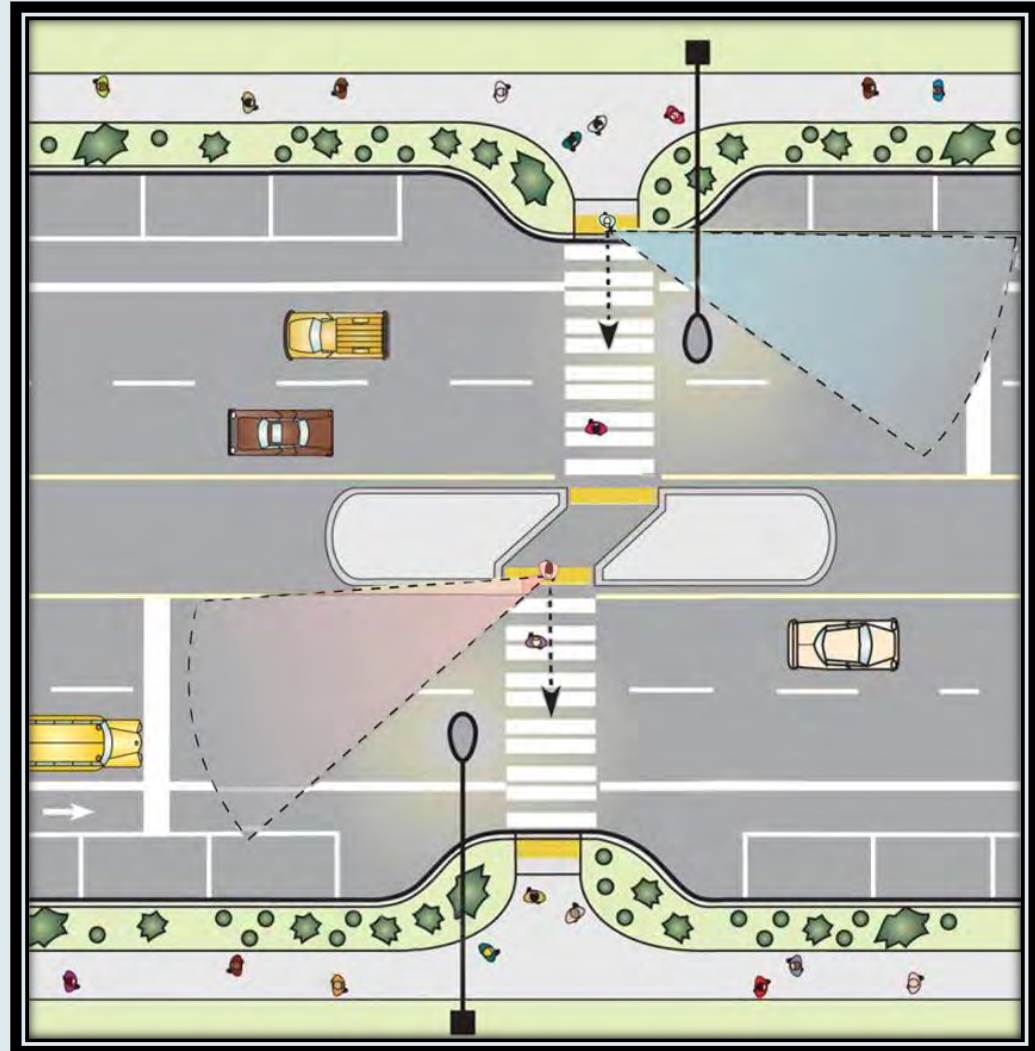


# CROSSING ISLANDS/RAISED MEDIANS

Designing for  
Pedestrian  
Safety  
201

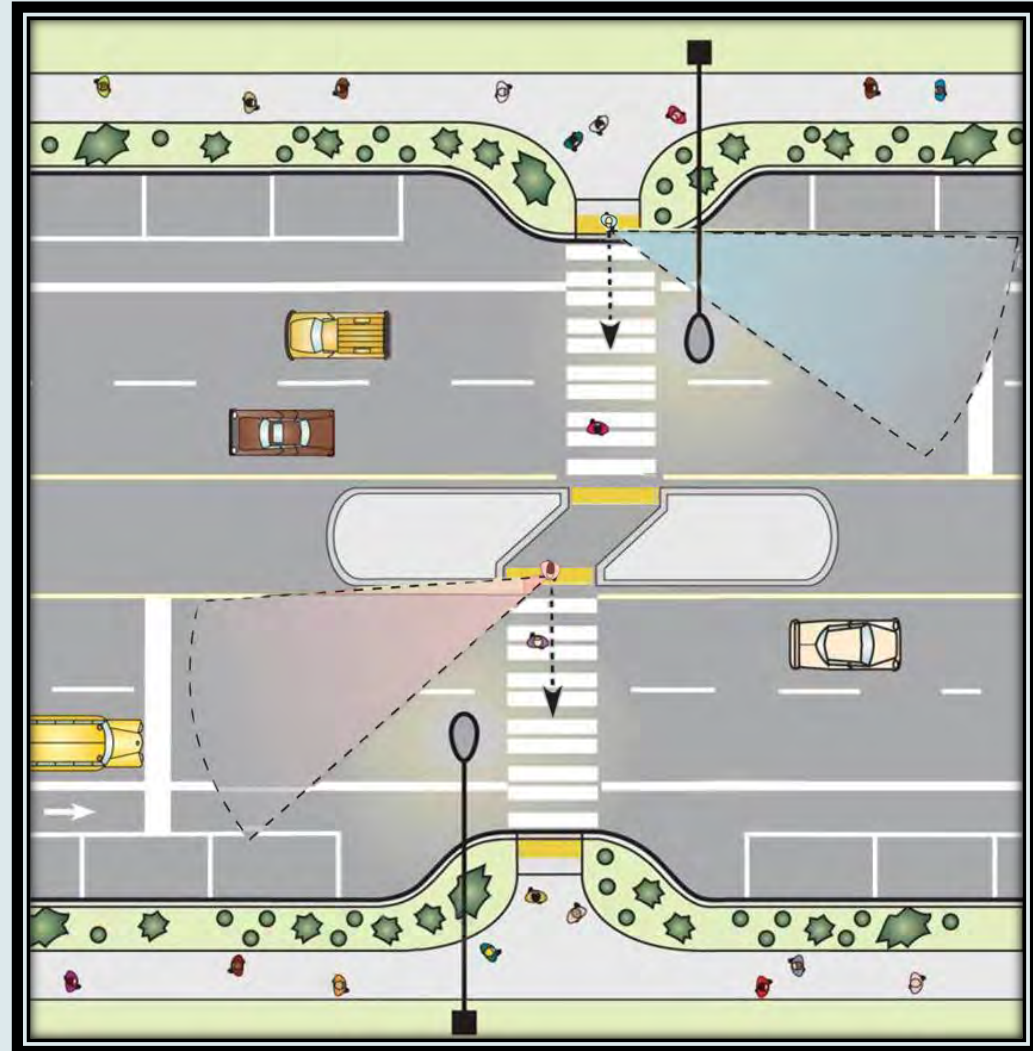
# LIST ALL FEATURES THAT IMPROVE PEDESTRIAN SAFETY?

- Curb extension
- High visibility crosswalks
- Lighting
- Pulled back stop bar
- On street parking
- Bike lanes
- Zone system sidewalks
- ADA
- Raised crossing island



# WHY RAISED ISLANDS ARE SAFER FOR PEDESTRIANS

- Breaks up complex crossing into two simpler ones
- Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
  - One of FHWA's 9 proven safety countermeasures
  - <http://safety.fhwa.dot.gov/provencountermeasures/>



# CROSSING ISLANDS/RAISED MEDIANS SAFETY



- Installing raised medians associated with a 25% reduction in pedestrian crashes in Florida <sup>(1)</sup>
- Installing raised medians associated with a 46% reduction in pedestrian crashes at sites with marked crosswalks, and a 39% reduction at sites with unmarked crosswalks in a sample from 30 U.S. cities <sup>(2)</sup>
- Installing refuge islands associated with a 56% reduction in pedestrian crashes <sup>(3)</sup>

## RESEARCH

- (1) Gan, A., Shen, J., and Rodriguez, A. (2005). Update of Florida Crash Reduction Factors and Countermeasures to improve the Development of District Safety Improvement Projects. Florida Department of Transportation.
- (2) Zegeer, C., Stewart, R., Huang, H., and Lagerwey, P. (2002). Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines, FHWA-RD-01-075.
- (3) Institute of Transportation Engineers. (2004). Toolbox of Countermeasures and Their Potential Effectiveness to Make Intersections Safer. Briefing Sheet 8, FHWA.



# WHEN TO INSTALL

## Recommended:

- **Midblock locations**
  - Crossing exceeds 60 feet
  - Limited number of gaps in traffic
- **Local roads with low speeds & volume**
  - Aesthetic reasons
  - Special pedestrian circumstances
- **Collector with moderate-to-high speeds & volume**
  - Strongly recommended
- **Midblock multilane arterials**
  - Desirable and consideration for supplementary traffic control devices

**Source: AASHTO Guide for the Planning Design, and Operation of Pedestrian Facilities, July 2004**

# WHEN TO INSTALL

## Guidance

- Curbed sections of multi-lane roadways in urban and suburban areas, particularly in areas where there are mixtures of significant pedestrian and vehicle traffic (more than 12,000 ADT) and intermediate or high travel speeds. <sup>1</sup>



1. [FHWA-SA-12-011](#)

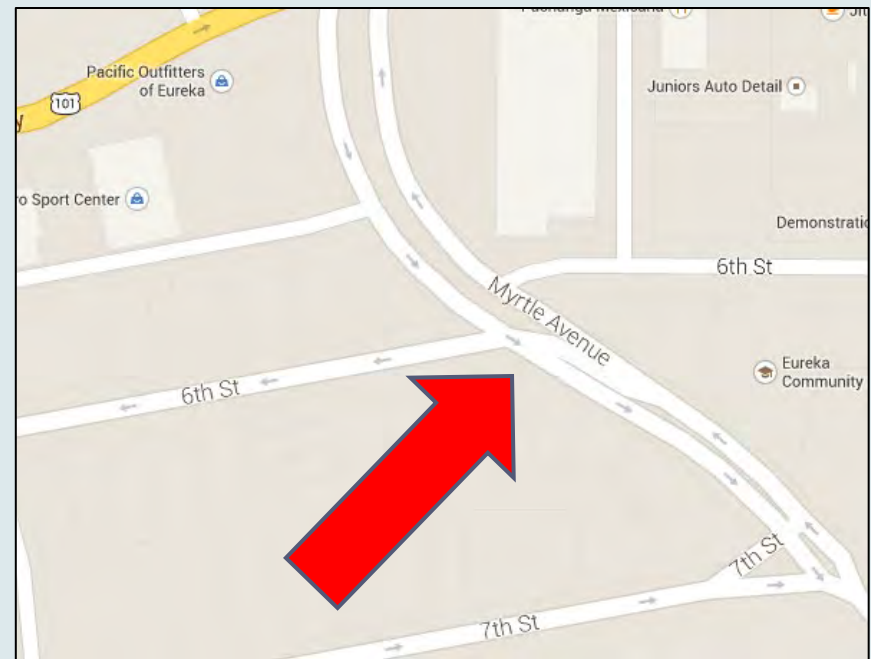
Proven Safety Countermeasures Medians and Pedestrian Crossing Islands in Urban and Suburban Areas



# CASE STUDY: ISLANDS/RAISED MEDIANS (EUREKA, CA)

## Problem/Background

- Wide 3 lane road
  - No marked crosswalks
- Intersection near curve
- Avoided by pedestrians, bicyclists, & motorists
- Increased traffic led to more collisions
- Highest crash intersection in the city



# CASE STUDY: ISLANDS/RAISED MEDIANS (EUREKA, CA)

## Solution

- Worked with CALTRANS and community
- Temporary traffic controls used to test measures
- Median island and crosswalk installed for pedestrian & bicyclist refuge
- Other islands channel vehicles and provide more refuge
- Street lighting and LED signs offer visibility



Signs, cones, and barricades were used to test the improvements before becoming permanent



# CASE STUDY: ISLANDS/RAISED MEDIANS (EUREKA, CA)

## Results

- Reduced conflicts and enhanced safety
- No collisions reported since project completed in 2009
- New school, business, and housing increased foot traffic and activity



Intersection with the permanent improvements

# WHERE TO PLACE ISLANDS



Turning  
movements

Access  
management

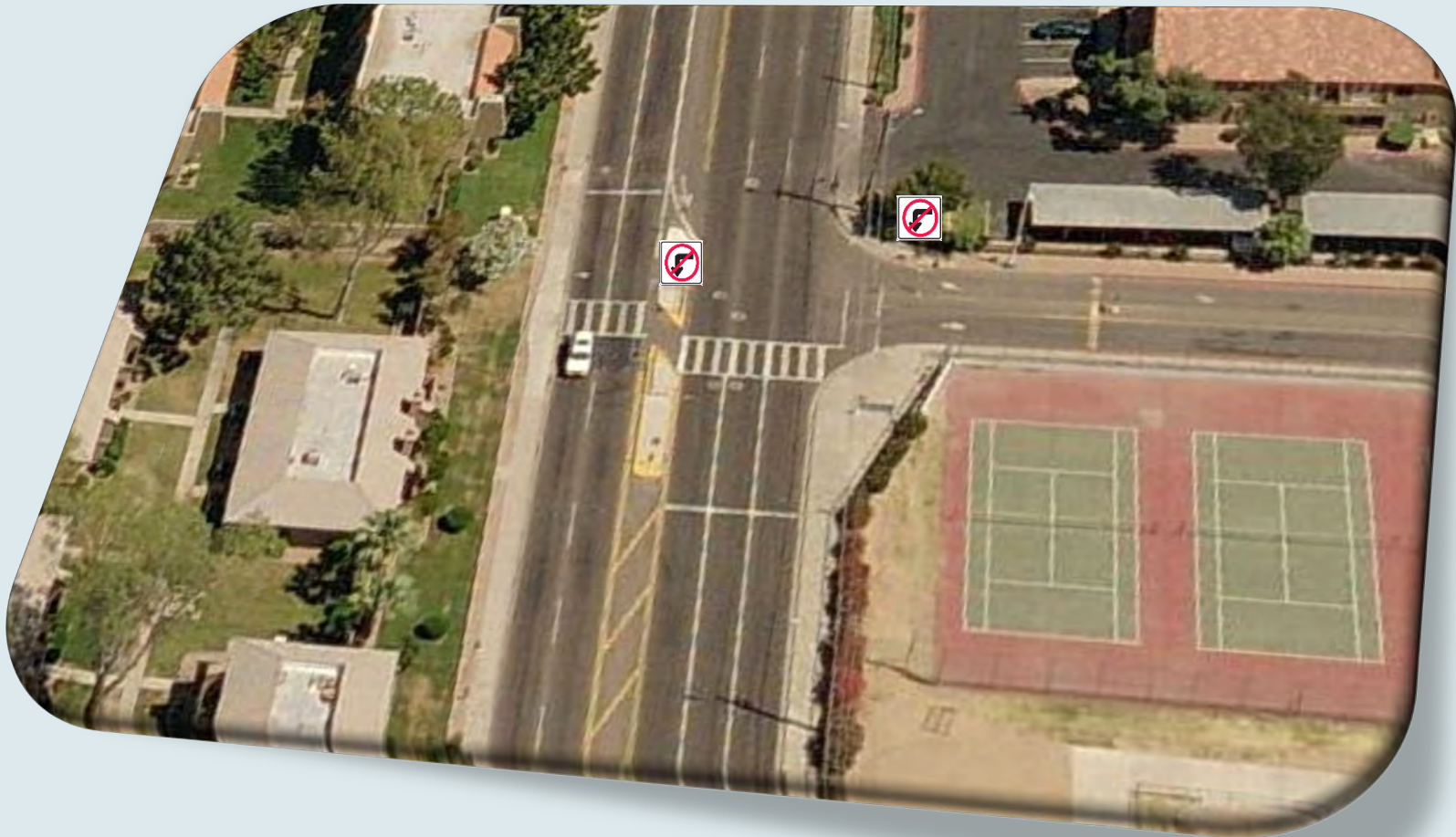
# WHERE TO PLACE

- Where there is room
- Where people are crossing
- Intersections
- Midblock





# CAN USE FOR ACCESS MANAGEMENT



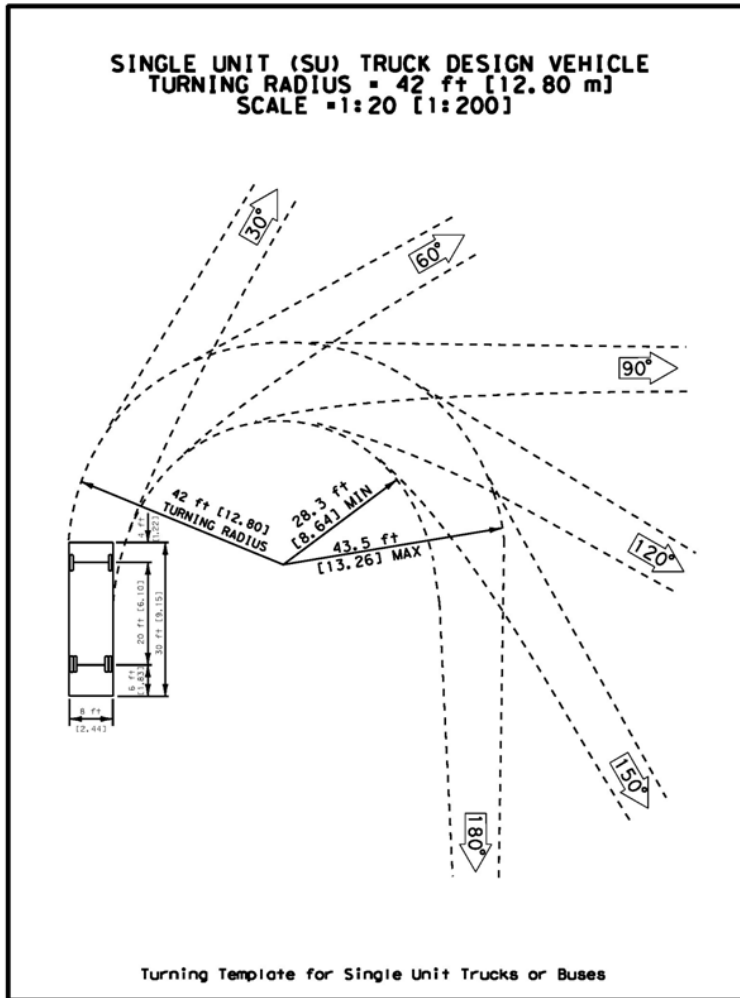
# LEFT TURNS PROHIBITED AT DRIVEWAY






Left turn restricted



Left turns not restricted

# LENGTH OF OPENING NEXT TO MEDIAN



 Low 2-axle vehicles and all motorcycles (including motorcycles pulling trailers)	6'-22'
 High 2-axle vehicles and low 3-axle vehicles	20'-34'
 High 3-axle vehicles and low 4-axle vehicles	32'-72'
 High 6-axle vehicles	65'-71'
 All vehicles with 7 or more axles	68'-111'





**Flush**



**6" Raised Curb**

# WHAT TYPE OF MEDIAN OR ISLAND



**Low Profile Barrier**

# FLUSH (TWO WAY CENTER TURN LANE)

- A TWLTL is not a crossing island
- It's an opportunity for pedestrians to use what's already out there
- TWLTL provides space for island
- But better than yellow centerline

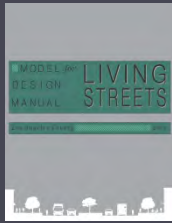


# 6-INCH RAISED

- Minimum 6 feet wide
- 8 feet to accommodate bicycles, wheelchairs, scooters, and groups of pedestrians
- Length parallel to street 20 feet minimum







# “MODEL DESIGN GUIDE FOR LIVING STREETS” LOS ANGELES COUNTY

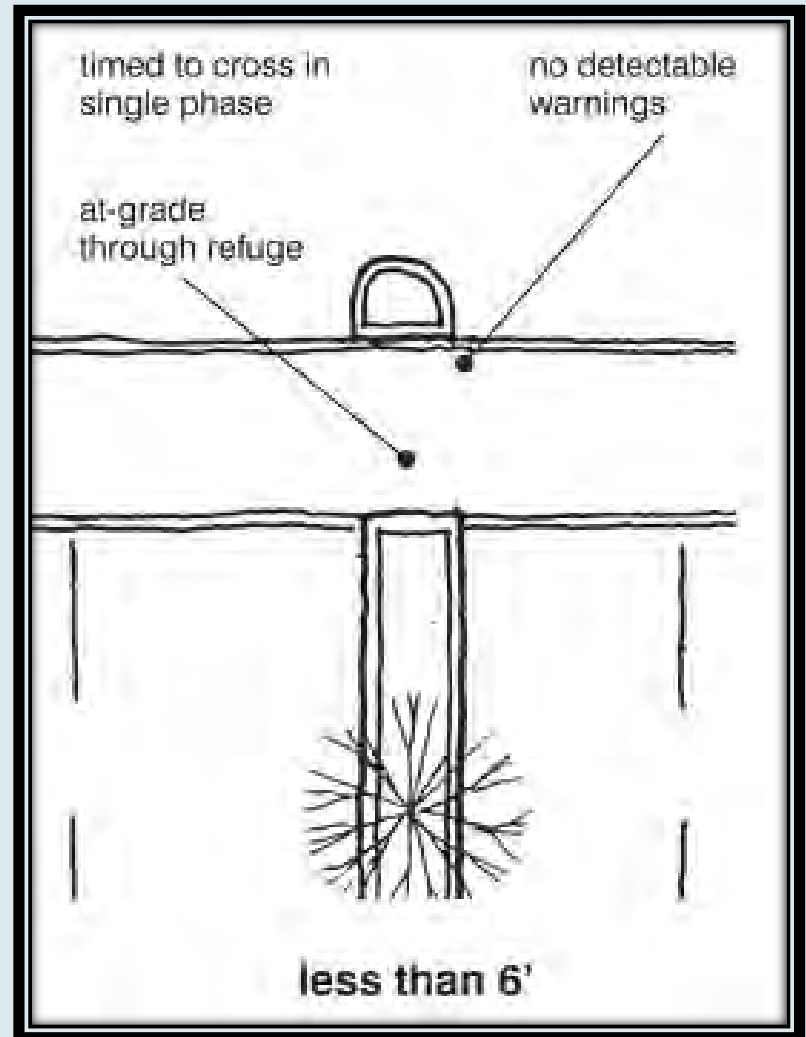
Median Type	Minimum Width	Recommended Width
Median for access control	4 feet	6 feet
Median for pedestrian refuge	6 feet	8 feet
Median for trees and lighting	6 feet [1]	10 feet [2]
Median for single left-turn lane	10 feet [3]	10 feet [2]
Median for single left-turn lane and pedestrian refuge	16 feet [4]	16 feet

## Table Notes

- [1] Six feet measured curb face to curb face is generally considered the minimum width for proper growth of small caliper trees (less than 4 inches).
- [2] Wider medians provide room for larger caliper trees and more extensive landscaping.
- [3] A 10-foot lane provides for a turn lane without a concrete traffic separator.
- [4] Includes a 10-foot turn lane and a 6-foot pedestrian refuge.

# MEDIANS LESS THAN 6 FEET WIDE

- Signals should be timed so that pedestrians can cross entire street in one phase
- No detectable warning strips in median



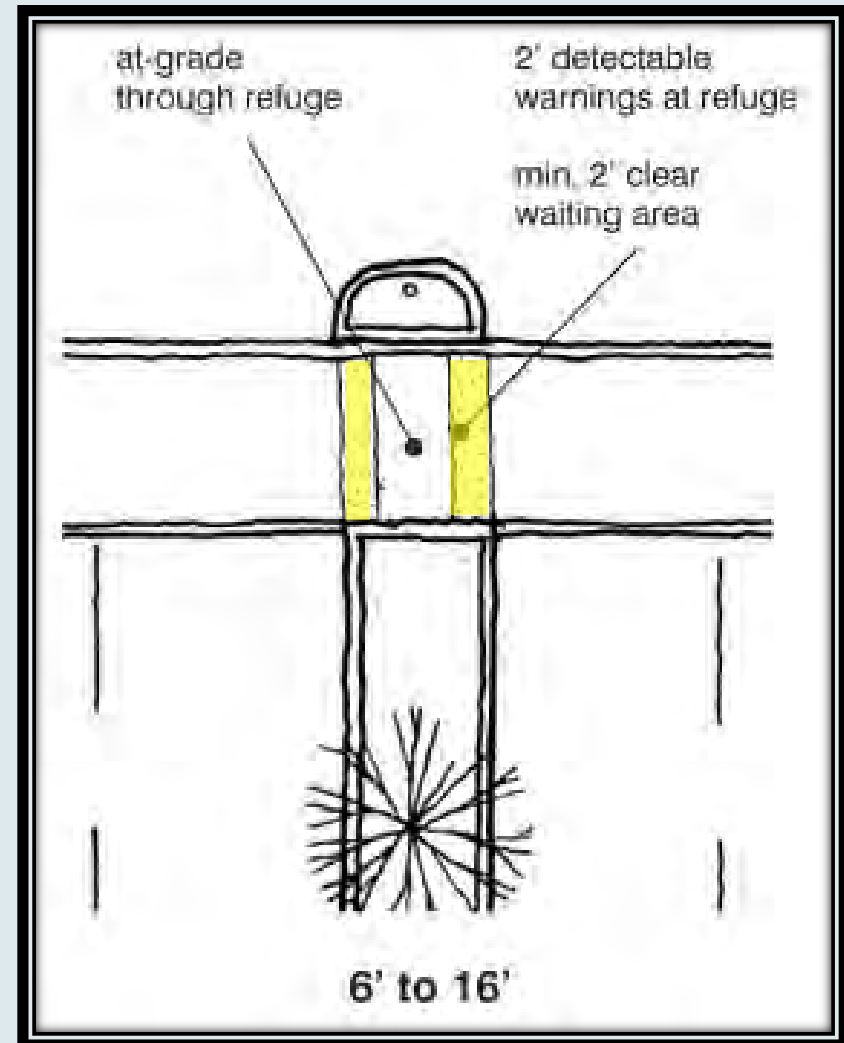
# LESS THAN 6 FEET MEDIAN NO TRUNCATED DOMES





# MEDIANS BETWEEN 6 AND 16 FEET WIDE

- Pathway & waiting area should be at street grade
- 2 foot wide detectable warning strips on each end
- 2 foot wide clear zone (min.) in the center



OK?



OK?

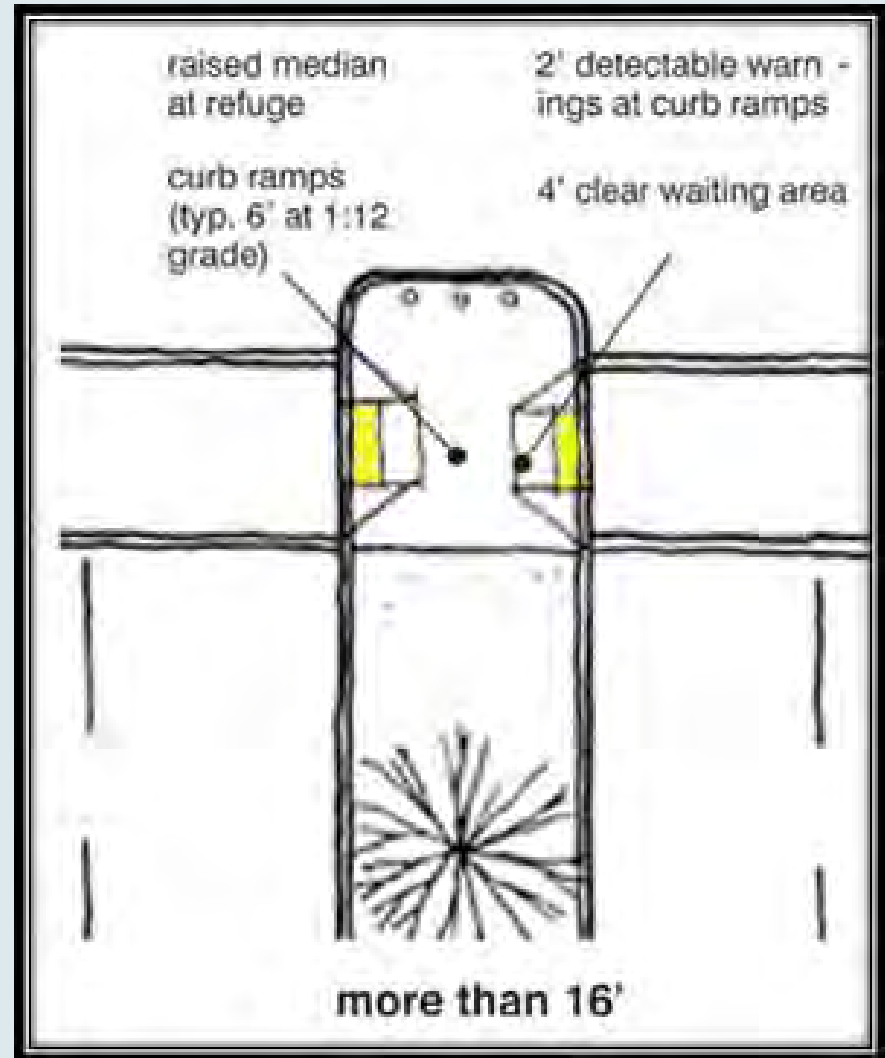


OK?



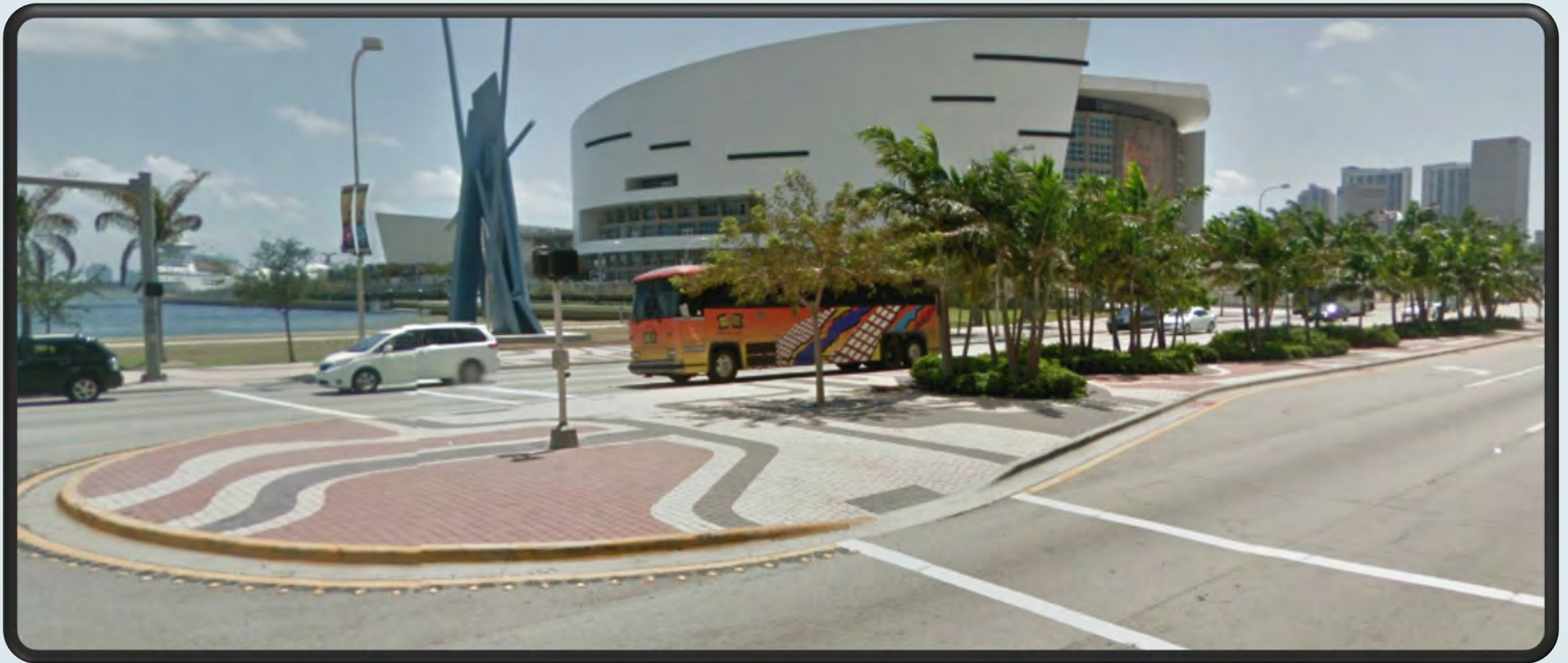
# MEDIANS 16 FEET WIDE OR GREATER

- Refuge islands should be raised
  - more visibility for waiting pedestrians.
- Raised islands should include two ramps
  - 8.3% (1 inch per foot)
- Ramp ~6 feet long for 4 & 5 inch height curb
  - 2 foot wide detectable warning strips on each end & minimum 4 foot wide waiting area





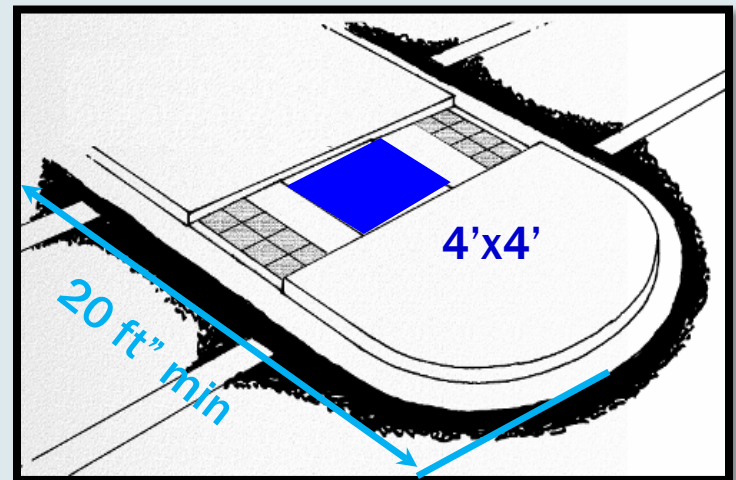
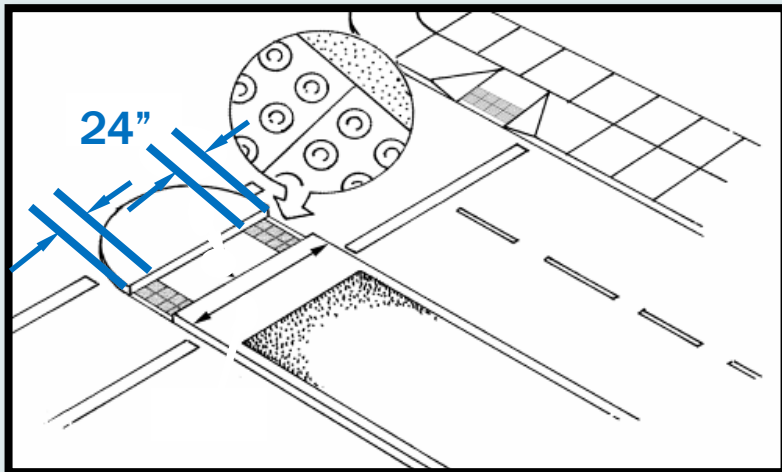
# MEDIANS 16 FEET WIDE OR GREATER





# ADA – AASHTO PED GREEN BOOK 2004

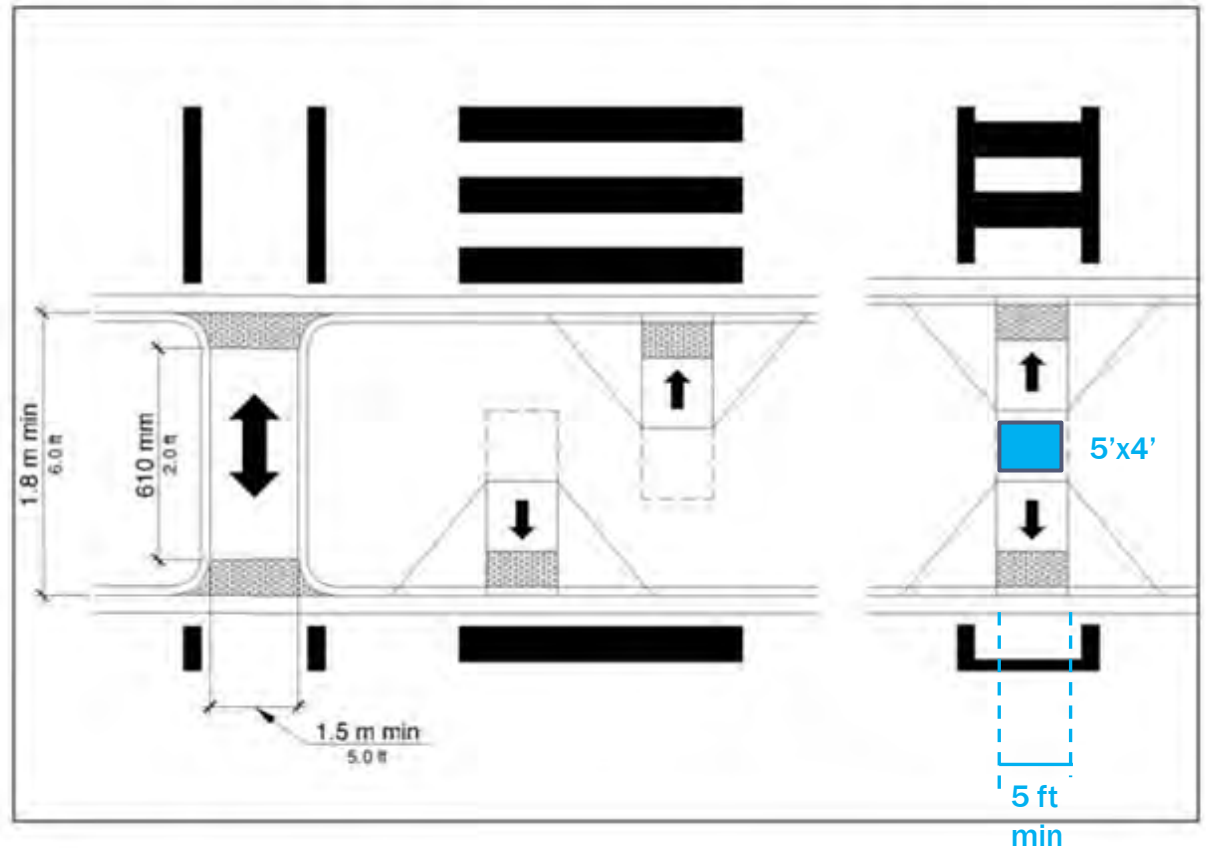
- Islands with ramps – level landing min. 4x4ft
- Ramp slope of 1V:12H (8.33%)
  - Island width ~16 feet needed if 6" curb height
- Detectable warnings bottom of all ramps
- Island length parallel to street min. 20ft



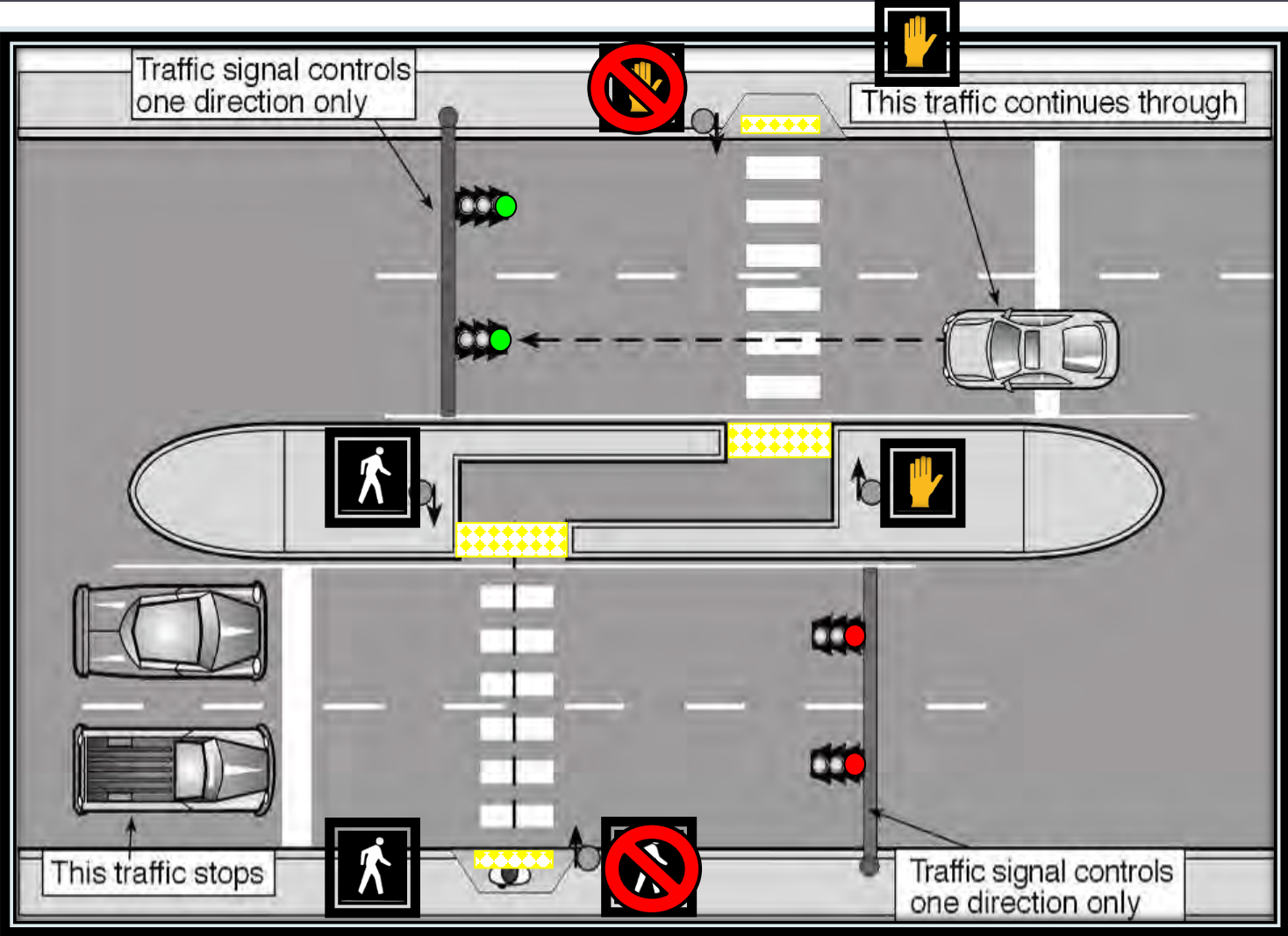
# ADA PROWAG

- **R302.3.1 Medians and Pedestrian Refuge Islands.** The clear width of pedestrian access routes within medians and pedestrian refuge islands shall be 5.0 ft minimum.

Figure R 305.2.4 Pedestrian Refuge Island



# TWO-STAGE CROSSING



# TWO-STAGE CROSSING AT 10 FT WIDE ISLAND



## Compromise:

- Reduce island height in pedestrian area (4")
- Keep 6" height at each end of island

Railing in island must be crash worthy





# TWO-STAGE ISLAND

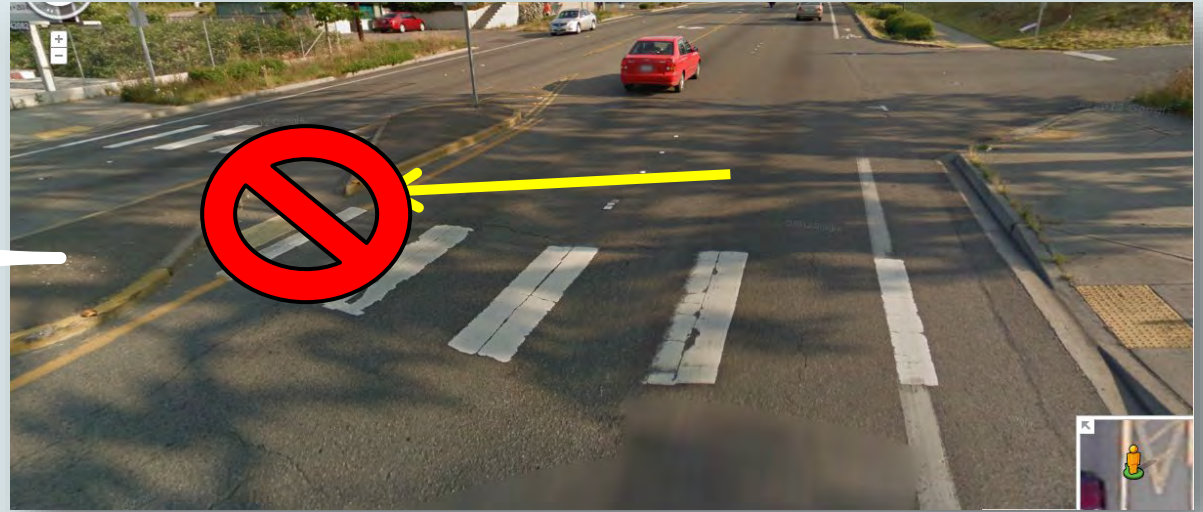


## Two-Stage PHB

- Decorative fencing
- Shade in median
- Decorative landscaping – does not block visibility



# ANGLED CUT THROUGH RIGHT OR WRONG?





# ANGLED CUT THROUGH

- Blind use curb to find direction
- Finish curb to line up with crosswalk



Photo credit: Carl Sundstrom

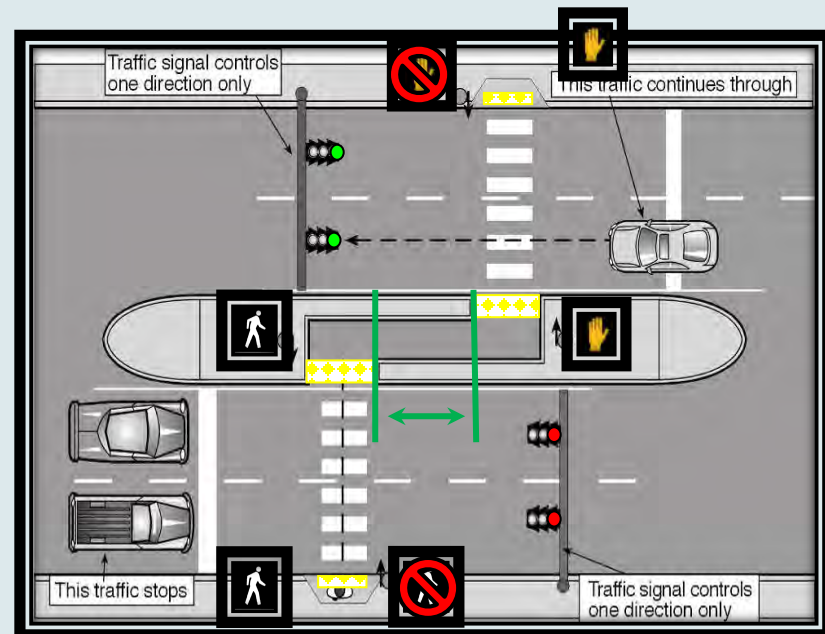
# INFORMAL RESEARCH ON OFFSET CROSSWALKS

- Most UNSIGNALIZED 2-stage crossings are only staggered the width of the crosswalk.
  - Some are staggered the width of the crosswalk plus about 10 feet
- Amount of stagger need not be great
  - Especially with wider medians (16 feet or wider)
  - With medians of 20 feet or more the staggering may not be as important, even with signal or PHB-controlled
  - Every site is unique.
- The greater the stagger, the less likely someone will use it



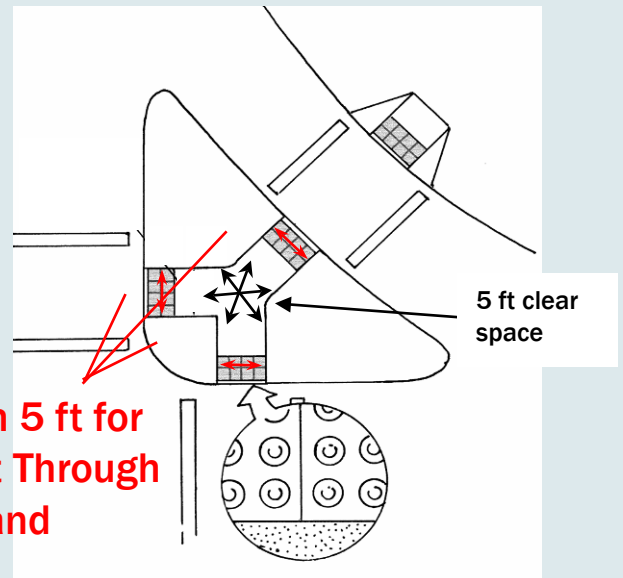
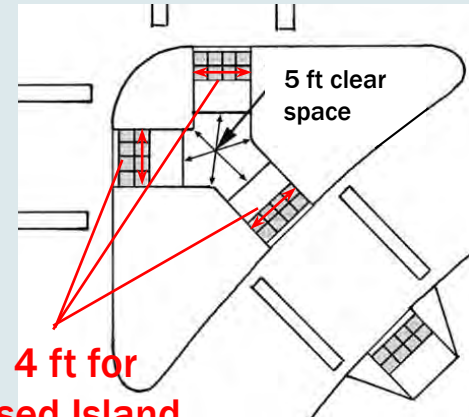
# INFORMAL RESEARCH ON OFFSET CROSSWALKS

- For signal controlled crossings the width of the crosswalk plus 10 to 20 feet would typically be fine for narrower medians (in some cases to hold the pedestrians and to prevent pedestrians from viewing the wrong pedestrians signal head)
- Wider medians, greater than 16 feet, the width of the crosswalk should be sufficient
- Most of the pedestrian signals should be equipped with “egg crate” visors so that they are seen by pedestrians in the crosswalk area and not outside the crosswalk.
- This will also encourage more pedestrians to use the crosswalk.



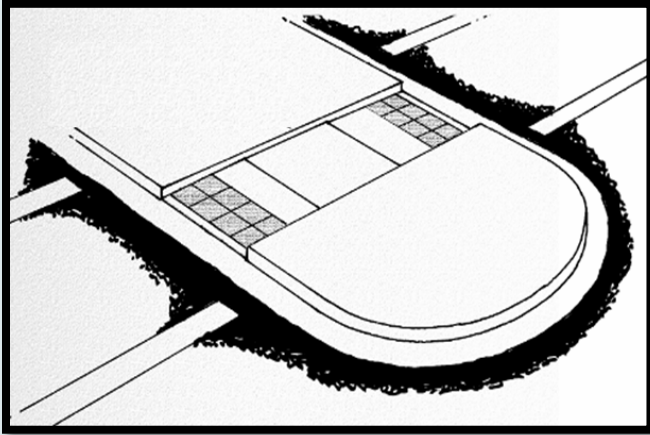
# CUT-THROUGH OR RAISED CORNER ISLANDS

- With slip lanes, always use raised islands (not painted)
- Ramps must be at least 4 ft. wide
- For cut-through: must be 5 ft. wide
- Provide at least 5 feet of clear (turning) space or level landing
- Provide a 2-foot strip of detectable warnings at end of cut-through or at bottom of ramp
- Align cut-through or ramps with crosswalks





# DRAINAGE



- Cut-through needs some slope
- Remember drainage at bottom of ramp





# LANDSCAPING







# LANDSCAPING

- Trees in median & sides of streets can help narrow long range field of vision for drivers, encouraging slower speeds
- Trees placed in median should comply with AASHTO Roadside Design Guide
- Trees should not block visibility of pedestrians crossing the street
  - Small caliper trees
  - Trim up branches
  - Bushes in median should be trimmed low

# PLACEMENT OF TREES WITH RESPECT TO MEDIAN OPENINGS

- Careful consideration should be given to the location & type of landscaping
- Plantings in narrow medians may create problems for maintenance activities
- Plantings may cause visual obstructions for turning motorists
- Plantings and objects in medians may constitute roadside obstacles

**Source: AASHTO Green Book**

# PLACEMENT OF TREES & SHRUBS WITH RESPECT TO MEDIAN OPENINGS

Guidance to consider when planting trees/bushes in medians:

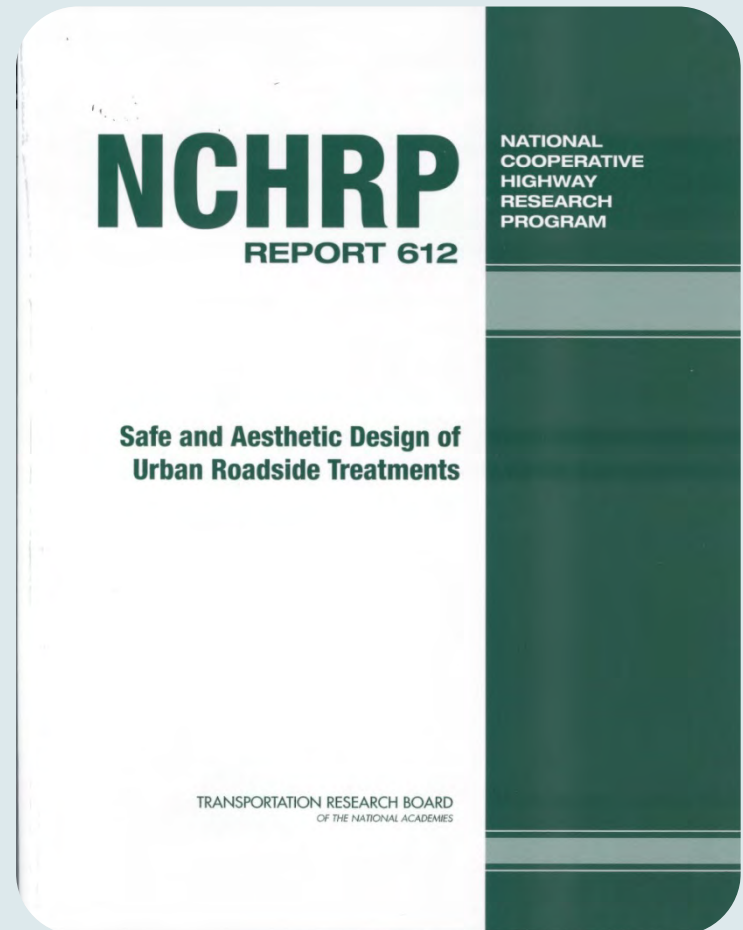
- **Non-signal median openings**
  - No shrubs with ultimate height over 30” within 50-ft of opening
  - No trees within 50 ft of opening
  - Second tree should be no closer than 100 ft from the first tree
  - No foliage between 2 ft and 6 ft above median
- **Median opening at traffic signals**
  - No shrubs with ultimate height over 30” within 50-ft of opening
  - No trees within 100 ft of opening
  - Second tree should be no closer than 100 ft from the first tree
  - No foliage between 2 ft and 6 ft above median
- **Same dimensions apply to median pedestrian crossings**

Source: Phoenix Traffic Operations Handbook, 2010

# NCHRP REPORT 612

## Objectives:

- Develop design guidelines for safe & aesthetic roadside treatments in urban areas
- Revised Chapter 10 of the Roadside Design Guide



# CORRIDOR STUDY ANALYSIS OVERVIEW

- Identify 140+ miles of urban arterial roads
- Analyzed approximately 5 years of crash data
- Video tape corridor in both directions of travel and identify characteristics where crashes occurred (also compare to locations where the crashes did not occur)

California	7 corridors (47.3 miles)
Georgia	9 corridors (23.8 miles)
Illinois	7 corridors (48.5 miles)
Oregon	8 corridors (23.7 miles)



# EVALUATION OF FIXED OBJECT CRASHES URBAN CORRIDORS – RAISED CURB

Lat. Dist.	Crashes	%	Cumul.%	
0-1'	129	28.3%	28.3%	Over 80% of crashes with fixed objects 4' or less from curb
1-2'	157	34.4%	62.7%	
2-4'	90	19.7%	82.5%	
4-6'	50	11.0%	93.4%	Over 90% of crashes with fixed objects 6' or less from curb
6-8'	23	5.0%	98.5%	
8-10'	6	1.3%	99.8%	
10-15'	1	0.2%	100%	
<b>Total:</b>	456	100%		Source: NCHRP Report 612

# LANDSCAPING

Landscaping can be a positive feature

- Must not block sight lines of pedestrians and motorists at the crossing area
- Use of small trees, low shrubs, colorful native plants



# MAINTENANCE

- Most likely swept by hand
- If swept by machine
  - Know width of sweepers
  - Know turning radius of sweepers
- Landscaping maintenance is essential





# LANDSCAPING AS BARRIER

- May be used to prohibit midblock crossings at times
  - Traffic volumes and or speeds make intersection crossing preferred option
- Midrise shrubs and other types of planting alternatives for fencing
  - Used to divert the adjacent intersections
- Requires a commitment to maintain/water/repair



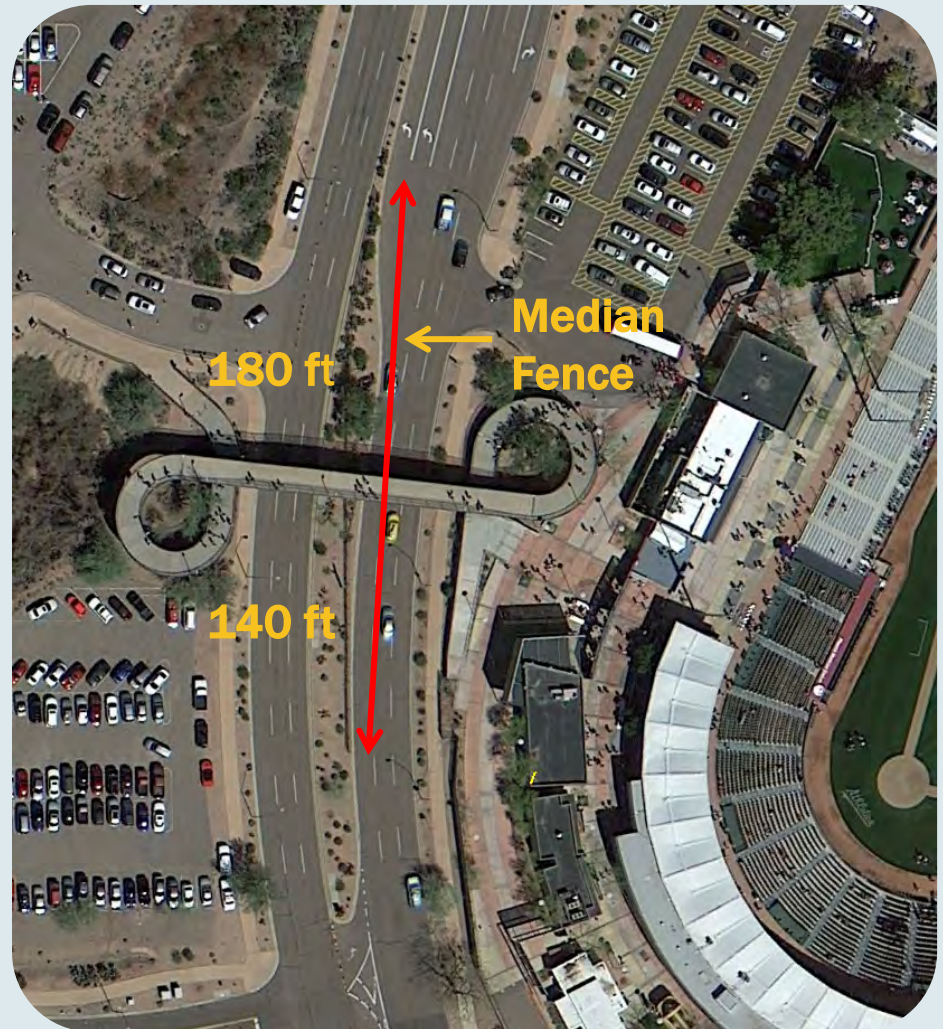
# PEDESTRIAN FENCES IN MEDIANS

- Should be attractive
- Appropriate length to prevent crossings
- Treatments to prevent crossing as end points & median openings
- Visibility limitations for left turning motorists
- Must be crash worthy



# MEDIAN FENCE FOR PEDESTRIAN OVERPASS

Median fence was added when it was found that police could not force pedestrians to use overpass





# SIGNALIZED MIDBLOCK CROSSINGS

- Signals should be timed so that pedestrians can cross the entire street
- If the street is “too wide”, and there is a sufficient median width, a 2-stage crossing may be considered
  - Median width min 6 feet – preferably 8 to 10 feet wide
  - What crossing distance is “too long” to warrant median installation?
    - Crossing distance may be based on cycle length & distance to nearest signal
- For 2-stage crossings, a pedestrian pushbutton must be installed in median
  - Consider APS pushbuttons

# COST (2013)

Infrastructure	Description	Median	Average	Minimum	Maximum	Cost Unit	No. of Observations
Island	Median Island	\$10,460	\$13,520	\$2,140	\$41,170	Each	17 (19)
Island	Median Island	\$9.80	\$10	\$2.28	\$26	Sq Ft	6 (15)

Infrastructure	Description	Median	Average	Minimum	Maximum	Cost Unit	Number of Sources (Observations)
Median	Median	\$6.00	\$7.26	\$1.86	\$44	Square Foot	9 (30)

**Source:** “Costs for Pedestrian and Bicyclist Infrastructure Improvements: A Resource for Researchers, Engineers, Planners, and the General Public”, October 2013



# POSSIBLE ISSUES WITH RAISED MEDIANS

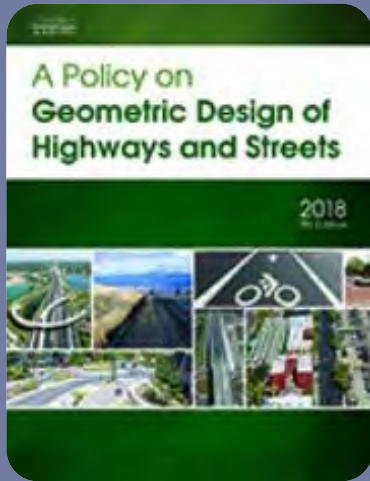
- Construction detours when half street is closed
- *Installing medians on existing streets with lots of driveways*
- Need room to make U-turns (narrow cross-sections)
  - Check turning templates
- Street width consideration (medians result in wider streets)
  - ROW cost/Maintenance/Traffic signal timing
- Prohibiting crossing may require median fencing
  - Aesthetics (wrought iron)
  - Make sure fencing does not block driver visibility
  - Fencing should be crash worthy
  - Provide about 200 feet fencing on either side of main crossing point (Rule of Thumb)
  - Issues at the end points of fencing

# U-TURN POINTS FOR CONTINUOUS MEDIANS

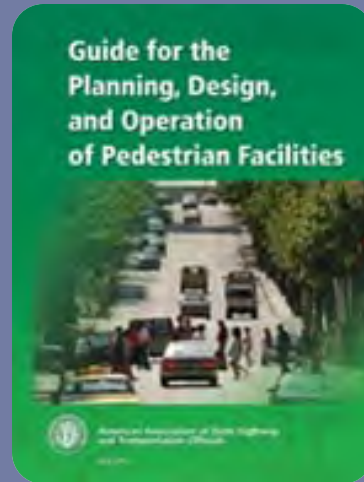
- U-Turn points were designed into continuous median
- Delineator posts discourage U-Turns for average drivers
- Emergency Vehicles run over delineators then replace
- Crossover point when roadwork is being done on one side of the roadway



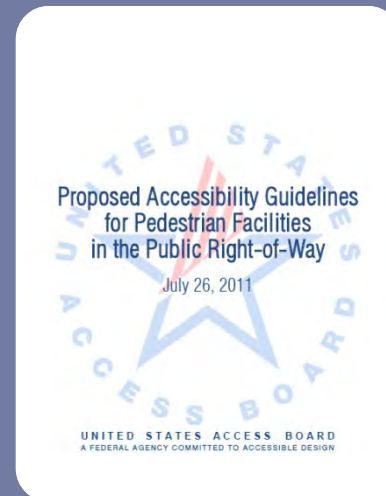
# NATIONAL GUIDANCE DOCUMENTS



**AASHTO  
Policy on  
Geometric  
Design of  
Highways  
and Streets**



**AASHTO  
Guide for the  
Planning,  
Design, and  
Operation of  
Pedestrian  
Facilities  
July 2004**



**Public Right-  
of-Way  
Accessibility  
Guidelines**

# QUESTIONS? RESOURCES

- AASHTO Guide for the Planning Design, and Operation of Pedestrian Facilities, July 2004
  - [https://bookstore.transportation.org/Item\\_details.aspx?id=119](https://bookstore.transportation.org/Item_details.aspx?id=119)
- AASHTO Policy on Geometric Design of Highways and Streets
  - [https://bookstore.transportation.org/collection\\_detail.aspx?ID=110](https://bookstore.transportation.org/collection_detail.aspx?ID=110)
- Public Right-of-Way Accessibility Guidelines
  - <https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way>
- Model Design Guide for Living Streets Los Angeles County 2011
  - <http://www.modelstreetdesignmanual.com/download.html>
- Update of Florida Crash Reduction Factors and Countermeasures to improve the Development of District Safety Improvement Projects
  - [http://www.fdot.gov/research/Completed\\_Proj/Summary\\_SF/FDOT\\_BD015\\_04\\_rpt.pdf](http://www.fdot.gov/research/Completed_Proj/Summary_SF/FDOT_BD015_04_rpt.pdf)



# QUESTIONS? RESOURCES

- Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations FHWA-RD-01-075.
  - [http://metroped.org/bpi/fhwa-rd-01-075\\_crosswalk.pdf](http://metroped.org/bpi/fhwa-rd-01-075_crosswalk.pdf)
- Toolbox of Countermeasures and Their Potential Effectiveness to Make Intersections Safer
  - <http://library.ite.org/pub/e26c7e9c-2354-d714-5181-4cc79fba5459>
- Informational Report on Lighting Design for Midblock Crosswalks FHWA-HRT-08-053
  - <https://www.fhwa.dot.gov/publications/research/safety/08053/08053.pdf>
- NCHRP Report 612
  - <http://www.trb.org/Publications/Blurbs/160176.aspx>
- Washington State DOT Low Profile Barrier
  - <http://www.wsdot.wa.gov/Design/Standards/PlanSheet/GD-3.htm>