

# Planning and Designing Pedestrian Facilities

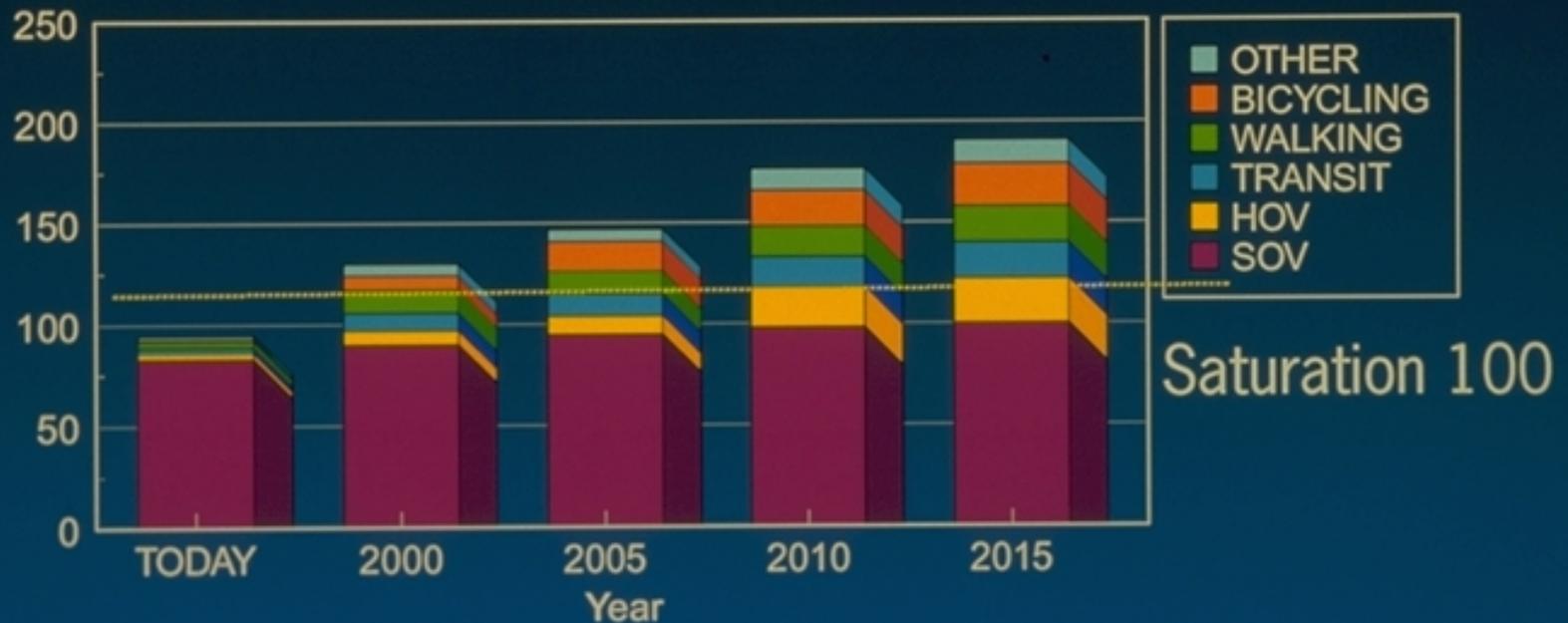
# Why should we accommodate pedestrians?

- There are 56 million walking trips in the U.S. everyday (7.2% of all trips)
- One in ten U.S. households do not own an automobile
- Everyone is a pedestrian at some point during their trip
- 1/3 of the population is either too old or too young to drive an automobile

# COMMUNITY WIDE COMMUTER TRIP BY TYPE

Percent of commute trip making by mode

If ISTEA intent is enacted (Key urban areas)



## More reasons:

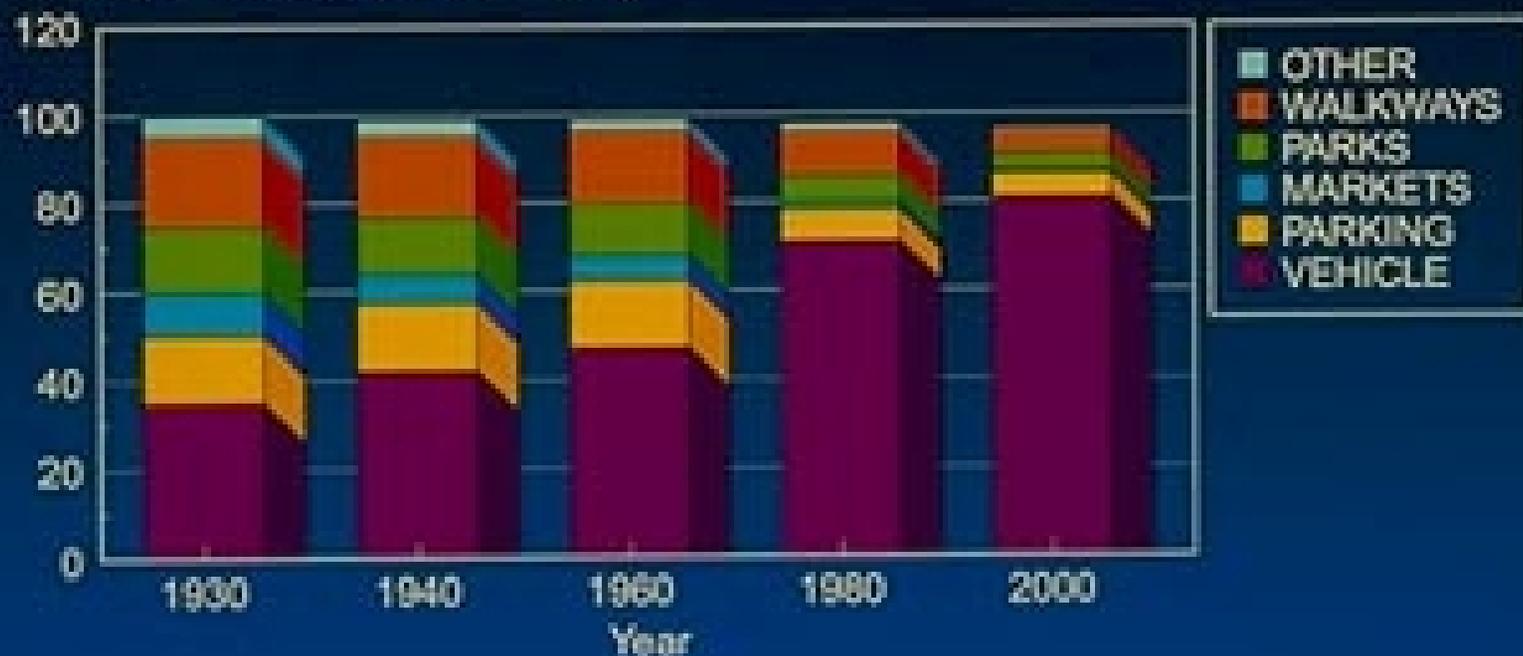
- Better environment: reductions in air pollution and traffic congestion
- Better health: 60% of Americans lead completely sedentary lifestyles, 40% are clinically overweight
- Improved safety: over 5400 pedestrians killed and 82,000 injured per year

(1996 figures)

# DWINDLING PUBLIC SPACE

Downtown and main street trends

Percent of available public space



# Federal Goals for Walking and Bicycling

- Double the percentage of total trips made by bicycling and walking (from 7.9 to 15.8%)
- Simultaneously reduce by 10% the number of bicyclists and pedestrians killed or injured in traffic crashes

Set by USDOT in National Bicycling and Walking Study (1994)

# Federal Legislation

- ISTEIA - Intermodal Surface Transportation Efficiency Act (1991):  
**\$2.6 Billion for Enhancements**
- TEA 21 - Transportation Equity for the Twenty-First Century:  
**\$3.8 Billion for Enhancements**

# Zoning and Subdivision Design Practices:

Effects on Pedestrian Mobility





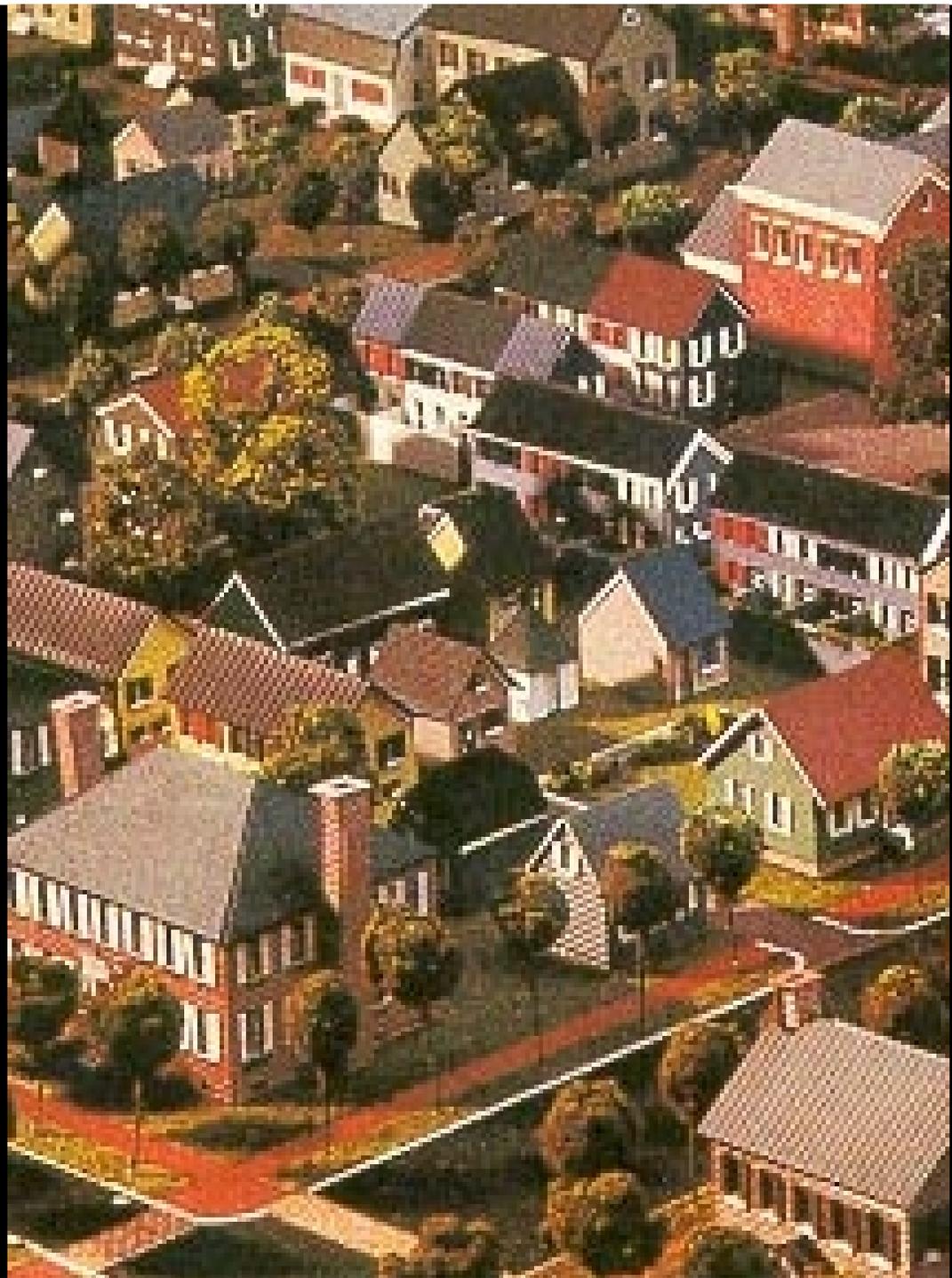








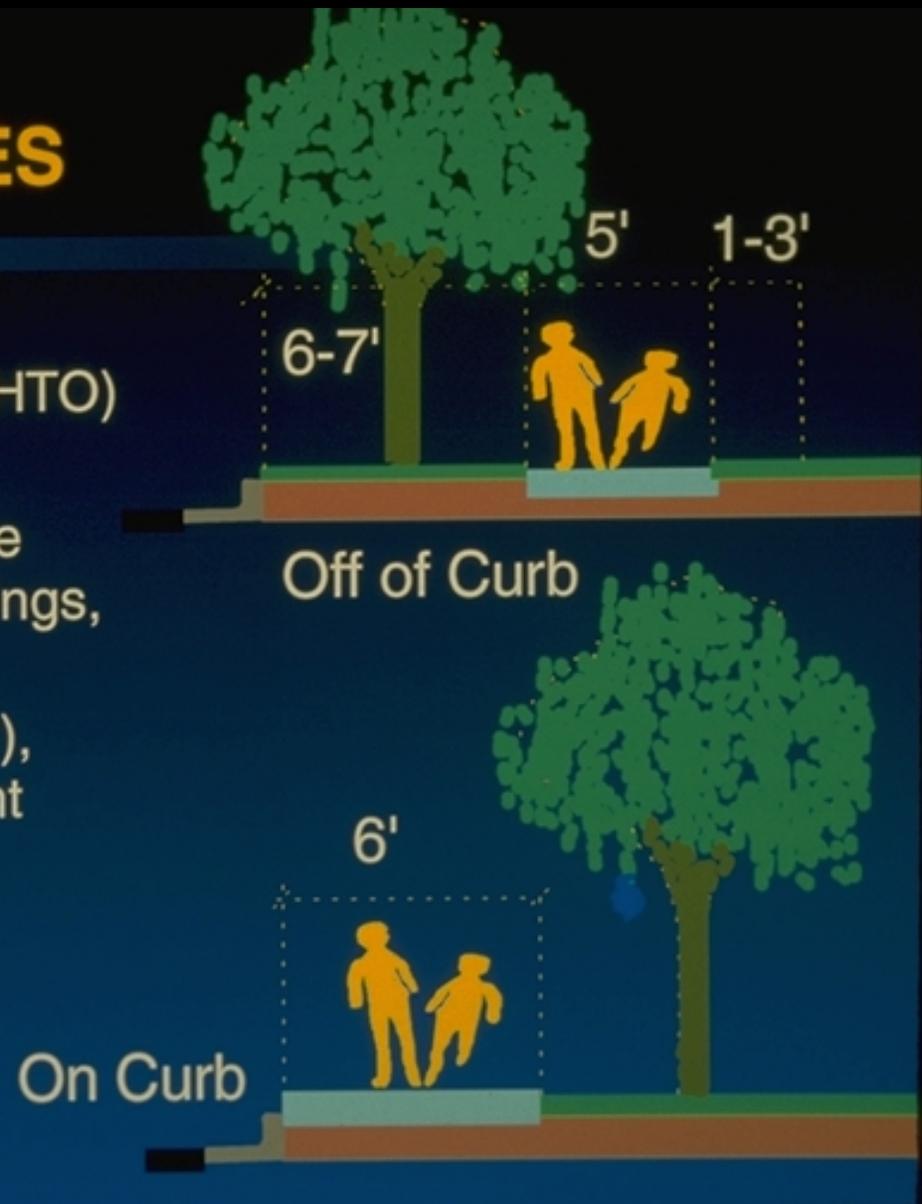




# Pedestrian Facility Design

## SIDEWALK FEATURES

- Width (minimum 5'), ADA
- 6 feet if at back-of-curb (AASHTO)
- Crossfall 1:50
- Pedestrians need a 2 foot wide buffer to all edges, curb, buildings, bridge railings etc.
- Buffer to motor vehicles (4-10'), nature-strip 7 feet wide to plant trees
- Street lighting, shade
- Pavers can be used for enhancement

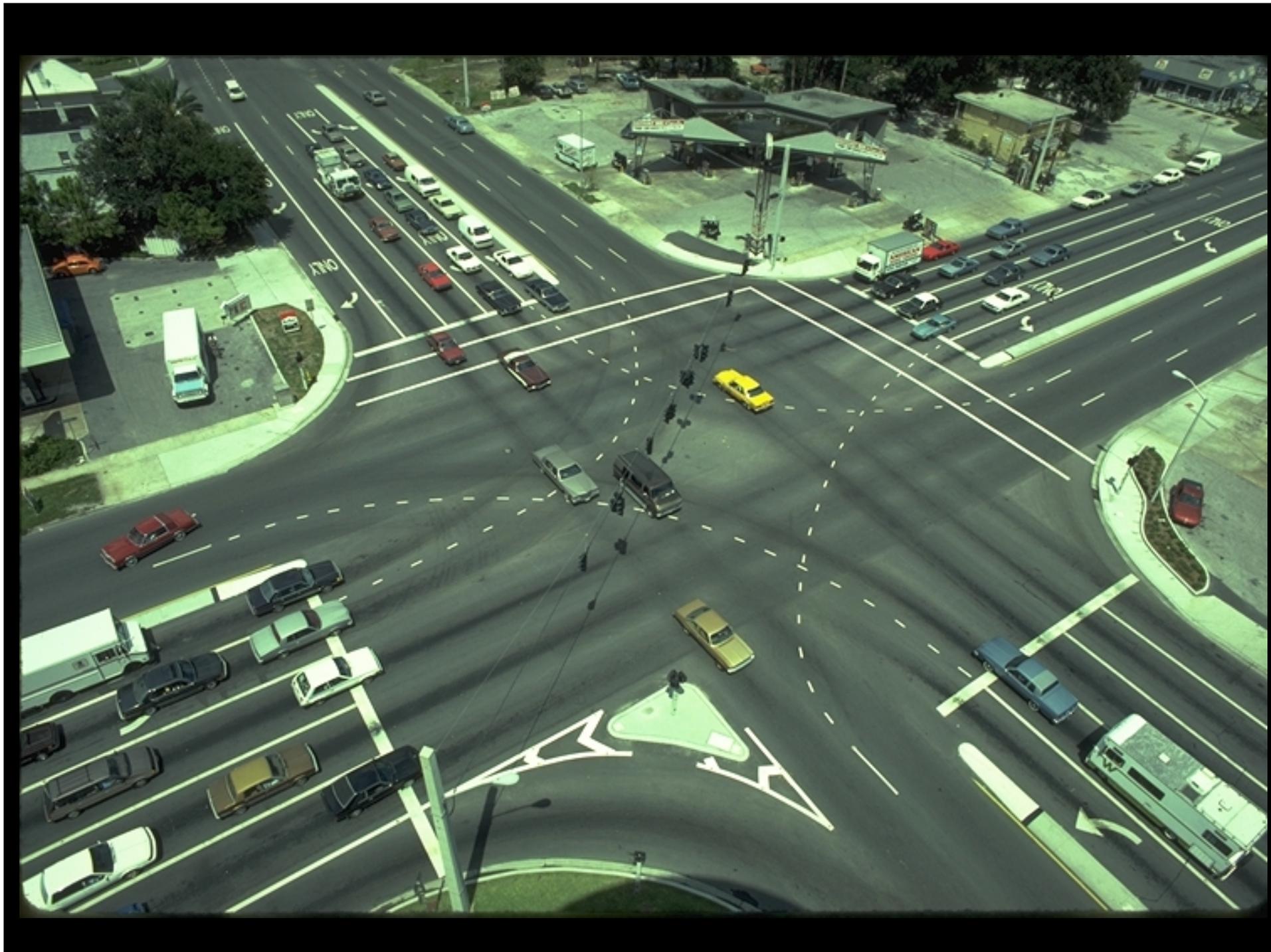




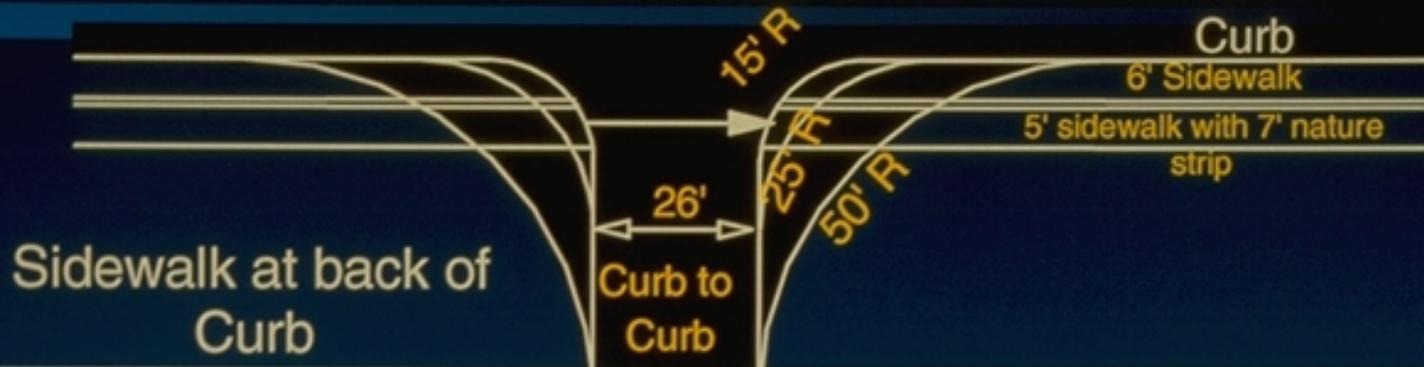








# EFFECT OF CORNER RADII ON PEDESTRIAN CROSSING DISTANCES



Radius	Crossing Distance	Increased Crossing	Percent Increase
15'	26'	+0'	0%
25'	36'	+10'	38%
50'	65'	+39'	150%

## Sidewalk with nature strip

Radius	Crossing Distance	Increased Crossing	Percent Increase
15'	37'	+11'	42%
25'	50'	+24'	92%
50'	89'	+53'	203%























TO TRAFFIC



*T*





**STEADY**



**START CROSSING**

**WATCH FOR  
TURNING CARS**

**FLASHING**



**DON'T START**

**FINISH CROSSING  
IF IN CROSSWALK**

**STEADY**



**DON'T CROSS**

**WAIT ON CURB**

**TO CROSS**

**PUSH BUTTON**





MORRISON'S  
CAFETERIA

BREAKFAST SPECIAL  
\$2.75 INCLUDES  
JUICE AND COFFEE

HILTON WELCOMES  
BREAKFAST BUFFET  
\$2.50  
11:00 AM  
"Smile first!"

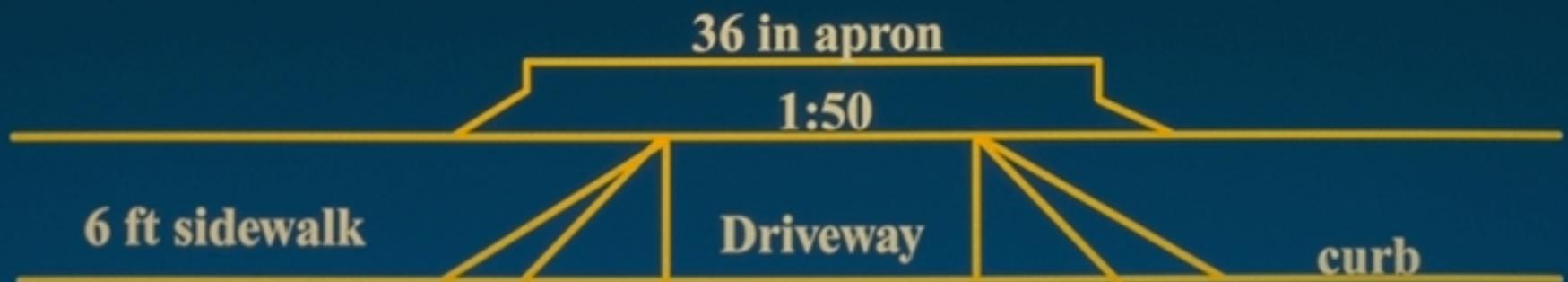
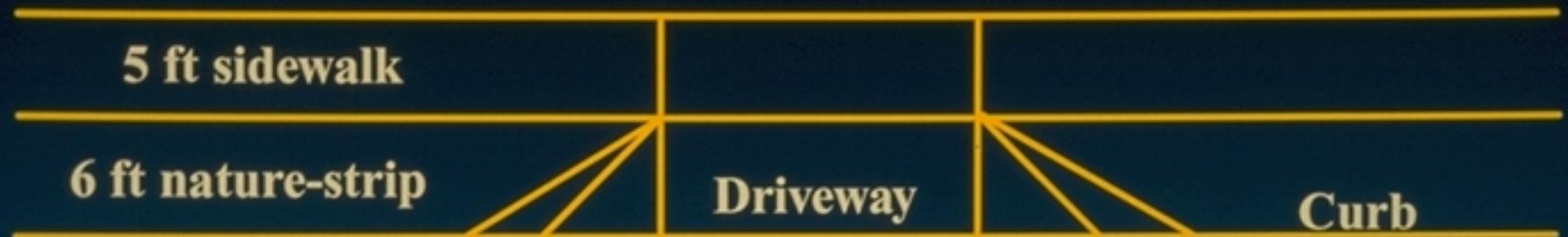








# ADA Driveways

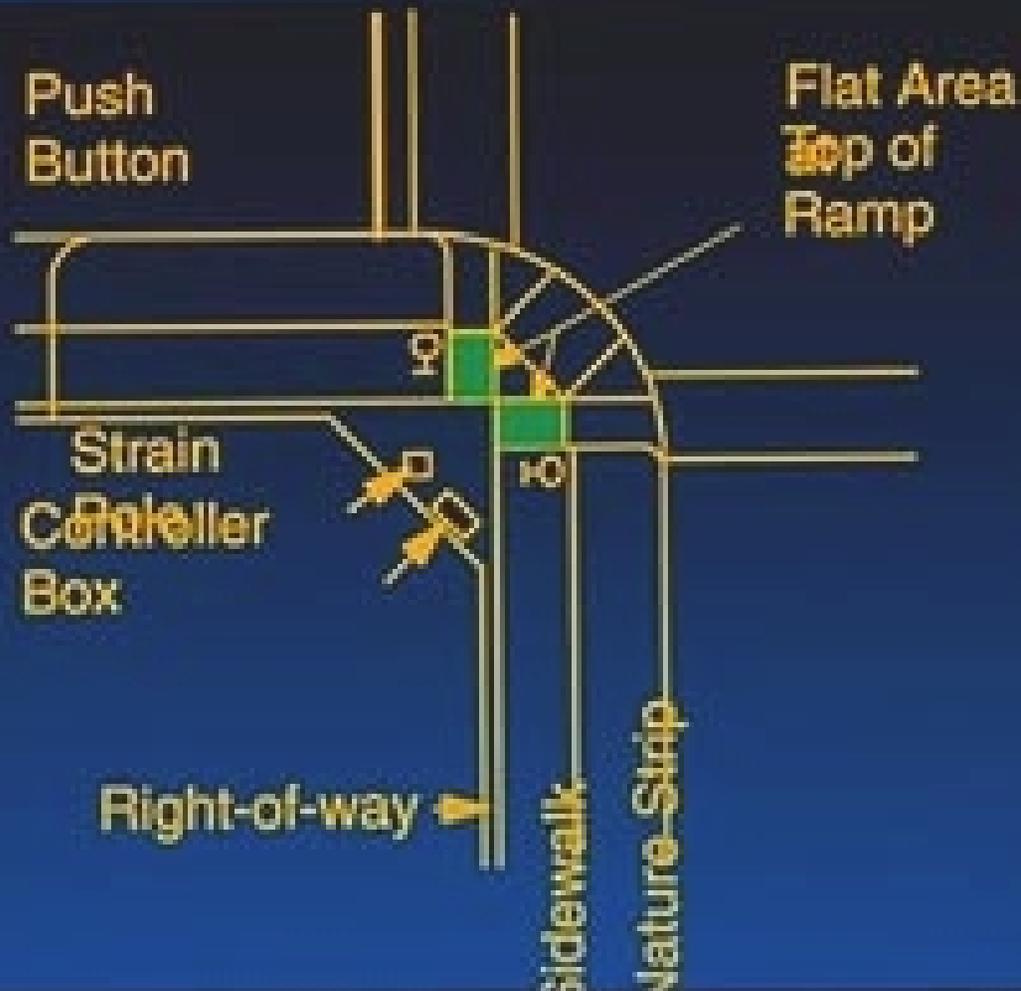




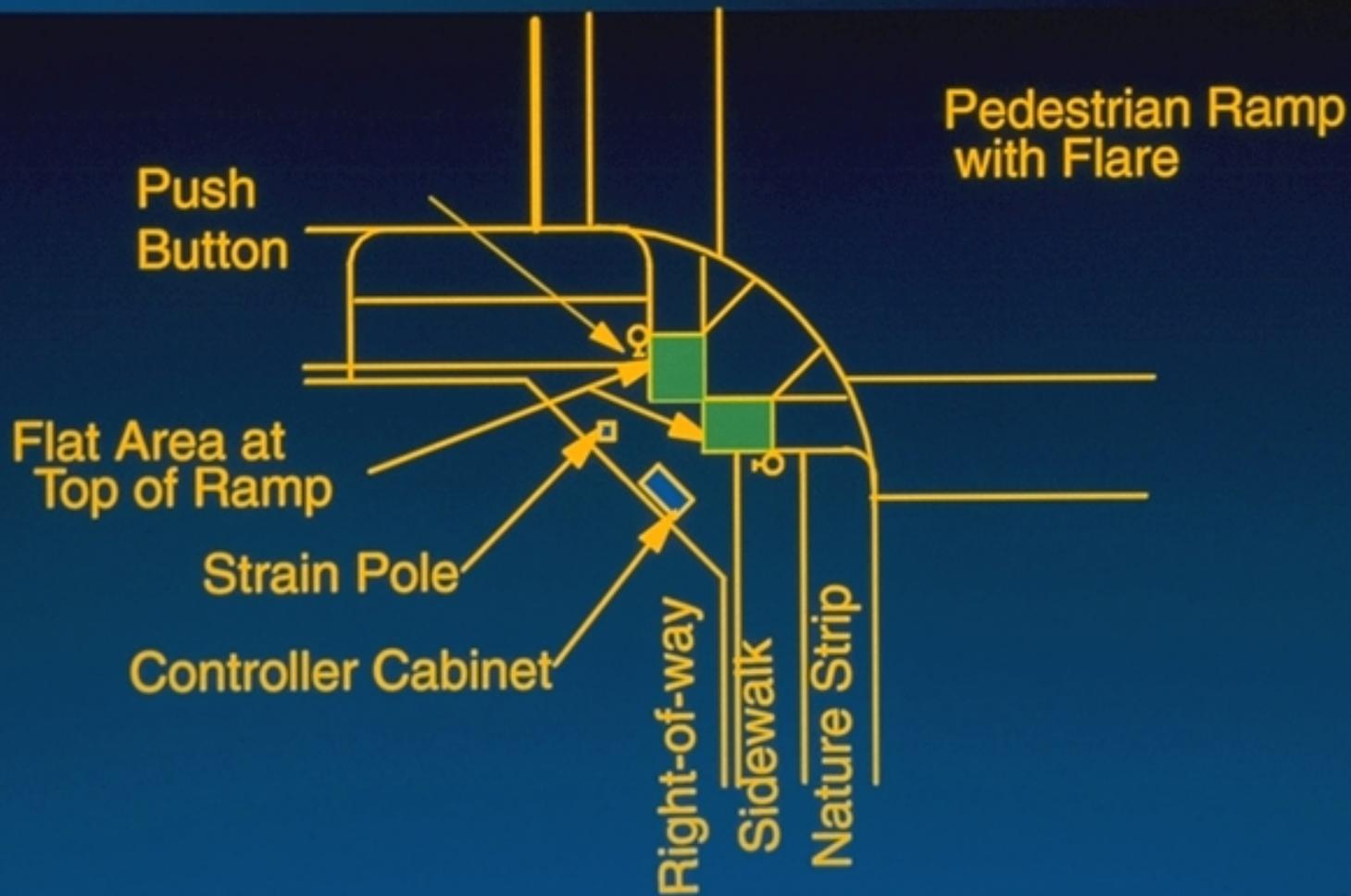


# CORNER RADIUS 15 FEET

Recommended



# CORNER RADIUS, 25 FEET Recommended



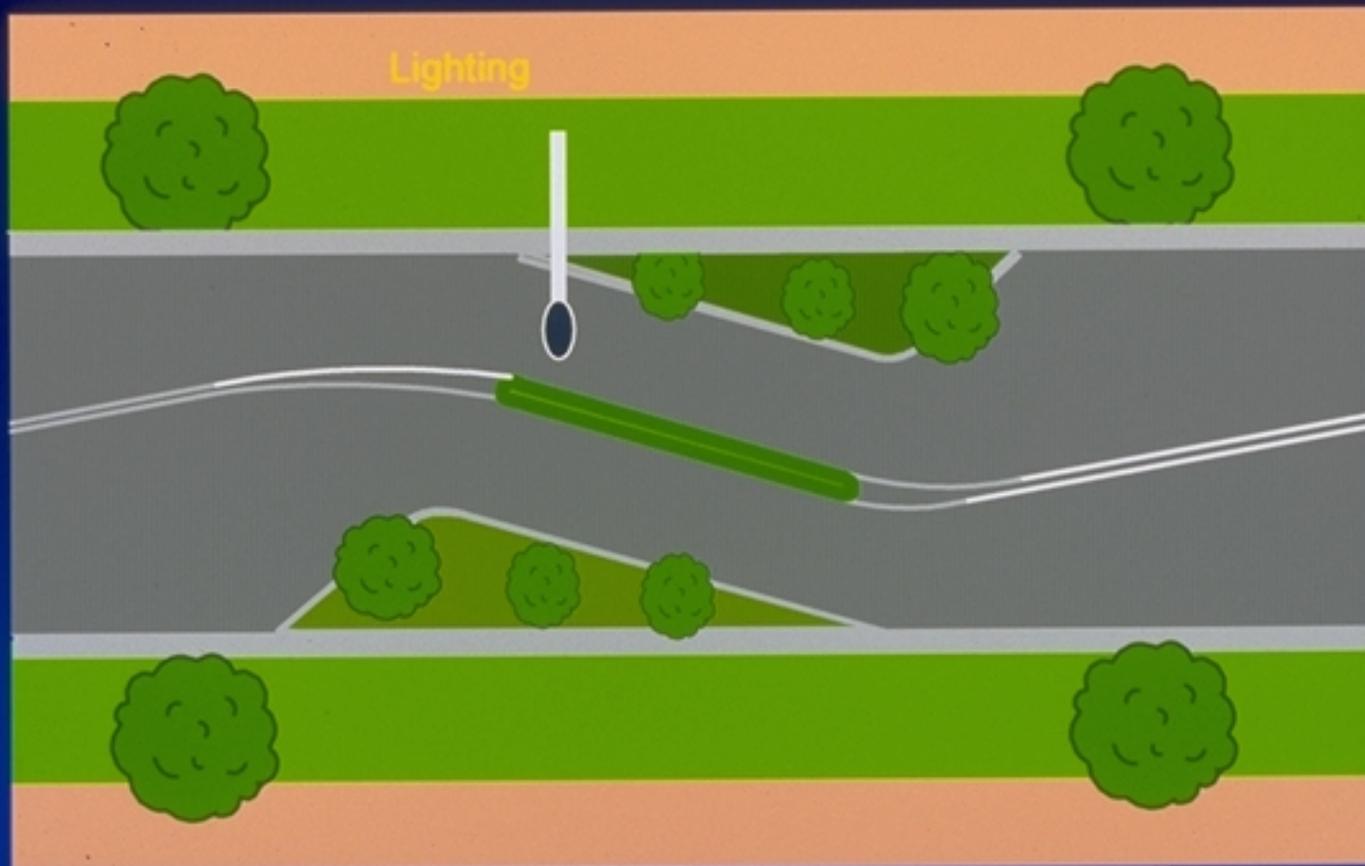
# Traffic Calming







# Two Lane Angled Slow Point With Median

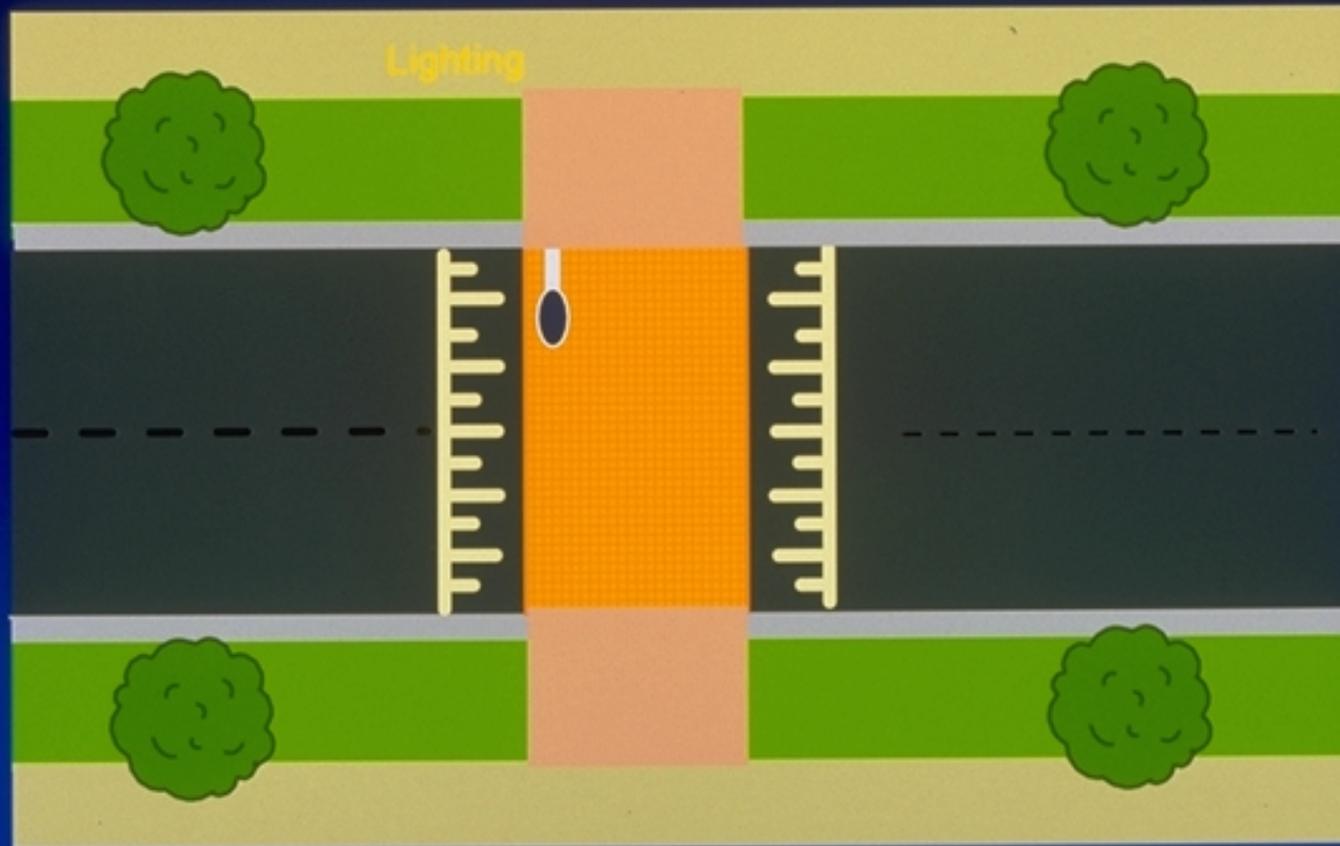




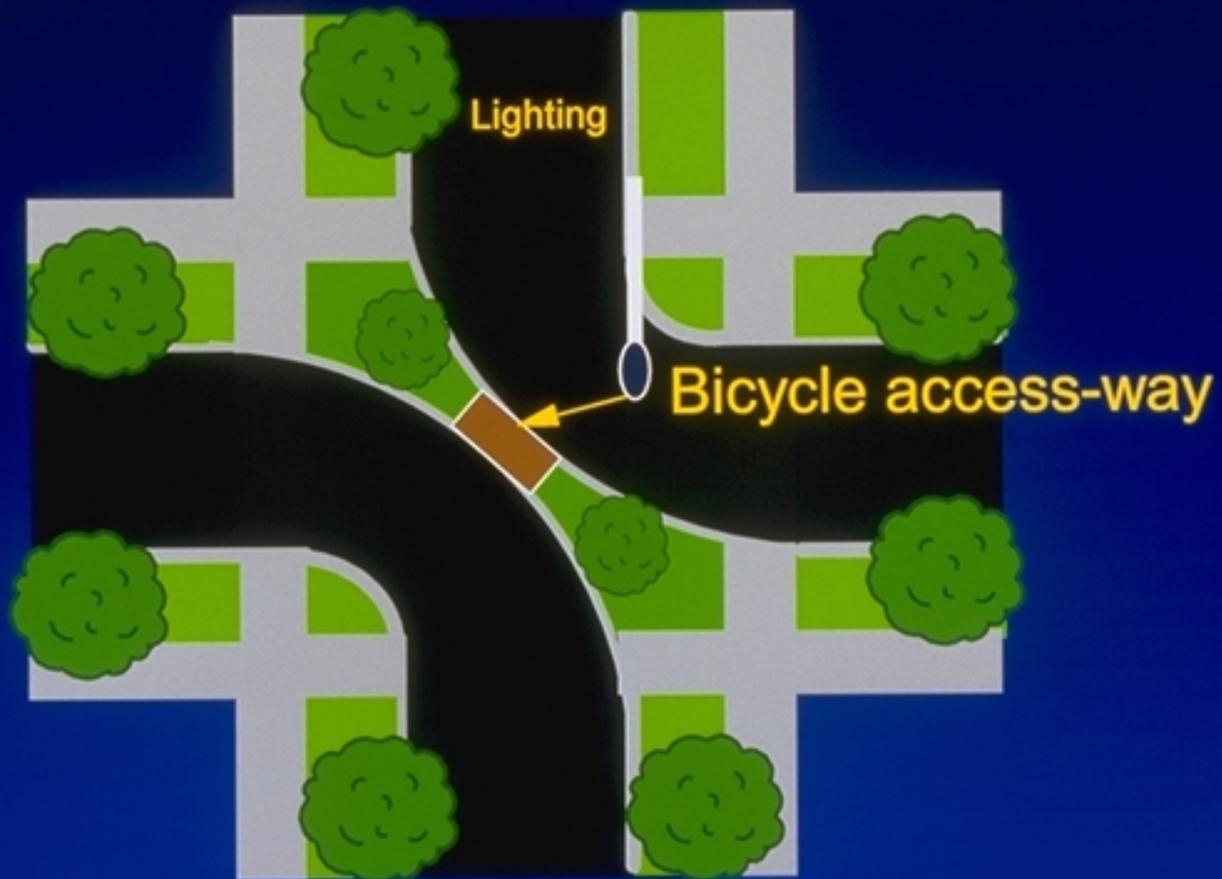




# Speed Table

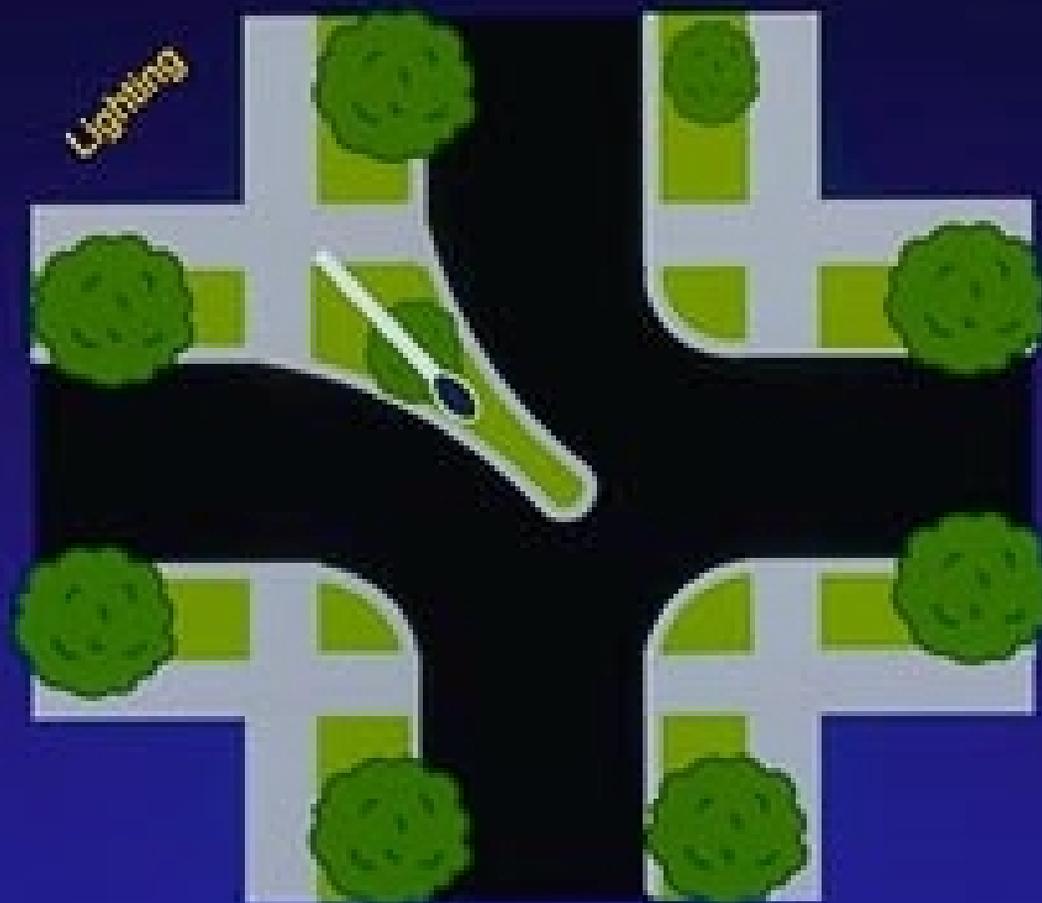


## Diagonal Diverter





# Trunkated Diagonal Divertor







## Slideshow Outline: Pedestrian Planning and Design

1 Powerpoint Word Slide (title):  
**Planning and Designing Pedestrian Facilities**

2 Powerpoint Word Slide:  
**Why should we accommodate pedestrians?**

- **There are 56 million walking trips in the U.S. everyday (7.2% of all trips)**
- **One in ten U.S. households do not own an automobile**
- **Everyone is a pedestrian at some point during their trip**

3 Powerpoint Slide: CD 160-13 – **Community Wide Commuter Trip by Type**

4 Powerpoint Word Slide:  
**More reasons why pedestrian facilities are important:**

- **Better environment: reductions in air pollution and traffic congestion**
- **Better health: 60% of Americans lead completely sedentary lifestyles, 40% clinically overweight**
- **Better safety: over 5400 pedestrians killed and 82,000 injured per year (1996 figures)**

5 Powerpoint Slide: CD 160-15 - **Dwindling Public Space**

6 Powerpoint Word Slide:  
**Federal Goals for Bicycling**  
**Set by USDOT in National Bicycling and Walking Study (1994):**

- **Double the percentage of total trips made by bicycling and walking (from 7.9 to 15.8%)**
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7 Powerpoint Word Slide:  
**Federal Legislation**

- **ISTEA - Intermodal Surface Transportation Efficiency Act (1991): \$2.6 Billion for “Enhancements”**
- **TEA 21 - Transportation Equity Act of the Twenty-First Century: \$3.8 Billion for “Enhancements”**

Explanation:

Bicycle and pedestrian facilities are eligible for funding through the Enhancements program, which (in both ISTEA and TEA-21) sets aside 10% of federal Surface

Transportation funds for ten categories of “enhancements” which also include scenic byways, historical transportation facilities, etc.

8

Powerpoint Word Slide (title):

**Zoning and Subdivision Design Practices: How they've affected pedestrian mobility**

9

Photo Slide: CD 278-21 – Aerial view of residential cul-de-sac development/residential street

Explanation:

Single-use zoning was introduced in order to buffer residential areas from unpleasant and noxious adjacent land uses. As automobiles became more commonly used for transportation, houses moved back from the street and garages were built. As traffic became a problem, cul-de-sacs were developed to reduce through-traffic on residential streets. The result has been enclaves of housing that are separated from commercial areas by high speed, heavily traveled arterial roadways. These communities aren't designed for walking.

Residential areas have lost the character that they once had. Houses all look the same - often the garage is the most prominent thing on the front of the house. No sidewalks or street trees, extremely wide streets.

10

Photo Slide: CD 278-27 – Residential street - Birmingham, AL

Explanation:

It wasn't always this way. Older communities were designed to be far more pedestrian-friendly, because people relied so much more on walking. This is now some of the hottest real estate in the U.S.

11

Photo Slide: CD 2480-31 – Arterial through a strip developed area

Explanation:

The result of our land use and transportation policies over the past 50 years has been to create shopping areas that look like this. People can't walk between adjacent developments because of fences, ditches, hedges and other barriers.

12

Photo Slide: CD 2480-12 – Aerial shot of parking lot

Explanation:

Storefronts are separated from the roadway by large parking lots designed for Christmas-time shopping volumes.

13

Photo Slide: CD 1082-2 – Wide intersection on arterial road

Explanation:

Intersections are vast, and are timed for optimum traffic flow. Crosswalks don't really solve the problem if you have 120' of pavement to get across in a 10 second signal phase (a healthy person *running* might make it).

14 Photo Slide: (from collection) – Downtown Poughkeepsie, NY

Explanation:

There is a trend towards revitalizing downtowns and making new commercial development more closely resemble the pedestrian-friendly shopping districts of earlier times.

15 Photo Slide: 160-54 – Renovated commercial development (FL)

Explanation:

Communities have also begun to provide incentives to developers to renovate older commercial strip centers. There are some excellent success stories. For example, an older commercial development in Florida (picture on the left) was renovated to look like this (picture on the right).

16 Photo Slide: Neotraditional neighborhood

Explanation:

Neotraditional neighborhood design (also called new urbanism) is a “new” style of community design that uses design principals from 18<sup>th</sup> and 19<sup>th</sup> century American and European towns. Land uses are more compact and mixed, creating the potential for short walking trips. The architecture in many of these neighborhoods is often traditional, with wide front porches and garages out back, connecting to streets via alleyways (thereby eliminating driveways in front of the houses). Streets are narrower, and arranged in a grid pattern to disperse vehicular traffic. Wide sidewalks and street trees are on both sides of the road.

17 Powerpoint Word Slide (title):  
**Pedestrian Facility Design**

18 Powerpoint Graphic Slide: CD 278-3 - **Sidewalk Features**

19 Photo Slide: 160-86 – Sidewalk next to highway

Explanation:

Sidewalks are certainly a critical first step in accommodating pedestrians, but a lot of other design features are important if you want to encourage walking. (Case in point - here's a sidewalk, but would anyone want to walk here?) You need to provide pedestrians a sense of protection from the adjacent roadway. There are a number of ways to do this:

20 Photo Slide: CD 160-51 – Sidewalk with street trees

Explanation:

It is amazing how different a sidewalk feels with street trees. They serve as a very effective buffer from traffic when they are located in the grass strip between the sidewalk and the curb. This requires a minimum of a 5' planting strip. The choice of tree species is important – shade trees are far more effective than small ornamental tree (like a pear tree).

21 Photo Slide: CD 160-96 - Sidewalk 20' off edge of the road

Explanation:

A wider separation between the street and sidewalk can also improve pedestrians' sense of comfort.

22 Photo Slide: CD 160-58 - Sidewalk next to parking lane

Explanation:

Parking lanes provide a very effective buffer between pedestrians and traffic.

23 Photo Slide: CD 735-57 - Aerial of large urban intersection

Explanation:

Intersections are the most challenging aspect of pedestrian facility design. Getting pedestrians safely across an intersection like this takes a lot more than crosswalk lines. Problems for pedestrians at intersections:

- Vast distances to cross (80' to 100'), and not enough time to make it because signals aren't timed for pedestrians.
- Right turn slip lanes - right turning traffic is not required to stop
- Pedestrians can't see traffic signals to know when they can get across
- Visibility problems: sign poles, utility boxes, etc. block visual access between motorists and pedestrians.
- Fast turning traffic: corner turning radii are wide, making it easy for motorists to maintain higher speeds when turning.

24 Powerpoint Graphic Slide: CD 735-40 - Effect of corner radii on pedestrian crossing distances

Explanation:

Intersection solutions: create narrower distances for pedestrians to cross at intersections. One way is to design corner curb returns with a tighter radius. This also has the effect of slowing down turning traffic. Must also consider the amount of heavy trucks that use the intersection - since they may ride over the curb if the radius is too tight.

25 Photo Slide: CD 1082-36 - Pedestrians starting to cross intersection

Explanation:

Designers have typically used an average walking speed of 4' per second in designing pedestrian accommodations at intersections. There is a growing tendency to use 3.5' per second, or 3' per second in locations with more frequent crossings by the elderly or school children.

26 Photo Slide: CD 2480-37 - Aerial shot of intersection with curb bulb-outs

Explanation:

Another solution is to build curb extensions (also called bulb-outs) that narrow the distance across the intersection.

27 Photo Slide: CD 2480-35 - Aerial shot of intersection with curb bulb-outs

Explanation:

Bulb-outs can be especially helpful in locations with on-street parking - the bulb-out extends out into the intersection so that pedestrians can see past parked cars. In this example, the extra sidewalk space is used to include a street lamp, improving pedestrians' visibility at night.

28 Photo Slide: CD 2480-50 - Median refuge on an arterial

Explanation:

Median refuge areas allow pedestrians to cross one direction of traffic at a time, and provide a protected waiting area prior to getting across the next segment. This is a good solution for large urban intersections. Intersections on heavily traveled urban corridors are often timed in sequence to reduce traffic backups, therefore it may be difficult or impossible to create one signal phase long enough for pedestrians to cross the entire width of the intersection without causing other parts of the system to fail.

29 Photo Slide: CD 1082-86 - Aerial shot of a median refuge on a major roadway

Explanation:

This solution can work on roads with extremely high volumes of traffic. In this example, the median refuge is part of a landscaped median that extends the length of the roadway.

30 Photo Slide: CD 2480-42 - Median refuge on a collector street

Explanation:

Median refuges can be used on quieter streets as well, with the same benefits.

31 Photo Slide: CD 1082-81 - Aerial shot of an intersection with colored crosswalks

Explanation:

Another solution - increase motorists' awareness of pedestrians by using colored, textured surfaces in crosswalks. This can be used on major streets like this one. It is important to make sure that the material used is not slippery, and that it maintains its stability next to the adjacent pavement.

32 Photo Slide: CD 1082-83 - Aerial shot of an intersection with colored crosswalks

Explanation:

This photo shows the same solution on a quieter street, combined with curb bulb-outs.

33 Photo Slide: CD 1082-67 - Aerial shot of Birmingham, AL intersection

Explanation:

In this example, the entire intersection has been paved with concrete, with brick pavers at the crosswalks. (Five Points intersection in Birmingham, AL) The change in pavement surface from asphalt to concrete tends to slow traffic.

34 Photo Slide: CD 1082-67 - Aerial view of continental-style crosswalks

Explanation:

Some types of crosswalk markings are more visible than others and can help to draw attention to pedestrian crossings. The continental-style crosswalk can be used when a high level of visibility is desired.

35 Photo Slide: (from collection) - Close up photo of Pedestrian yellow-green warning sign

Explanation:

Warning signs can help, too. Keep in mind that they are often ignored by motorists and, like crosswalks, should be used in conjunction with other pedestrian improvements at intersections. This is a new sign that is being used in more and more locations in the U.S. - it's a standard Pedestrian warning sign with a bold fluorescent yellow/green color.

36 Photo Slide: CD 1082-19 - Pedestrian signal indication

Explanation:

Pedestrian signals can be confusing, particularly at crowded urban intersections with multiple signalheads. It has been well documented that many pedestrians do not understand the meaning of pedestrian signals and indications, particularly the flashing DON'T WALK signal. For this reason, it has been taken out of the MUTCD.

37 Photo Slide: Instructional sign at pedestrian signal (Scan from ITE Guide)

Explanation:

This is one example of an educational sign for a pedestrian signal display.

38 Photo Slide: CD 1082-18 - Pedestrian push button

Explanation:

Pedestrian push-buttons are appropriate where occasional pedestrian movements occur and adequate opportunities do not exist for pedestrians to cross. Where no pedestrian signals are present, actuation of the push-buttons may be used to extend the green phase to allow pedestrians sufficient crossing time. Push-buttons may also be used with pedestrian signals to provide a quicker WALK interval with extended WALK time for safer pedestrian crossing.

39 Photo Slide: CD 2480-30 - People waiting out in the middle of the road

Explanation:

Midblock crossings are a necessity when travelling on foot in urban areas. Pedestrians often need to get to the other side of the street, and there isn't always a convenient intersection nearby. People on foot do not like to take detours - they will almost always take the most direct route, even if it means crossing in a dangerous location.

40 Photo Slide: CD 2480-55 - Aerial view mid-block crossing

Explanation:

This is a good example of a location where a midblock crossing was needed. Without a midblock crossing at this location, a pedestrian would have to walk an extra half mile to get to the other side of the road. In locations like this, the best approach is to make the crossing as visible as possible so that motorists know they may encounter pedestrian crossings.

41 Photo Slide: CD 2480-9 - Aerial view of man in mid-block crossing

Explanation:

You can use the same measures described earlier for intersections to make mid-block crossings safer. Colored, textured crosswalks, curb bulb-outs (pinch points), speed tables, median refuges, etc. (These techniques are also called traffic calming – which is covered later in this slideshow.)

42 Powerpoint Graphic Slide: CD 160-36 – Woman with cane on a sidewalk

Explanation:

The Americans with Disabilities Act of 1990 has greatly improved sidewalk design and is the reason why more and more sidewalks and public spaces are barrier-free. ADA not only improves conditions for disabled pedestrians, but makes sidewalks and intersections better for all users. Sidewalks should be a minimum of 5' wide to meet ADA requirements, with a clear and barrier-free path of travel that is never less than 36" wide. Slopes should generally not exceed 8% unless the adjacent street has a higher slope. In any case, slopes higher than 5% are recommended to include 5' wide level landings at regular intervals so that wheelchair users can rest on a level area.

43 Photo Slide: CD 735-16 - Wheelchair on driveway ramp

Explanation:

The Americans with Disabilities Act Accessibility Guidelines (ADAAG) includes requirements for driveway design. Disabled pedestrians - particularly those in wheelchairs - have a very difficult time negotiating cross slopes that are greater than 2%. Steeper cross slopes can cause a wheelchair to tip over. A sidewalk (such as the one in this photo) that crosses a steep driveway can cause the person in the wheelchair to lose control and veer towards the street.

44 Powerpoint Graphic Slide: CD 735-47 - **ADA Driveways**

Explanation:

ADAAG has very specific requirements for driveway design, requiring that the sidewalk cross the driveway at a level area, with a cross slope that is no steeper than 1:50.

45 Photo Slide: CD 735-48 - Sidewalk that curves up to meet driveway at a level area

Explanation:

These requirements can be hard to meet if the sidewalk is immediately adjacent to the curb. This photo shows a solution - swing the sidewalk away from the curb so that it meets the driveway at a level area.

46 Photo Slide: CD 1082-55 - Person crossing the street in a wheelchair

Explanation:

ADAAG includes comprehensive guidelines on installing curb ramps at intersections. These requirements cover both the placement of the ramps at the curb and their relationship to crosswalk markings in the intersection.

47 Powerpoint Graphic Slide: CD 735-41 - **Corner Radius, 15 Feet**

48 Powerpoint Graphic Slide: CD 735-43 - **Corner Radius, 25 Feet**

49 Powerpoint Word Slide (title):  
**Traffic Calming**

Explanation:

Traffic calming is a term used to describe ways of encouraging slower speeds and reducing cut-through traffic through physical modifications to the street environment.

50 Powerpoint Graphic Slide: CD 2476-37 - **A Traffic Calmed Neighborhood**

Explanation:

One important thing to remember about traffic calming is that it is more successful if it is part of an integrated network of solutions. To be successful, it requires a comprehensive approach to traffic problems in an area. One speed hump used as a lone traffic calming device cannot be expected to solve speeding problems. The best approach is to use a combination of devices.

51 Photo Slide: CD 2498-1 - Long, straight, wide street

Explanation:

One of the main goals of traffic calming is to improve the "feel" of the street, making it more comfortable for pedestrians, and less comfortable for speeding motorists. A central principal of traffic calming is to visually narrow the street and eliminate long vistas so that motorists are encouraged to slow down. Wide, straight streets like this one encourage higher speeds.

52 Photo Slide: CD 2498-2 - Street with narrower painted lanes and a median

Explanation:

One relatively simple traffic calming method is to "narrow" the street. In this solution, the pavement markings and a median are used to visually narrow the street.

53 Powerpoint Graphic Slide: CD 2476-25 - **Two Lane Angled Slow Point**

Explanation:

This is another solution that breaks up the vista down a long, straight street (with trees), and at the same time requires motorists to negotiate a curve. This is also called a chicane.

54 Photo Slide: CD 2476-26 - View of an angled slow point

Explanation:

If designed well, the motorist may never realize that he/she just experienced a traffic calming device.

55 Photo Slide: CD 2480-59 - Speed hump

Explanation:

Speed humps are elongated speed bumps. They normally have a height of 3 to 4 inches and a travel length of 12'. They can usually be crossed at speeds of 15 to 25 miles an hour, but will cause discomfort at higher speeds. A variety of signage and pavement marking patterns can be used to warn motorists of the hump.

56 Photo Slide: CD 2476-9 - Speed hump and median

Explanation:

As mentioned earlier, the best approach is to combine several methods. This is a speed hump combined with a median to create a narrow "pinch point". The tree in the median also helps to break up the long view down the street.

57 Powerpoint Graphic Slide: CD 2476-15 - **Speed Table**

Explanation:

Speed tables are speed humps with flat tops. They are often used in conjunction with crosswalks, with colored and/or textured pavement surfaces to encourage slower motor vehicle speeds.

58 Powerpoint Graphic Slide: CD 2476-41 - **Diagonal Diverter**

Explanation:

If the goal is to reduce through-traffic on neighborhood streets, there are a number of solutions. This is a diagonal diverter - straight-through traffic movements are prohibited. Motorists are diverted in one direction.

59 Photo Slide: CD 2476-42 - Photo of a diagonal diverter

Explanation:

Diagonal diverters reduce through traffic (and if landscaped, can be visually appealing), but they inconvenience people who live in the neighborhood.

60 Powerpoint Graphic Slide: CD 2476-33 - **Truncated Diagonal Diverter**

Explanation:

This is the same general concept, but a little less restrictive. It allows right-hand turns around one end of the diverter. Diverters should be used with care and full consideration of the inconveniences they will create for neighborhood residents.

61 Photo Slide: CD 2498-85 - Traffic circle on a neighborhood street

Explanation:

Traffic circles or "roundabouts" can be used as traffic calming devices at intersections, reducing vehicle speeds. A roundabout is a channelized intersection in which all traffic moves counterclockwise around a center island. They are used on both residential streets and arterial streets.

62 Photo Slide: CD 2498-81 - Traffic circle on an arterial street

Explanation:

Traffic circles on busy streets should be carefully designed to reduce pedestrian conflicts.