Walking Along the Road
Learning Outcomes:

- At the end of this module, you will be able to:
  - Describe the operational and safety benefits of shoulders and sidewalks
  - Select the appropriate design for sidewalks
Crash Modification Factor (CMF): factor used to compute the expected number of crashes after implementing a given countermeasure.

Crash Reduction Factor (CRF): % fewer crashes experienced on a road with a given countermeasure than on similar road without the countermeasure

Relationship between CMF and CRF:

\[
CMF = 1 - \frac{CRF}{100}
\]

\[
CRF = 100 \times (1 - CMF)
\]

(Examples on next slide)

CMF/CFR Clearinghouse: [www.cmfclearinghouse.org](http://www.cmfclearinghouse.org)
Shoulders and Sidewalks

- Walking along the road accounts for 10-15% of fatal pedestrian crashes:
  - Fewer in urban areas
  - More in rural areas
- They’re easily preventable

- Paved shoulders reduce pedestrian crashes by 70% (CRF)
  - CMF = 0.3
    - Gan et al. study
- Sidewalks reduce pedestrian crashes by 88% (CRF)
  - CMF = 0.12
    - McMahon Study
Shoulders improve safety for all users

For motorists: room to avoid crashes
Shoulders improve safety for all users

For bicyclists: a place to ride
Shoulders improve safety for all users

For pedestrians: a place to walk

CMF = 0.3 (CRF = 70%)

6’ width preferred
At a certain point, sidewalks are needed
“Goat trail” indicates sidewalks are needed
The 2011 AASHTO “Green Book” states:

“Sidewalks are an integral parts of city streets”

Sidewalks are not added to streets, they are part of the street
Sidewalks reduce pedestrian crash risk by 88%
Curbs & sidewalks slow traffic more than speed sign

Sidewalks define an urban street
Discussion: Why are sidewalks discontinuous?
Discussion: Why are sidewalks on one side not OK?

Answer: Pedestrians walk in street, or cross twice
Sample Implementation Strategy to retrofit existing streets w/sidewalks

Develop a program to fill in missing sidewalks over 20 years
How do you make such a daunting task manageable?

Seattle example: divide it into bite-size chunks, with overlapping priorities.
Designing for Pedestrian Safety - Walking Along the Road

Service providers

BINGO!
Discussion:

- What are your requirements for sidewalks?
- What are the triggers?
- Who pays for them?
- Who maintains them?
Sidewalk Corridors – The Zone System

The sidewalk corridor extends from the edge of roadway to the right-of-way and is divided into 4 zones:

- Curb zone
- Furniture zone
- Pedestrian zone
- Frontage zone
Curb Zone

Typically 6 inches
Why the curb zone matters: Mountable curbs are inappropriate on local streets
Why the curb zone matters: It’s where pedestrians transition from/to the street
Curbs & drainage are the greatest sidewalk cost
This sidewalk cost little to install w/o curb
Furniture Zone

- Local or collector streets 2 to 4 ft
- Arterial or major streets 4 to 6 ft
All these things go here!

All the “stuff” goes in the furniture zone
The furniture zone keeps the sidewalk clear
Sidewalk with furniture zone is pleasant to walk on
Planter strip helps define driveways, it’s easier for drivers to find them and they’re more likely to yield to pedestrians.
Pedestrian Zone
5 feet necessary for two people to walk comfortably side by side or to pass each other; 6’ preferred
Sidewalk should be as wide as needed to serve anticipated pedestrian use (use HCM ped LOS)
Minimum Sidewalk Recommendations

- Local or collector streets 5 ft
- Arterial or major streets 6 to 8 ft
- Along parks, schools, and other major pedestrian generators 8 to 10 ft
- CBD areas 8 to 12 ft
  - 8-ft minimum in commercial areas with a planter strip,
    12-ft minimum in commercial areas with no planter strip
Frontage Zone

- Doors, planters, etc...
  - 3 feet
- Café seating
  - 8 feet
Shy distance concept applies to pedestrians, who will shy away from a vertical face; extra width is needed.
An interesting façade makes narrow sidewalks feel wider.
Fence placement and type impacts pedestrian comfort: the sidewalk on the left is wider, but feels narrow due to high and adjacent chain link fence.
One foot of frontage zone between right-of-way line and sidewalk makes maintenance easier
The Zone System - Summary

Residential street
The Zone System - Summary

Commercial street
With Zone System

Street furniture arranged in zones leaves sidewalk clear
Without Zone System

Randomly placed street furniture clutters sidewalk
Without Zone System

No buffer between pedestrians and traffic
Well-designed sidewalks meet ADA:

- Sidewalks should be clear of obstructions:
  - 3’ min clearance, 4’ proposed
- Sidewalk should have smooth surface
- Sidewalk should be at 2% max cross-slope including at driveways

- The zone system creates a safer and more pleasant place to walk, and makes it easier to meet ADA requirements.

Utilities & poles should not obstruct sidewalk
Mitigate around obstacles on narrow curbside sidewalk
## Recommendations from Model Design Manual for Living Streets

<table>
<thead>
<tr>
<th>Boulevard</th>
<th>Avenue</th>
<th>Street</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low / Medium-Low Density Residential</strong></td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 4’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 11’</td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 4’</td>
</tr>
<tr>
<td><strong>Med / High Density Residential</strong></td>
<td>Frontage: 18’ Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 13’</td>
<td>Frontage: 30’, 8’ with cafe seating Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 14’</td>
</tr>
<tr>
<td><strong>Neighborhood Commercial</strong></td>
<td>Frontage: 18’ Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 13’</td>
<td>Frontage: 30’, 8’ with cafe seating Pedestrian: 8’ Furniture: 5’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 16’</td>
</tr>
<tr>
<td><strong>General Commercial</strong></td>
<td>Frontage: 18’ Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 13’</td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 5’</td>
</tr>
<tr>
<td><strong>Mixed / Multi-use</strong></td>
<td>Frontage: 30’, 8’ with cafe seating Pedestrian: 6’ Furniture: 4’, 6’-8’ at bus stops and where large trees are desired Curb: 6’ Min. Width: 13’</td>
<td>Frontage: 30’, 8’ with cafe seating Pedestrian: 6’ Furniture: 4’</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 5’ Curb: 18’ Min. Width: 14’</td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 5’ Curb: 18’</td>
</tr>
<tr>
<td><strong>Downtown Core / Main Street</strong></td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 4’ Curb: 18’ Min. Width: 14’</td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 5’ Curb: 18’ Min. Width: 14’</td>
</tr>
<tr>
<td><strong>Office Park</strong></td>
<td>Frontage: 18’ Pedestrian: 5’ Furniture: 5’ Curb: 6’ Min. Width: 12’</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Frontage and curb widths are in feet, and minimum widths are in feet.
Driveways are the source of most conflicts with motor vehicles on sidewalks.
Driveways built like intersections encourage high-speed turns
Driveways built like driveways encourage slow-speed turns
Intersection or Driveway?

Designing for Pedestrian Safety - Introduction
This driveway was built like an intersection

Driver exits at high speed, not looking at pedestrians
This driveway tells drivers watch for pedestrians
ADA requirements for driveways: minimum pedestrian access route of 3’ (soon to be 4’) at 2% max cross-slope
Easier to maintain level access with separated sidewalks
Without zone system hard to meet ADA

Cross-slope exceeds 2%
For narrow curbside sidewalks, wrap sidewalk around apron
Driveway Coaster

Most common reason given by wheelchair users using the street

- Driveways are not flat
For narrow curbside sidewalks

- Max Ramp Slope 8.33%
- Max Cross Slope 2%

- Fully lowered sidewalk
1. Crash Reduction Factors:

- Rural environments:
  - Paved shoulders reduce ped crashes up to 70%

- Urban environments:
  - Sidewalks reduce ped crashes up to 88%
    - (most sidewalk crashes occur at driveways)
2. Sidewalk Design: The zone system

What are the 4 zones?

1. The curb zone
2. The furniture/planter/buffer zone
3. The pedestrian/walking zone
4. The frontage zone
Walking Along the Road – Let’s Recap

3. Sidewalk Design: Key characteristics

How should the walking zone be designed?

- Smooth
- Separated from traffic
- Clear of obstructions
- Level cross-slope (max 2%)
- Wide enough to accommodate expected pedestrian volumes
Walking Along the Road

Learning Outcomes:

You should now be able to:

- Describe the operational and safety benefits of shoulders and sidewalks
- Select appropriate designs for sidewalks
Questions?