DESIGNING FOR PEDESTRIAN SAFETY

Module 1
Logistics

- Restrooms
- Emergency Evacuation
- Cell phones
- Lunch
- Breaks
- Other?
Instructors

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Self Introductions

- Please tell us:
  - Your Name and Title
  - Your employer
  - What is your ONE pedestrian safety issue?
This is a workshop:
Expect to do some work!

- Ask questions and issues as you have them
- May be covered in course material or
- Will be placed on the “Park Bench” for later
- Exercises, questions, and discussions — YOU provide the answers!
- Field trip: Assess the situation, apply the principles, and make recommendations
- Identify and prioritize potential policies and procedures
Designing for Pedestrian Safety Workshop Outcomes

☐ At the end of this workshop, you will be able to:

☐ Describe the influence of planning factors: land use, street connectivity, access management, site design, and level of service.

☐ Describe how pedestrians should be considered and provided for during the planning, design, work zone, maintenance, and operations phases.

☐ Describe how human behavior affects the interaction between pedestrians and drivers

☐ Identify good practices and effective solutions to enhance pedestrian safety and accessibility.
Overview of Pedestrian Safety Problem

- Annually almost 4,500 pedestrians are killed in traffic crashes, representing about 12% of all traffic deaths.
- Nearly 70,000 pedestrians are injured each year.
- Most crashes occur when the pedestrian crosses a road.
- Most fatalities and serious injuries occur on roads designed with little attention for pedestrian safety.
- Pedestrians are less likely to be killed in walkable environments.
Pedestrian Fatalities

Source: FARS
Pedestrian Fatalities

- A decline of 103 fatalities (1.7% decrease from 2016).
- First decline since 2013.
- A pedestrian was killed every 1.5 hours in 2017.
- 47% involved alcohol (driver and/or pedestrian).

From 2008-2017, for fatalities when land use was known:

- Pedestrian fatalities:
  - in rural areas decreased by 6%.
  - in urban areas increased by 46%.

- Pedalcyclist fatalities:
  - in rural areas decreased by 15%.
  - in urban areas increased by 13%.
# GHSA Pedestrian Traffic Fatalities by State 2017 Preliminary Report

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<tr>
<th>State</th>
<th>Pedestrian Fatalities per 100K Population - 2016</th>
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<td><strong>U.S. Average</strong></td>
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Agenda overview

- Planning factors: land use, street connectivity, access management, site design, and level of service
- Walking along the road: Effectiveness of sidewalks
- Street crossings: Human behavior, midblock crossings, crosswalks, medians, signals, over/under-crossings
- Pedestrian-friendly intersections: Geometry, radii, curb extensions, islands, crosswalks
- Signalized Intersections: Making them better for pedestrians
- Interchanges: Providing pedestrian safety and accessibility
- Roundabouts: Making them work for pedestrians
- Transit: Stop locations & pedestrian crossings
- Road diets: Making room for pedestrians
- Field Exercise: Apply what we have learned
- Policy Discussion – Optional based on time
Why is it important to accommodate pedestrian safety and accessibility?

Because we are all pedestrians
Why?

Because many people do not drive
Why?

Because other modes depend on walking
Why?

Because it’s good for business – people walk into stores
Why?

Because pedestrians use and belong on streets and highways.
Why?

Because walking is healthy exercise
Why?

Because it will make roads safer for all road users
Myth: Accommodating pedestrians increases liability

Fact: ignoring a problem increases liability

A good solution is to identify the problem and have a plan to address it.

“A Circuit Court civil jury ... awarded $3.3 million to relatives of a woman killed by a motorist as she walked on a stretch of Pennsylvania Avenue that did not have a sidewalk or guard rails. The jury found the state of Maryland liable in the wrongful death lawsuit, and voted to award $2.5 million to Kayla Martin, the daughter of Kelay Smith, who was struck and killed by a motorist on Aug. 12, 2008.”

--Washington Post; March 11, 2011

To reduce liability
AASHTO: “Because of the demands of vehicular traffic in congested areas, it is often extremely difficult to make adequate provisions for pedestrians. Yet this should be done, because pedestrians are the lifeblood of our urban areas…”

Why?


- Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems

It’s also been Federal Policy since ISTEA (1991)

--Ray LaHood, Transportation Secretary

It’s also been Federal Policy since ISTEA (1991)

U.S. Transportation Secretary Anthony Foxx
Why?

- USDOT Policy Statement – Actions to integrate non-motorized modes into future projects:
  - Consider walking and bicycling as equals with other transportation modes;
  - Ensure convenient choices for people of all ages and abilities;
  - Go beyond minimum design standards;
  - Collect data on walking and biking trips;
  - Set mode share targets for walking and bicycling
  - Maintain sidewalks paths, including snow removal
  - Improve non-motorized facilities during maintenance projects.
Resources

PBIC: www.walkinginfo.org
FHWA: safety.fhwa.dot.gov
NHTSA: nhtsa.dot.gov
ITE: www.ite.org
AASHTO/NCHRP: safety.transportation.org
Science-based technical approach for safety analysis

AASHTO HSM Website:
- www.highwaysafetymanual.org

FHWA HSM Website:
- http://safety.fhwa.dot.gov/hsm/

TRB Highway Safety Performance Committee Website:
- www.safetyperformance.org

FHWA RC HSM Webinar Series
- http://www.highwaysafetymanual.org/Pages/FHWAResourceCenterHSMWebinarSeries.aspx
Calculating Reduction in Number of Crashes

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 a similar road without the countermeasure.

Relationship between CMF and CRF:

\[
CMF = 1 - \left(\frac{CRF}{100}\right)
\]

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

CMF/CFR Clearinghouse: www.cmfclearinghouse.org
CMF - Important Concepts

- May apply to all crashes, or crash specific subsets (e.g., run-off-road, night, wet weather, multi-vehicle, etc.)
- Same treatment in different contexts or highway types may have different effects and different CMF values
Planning elements that affect pedestrian safety:

- Land Use
- Street Connectivity
- Access Management
- Site Design
- Level of Service
Land Use
Why do we have cities?

To minimize travel & maximize exchange (to be closer together)
How have we built our urban roadway system?

To facilitate travel over longer distances
The problem:

- Commercial activities concentrated in auto-dominated corridors.
- Segregated land uses.
- Result: long travel distances, not conducive to walking.

Potential solutions?
1. Allow small-scale retail in neighborhoods.
2. Create neighborhood parks.
3. Site school closer to residences & parks.

Reducing travel demand is best achieved through **Land Use** policies that bring destinations closer together.
Neo-traditional development: destinations are close to residential areas
Designing for Pedestrian Safety - Introduction
Connectivity creates a walkable street system by:

- Reducing walking distances;
- Offering more route choices on quiet local streets;
- Dispersing traffic – reducing reliance on arterials for all trips.
You live here, your child wants to visit a friend who lives not far away; how do you get there?

Cul-de-sac patterns increase walking distances & increase reliance on arterials
Can you increase connectivity with paths, greenways?

- Reduces walking distances: YES
- Offers more route choices: YES
- Disperses traffic: NO
- Dedicate R.O.W. to link cul-de-sacs with linear parks
- Land Use & Connectivity: Schools next to parks.
Designing for Pedestrian Safety - Introduction

High Connectivity

Moderate Connectivity

Low Connectivity

Travel Lanes Required
Lack of connectivity $\Rightarrow$ overly wide streets
Lack of connectivity => few but large intersections
Access Management

Every driveway is a potential conflict
Drivers and pedestrians must make choices:
- Walk in front or in back? Pull forward or back up?
Access Management => fewer conflicts at driveways
2 techniques: (1) median (no left turns) (2) consolidate driveways
Which has greater crash reduction factor: (1) Median (no left turns) or (2) consolidate driveways?
Driveways can be closed for safety
Severing public streets not a desirable access management technique

This limits people’s ability to walk or bicycle
Connecting severed streets reestablishes walking routes
Severed street can be reconnected for pedestrians
Site Design
Bringing Buildings closer to the Street

- Creates a street where drivers know to expect pedestrians
Parking between sidewalk and building is not pedestrian-friendly
Building at back of walk: pedestrian-oriented design
- Fast food typically favors drive-thru over walk-ins
- Pedestrians must cross drive-thru lane
Alternative design: Direct pedestrian access is provided with no vehicular conflicts
Parking and drive through are still provided
Even a gas station / convenience store can be built with pedestrian friendly design, at back of walk.
Pedway retrofitted from sidewalk to building through parking
Same principles apply to large-scale developments:
Direct, safe & convenient access is provided
Poor Design: Drivers use sidewalk for backing

So desperate for parking, they cut down tree!
Do your local ordinances support pedestrian-oriented planning and design?

- These goals are achieved by local ordinances, which must be enforced.
- They are beyond the scope of road designers, yet contribute greatly to the safety, comfort and aesthetics of the walking experience.
Rethinking The Role of Urban Streets
A “complete street” accommodates many uses and provides for all purposes of a street:

- Mobility (all modes)
- Access to destinations
- Thriving businesses
- Beauty
Transforming a street
Narrow lanes; add bike lanes, median, trees, texture
Bring in buildings that face the street
More buildings: Infill
The street now has life and is safer for pedestrians.
The impact of LOS standards on street design and pedestrian safety
HCM 2000 says LOS = A; little traffic, no impediments
Result: very wide roads that reduce pedestrian safety
- HCM 2000: ped LOS = A; few people walking
- New HCM 2010: worse ped LOS due to poor quality
- HCM 2000: ped LOS = F; too many peds!
- New HCM 2010: considers quality and density for peds
HCM 2010 Approach

- Multimodal evaluation for urban streets
  - Emphasizes combined evaluation of auto, bike, and transit modes
Pedestrian LOS

- LOS model determined from research on pedestrians’ perceptions
- LOS models are provided for:
  - Urban street segments
  - Signalized intersections
  - Two Way Stop Controlled (TWSC) intersections
  - Roundabouts
  - Off-street facilities
Pedestrian LOS

- **Urban street segments**
  - Density of pedestrians and comfort / perceived exposure

- **Signalized intersections**
  - Pedestrian delay and perceived exposure

A = actual sidewalk width
E = effective sidewalk width
Pedestrian LOS

- TWSC intersections
  - Average pedestrian delay crossing major street
- Off-street facilities
  - Affected by bicyclists
Why are pedestrians at high risk on this street?

- Multi-lane roadway, high speeds
Why are pedestrians at low risk on this street?

Narrow roadway, low speeds, busy
What is the core safety issue?
Pedestrians & drivers must use the street together

- Narrow cross-section
- Buildings close to street
- On-street parking
- Sidewalks
- Crosswalk
- People!

What does the driver see that says “slow down, watch for pedestrians”? 

Designing for Pedestrian Safety - Introduction
Reinventing the roadway:

Transform a 5-lane commercial strip to …
...a safer road for everyone

Discussion: 1. What changed?

Discussion: 2. What didn’t change?
Let’s Recap

- Why is it important to accommodate pedestrian safety and accessibility?
- How does the street environment influence drivers’ and pedestrians’ expectations and interactions?
- Where is the information?
- What planning factors influence pedestrian safety and accessibility?