U.S. Department of Transportation
Federal Highway Administration

Complete Streets

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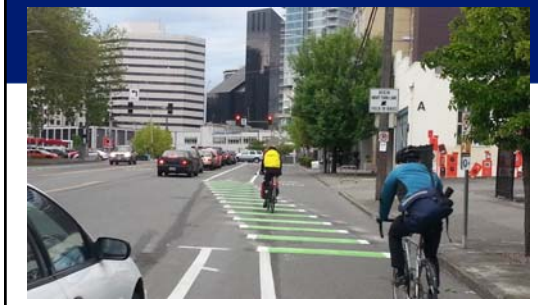
Outline

- What is a Complete Street?
- Users and their Needs
- A Complete Network
- Elements of a Complete Streets Policy



What is a Complete Street?

A Complete Street is safe, comfortable & convenient for travel via automobile, commercial vehicle, foot, bicycle, & transit.

What is a Complete Streets policy?

Complete Streets policies provide for all users

What is a Complete Streets policy?

Ensures that the **entire right-of-way** is designed for all users

What is a Complete Streets policy?

Make the needs of all users the default:

- No need to prove ped, bike, transit, & freight facilities are needed
- Rather, it's assumed they're needed unless proven otherwise

Why have a Complete Streets policy?

- To shift transportation investments
- Create better streets opportunistically
  - Planning
  - Construction
  - Operations, and
  - Maintenance activities

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What does a Complete Street look like?

One size doesn't fit all

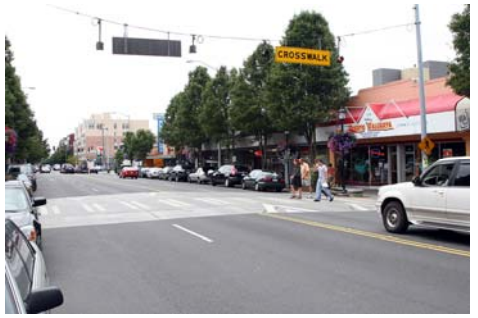
The Many Types of Complete Streets

Shoulders on Rural Roads

The Many Types of Complete Streets

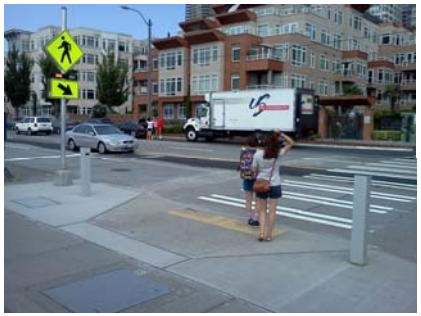
A Slow-Speed Shared Street

The Many Types of Complete Streets



Commercial Neighborhood with Mid-Block Crossing

The Many Types of Complete Streets



High Density Neighborhood with Mid-Block Crossing

The Many Types of Complete Streets

Historic Main Street

The Many Types of Complete Streets

Transit Route on an Urban Arterial

The Many Types of Complete Streets

High Density Neighborhood with One-way Protected Bike Lane, Parking, and Sidewalk

The Many Types of Complete Streets

A Two-Way Protected Bike Lane Through Downtown

The Many Types of Complete Streets

A Roundabout with Space for Over-size Trucks

The Many Types of Complete Streets

A Natural Drainage System as Part of a Complete Street

"Complete" for Context

"Complete" for Context

"Complete" Facility for Context

Users and their Needs

- Motorists
- Pedestrians
- Bicyclists
- Transit
- Freight
- ADA
- Law enforcement
- Maintenance
- Emerging technology

People Who Walk

- Condition of sidewalk
- Comfort level – how close to traffic
- Crossing opportunities
- Delay at signals
- Conflict points
  - Driveways
  - Intersections
- High speed roadways

People Who Bicycle

- Pavement condition
- Proximity to traffic
- Conflict points
- Visibility/sight distance
- Bike network / connectivity
- Traffic speed and volume
- Size of intersections

People Who Ride Transit

- Crossing the roadway
- Shelters
- How long of a wait
- Personal safety
- How far to transit stop
- How many transfers

People with Disabilities

- Curbs
- Slope
- Cross slope
- Accessible signals
- Detectable warnings
- Roundabouts
- Electric or hybrid cars

People Who Drive

- Delay
- Roadway conditions
- Direct route
- Conflicts

People Who Driver Commercial Vehicles

- Starting and stopping
- Turning corners
- Being able to see all road users
- Delay
- Parking
- Curb and building access for deliveries
- Service hour restrictions

People Who Drive Transit

- Getting back into traffic
- Staying on schedule
- Seeing all road users

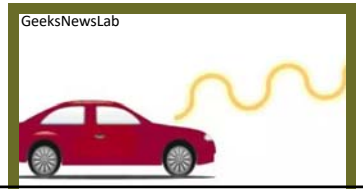
People Who Provide Emergency Services

- Maneuvering
  - Roundabouts
  - Traffic calming treatments
  - Making turns
- Access
- Time to respond
- Save lives
- Enforcement activities

People Who Provide Street Maintenance

- Snow plowing
- Street sweeping
- Vegetation
- Pavement markings
- Signs
- Work zones


Kim Kulish/Corbis/Smithsonian Magazine



Emerging Technologies

- Sharing economy
  - Parking
  - Availability
- Self-driving cars
  - Legible pavement markings
  - Legible signs
  - Predictability of behavior
  - Visibility of pedestrians and bicyclists

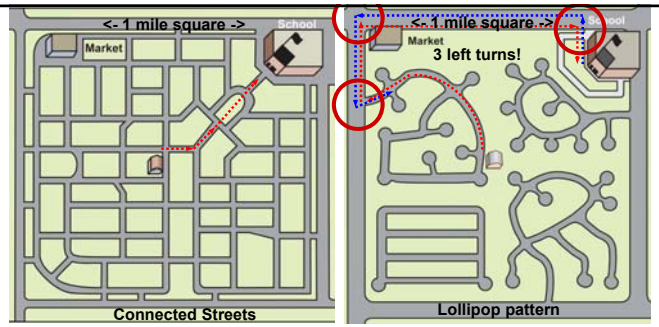
A Complete Network

Why do we have cities?

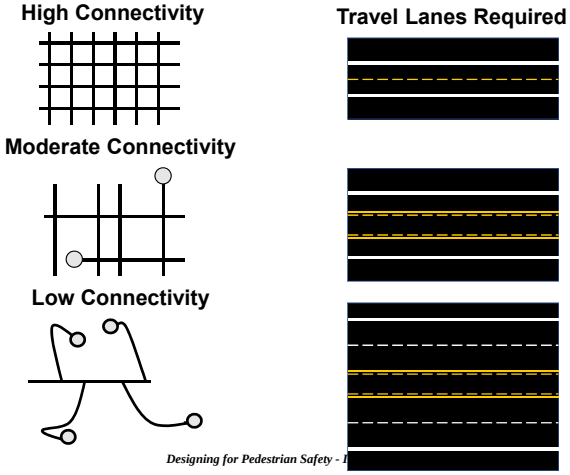
To minimize travel and maximize exchange

How have we built our cities?

To facilitate longer travel distances



- ☐ Connectivity creates a walkable street system by:
- ☐ Reducing travel distances;
- ☐ Offering more route choices on quiet local streets;
- ☐ Dispersing traffic – reducing reliance on arterials for all trips

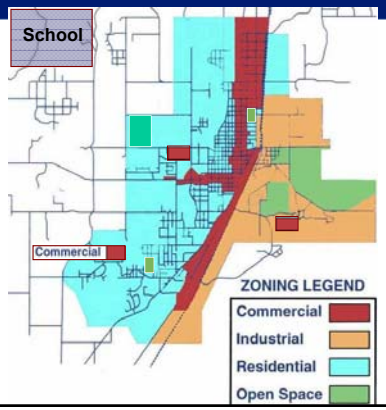


Reducing Travel Demand Through Land Use

- ☐ 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



Neo-traditional Development

Destinations are close to residential area

Manufacturing District

- Prevent encroachment of incompatible land uses
- Buffer sub-zones
- Performance criteria for each zone

Source: City of Chicago.

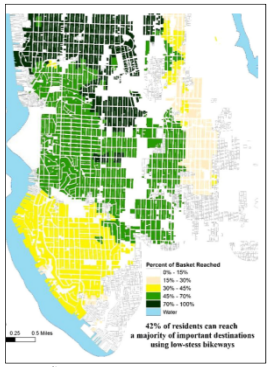
Complete Network

- Network for each mode
- Not all users are prioritized on all corridors
- Always provide access:
  - Across low-comfort corridors
  - Along key links

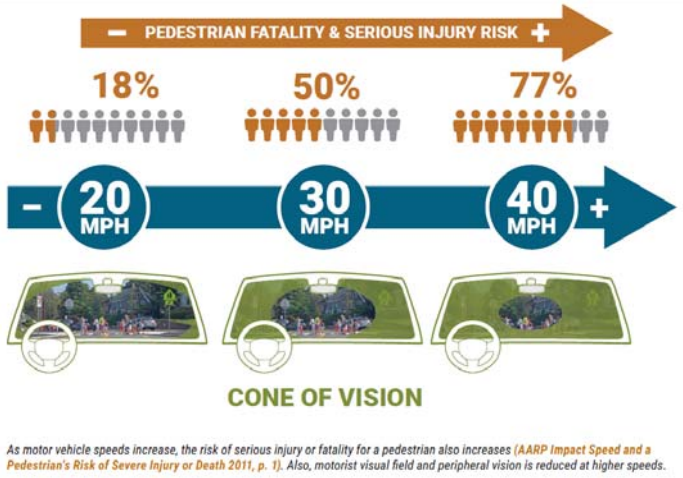
Source: METRANS Transportation Center

What is Multimodal Connectivity?

- Networks are accessible, interconnected transportation facilities that allow all users to safely and conveniently get where they want to go.
- Connectivity is the extent to which users can make comfortable trips from beginning to end when traveling to destinations throughout a community.



Map credit: Lowry 2016

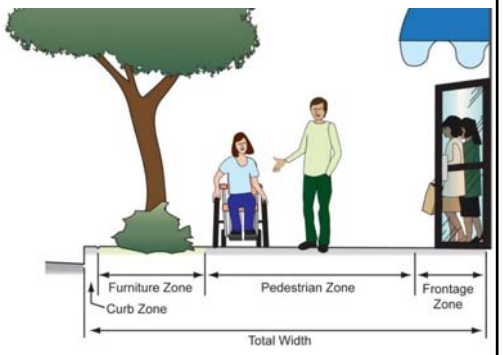


As motor vehicle speeds increase, the risk of serious injury or fatality for a pedestrian also increases (AARP Impact Speed and a Pedestrian's Risk of Severe Injury or Death 2011, p. 1). Also, motorist visual field and peripheral vision is reduced at higher speeds.

Sidewalk Zones

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

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



Level of Traffic Stress

Comfortable for children

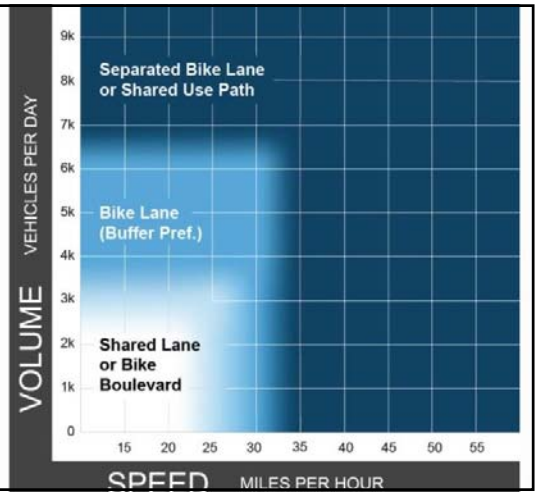
Comfortable for most adults

Typical of most U.S. facilities

"Strong and fearless" or those who absolutely have to

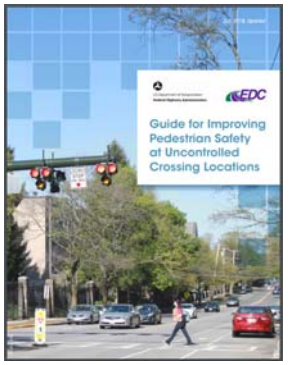
Level of Traffic Stress

- Increased bicyclist comfort leads to increased ridership



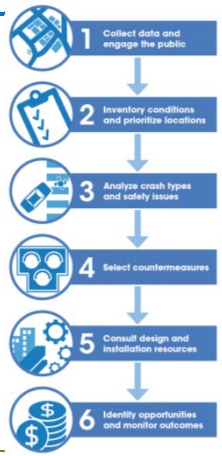
EDC4 STEP's Spectacular Six

- Crosswalk Visibility Enhancements
- Raised Crosswalks
- Pedestrian Refuge Islands
- Rectangular Rapid Flashing Beacon
- Pedestrian Hybrid Beacon (PHB)
- Road Diets



https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm

Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations



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Marked vs. Unmarked Crosswalks at Uncontrolled Locations

Marked vs. Unmarked Analysis

Speeds < or = to 40 mph

- Two-lane roads: No significant difference in crash rate
- Multilane roads (3 or more lanes)
  - Under 12,000 ADT: no significant difference in crash rate
  - Over 12,000 ADT w/ no median: crashes marked > crashes unmarked
  - Over 15,000 ADT & w/ median: crashes marked > crashes unmarked

https://www.fhwa.dot.gov/publications/research/safety/04100/

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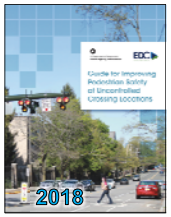

https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf

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4 Select countermeasures

of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT: Vehicle AADT <9,000 ≤30 mph	35 mph	≥40 mph	Vehicle AADT 9,000–15,000 ≤30 mph	35 mph	≥40 mph	Vehicle AADT >15,000 ≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	○ 2 4 5 6 7	○ 5 6 7 9 ●	◎ 5 6 9 ●	○ 4 5 6 7 9 ●	○ 5 6 7 9 ●	◎ 5 6 9 ●	○ 4 5 6 7 9	◎ 5 6 7 9	◎ 5 6 ●
3 lanes with raised median (1 lane in each direction)	○ 2 3 4 5 7	○ ◎ 5 7 9 ●	◎ 5 9 ●	○ ◎ 3 4 5 7 9 ●	○ ◎ 5 7 9 ●	◎ 5 9 ●	○ ◎ 3 4 5 7 9	○ ◎ 5 7 9 ●	◎ 5 9 ●
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	○ 2 3 4 5 6 7	○ ◎ 5 6 7 9	◎ 5 6 9	○ ◎ 3 4 5 6 7 9 ●	○ ◎ 5 6 7 9 ●	◎ 5 6 9 ●	○ ◎ 3 4 5 6 7 9	○ ◎ 5 6 7 9	◎ 5 6 ●
4+ lanes with raised median (2 or more lanes in each direction)	○ 5 7 8 9	○ ◎ 5 7 8 9	◎ 5 8 9	○ ◎ 5 7 8 9 ●	○ ◎ 5 7 8 9 ●	◎ 5 8 9 ●	○ ◎ 5 7 8 9	○ ◎ 5 7 8 9	◎ 5 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	○ 5 6 7 8 9	○ ◎ 5 6 7 8 9	◎ 5 6 8 9	○ ◎ 5 6 7 8 9 ●	○ ◎ 5 6 7 8 9 ●	◎ 5 6 8 9 ●	○ ◎ 5 6 7 8 9	○ ◎ 5 6 7 8 9	◎ 5 6 8 9

Given the set of conditions in a cell.

- ◦ Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning sign
2 Raised crosswalk
3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
4 In-Street Pedestrian Crossing sign
5 Curb extension
6 Pedestrian refuge island
7 Rectangular Rapid-Flashing Beacon (RRFB)**
8 Road Diet
9 Pedestrian Hybrid Beacon (PHB)**

*Refer to Chapter 4, Using Table 1 and Table 2 to Select Countermeasures, for more information about using multiple countermeasures.
**The PHB and RRFB are not both installed at the same crossing location.

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Crosswalk Visibility Enhancements

Crosswalk Visibility Enhancements

Tampa FL

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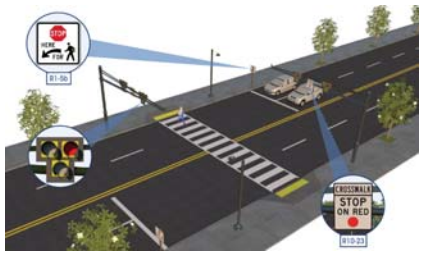
Raised Crosswalks

Photo Source: SRTS Guide

Pedestrian Refuge Islands

Rectangular Rapid Flashing Beacon

Pedestrian Hybrid Beacons (PHB)



Road Diet:

Before

After

EDC5 STEP's Spectacular Seven

- Crosswalk Visibility Enhancements
- Raised Crosswalks
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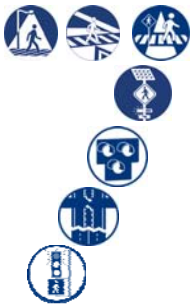
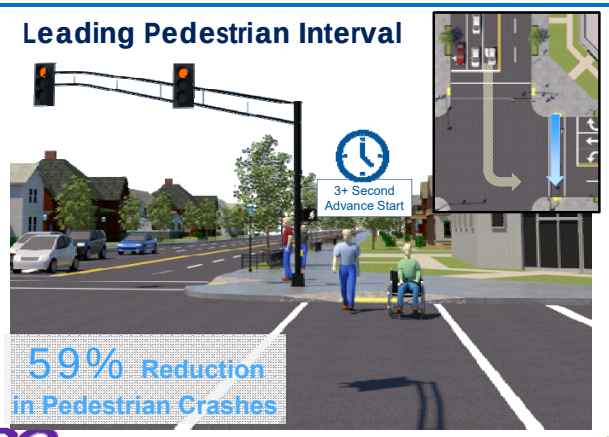
- Pedestrian Hybrid Beacon (PHB)
- Road Diets
- Leading Pedestrian Interval



Leading Pedestrian Interval

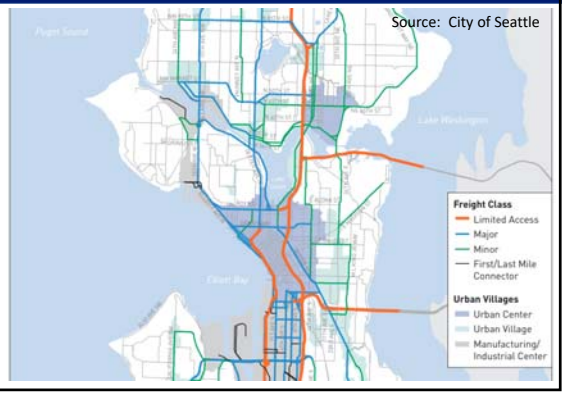


EDC

Freight Network: City of Seattle

Major Truck Street

- Arterial street that has significant truck traffic
- Also includes some State and US Routes
- Criterion for
  - Design
  - Traffic management
  - Pavement
  - Repairs

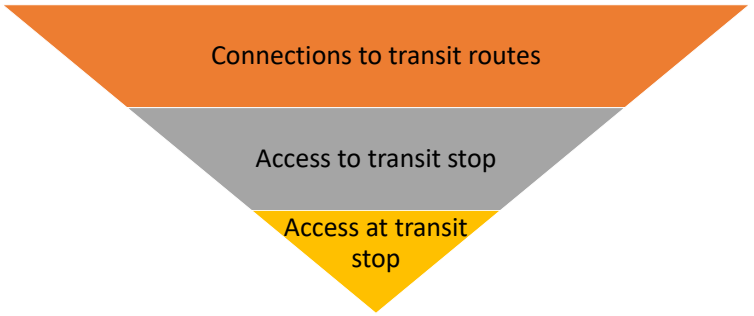


City of Seattle

Policies to manage freight operations:

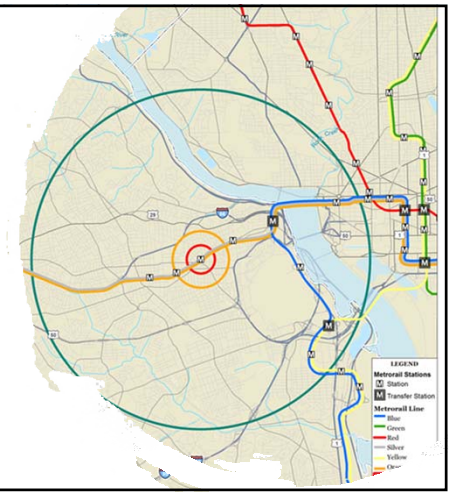
- Reserve some on-street parking for commercial vehicles
- Require permits for over-size trucks
- Require new developments to provide off-street truck loading areas
- Retain alleys for truck delivers and garbage/recycling collection
- Provide signage for truck drivers to identify appropriate routes and note prohibitions
- Provide businesses with information regarding route closures and detours early enough for them to adjust routes or delivery schedules if requires
- Provide real-time information about incidents that will disrupt traffic operations

Access to Transit



Catchment Area

- The catchment area is defined as the area served by transit
- Transit access considers elements within catchment area
- In general, people are willing to:
  - Walk ¼ mile to access local bus
  - Walk ½ mile to BRT or rail transit
  - Bike 1-3 miles
  - Drive 15 miles



Site Design

- Set-backs
- Walkable access to store front
- Driveways
- Parking (cars, bikes, & sharing economy)
- Commuter services
  - Repair stations
  - Showers
- Off-street transit stops
- Off-street loading

Local Example

- Context cues for motorists
- Pedestrian access from sidewalk
- Bike rack
- Parking on side
- Curb ramps at driveways

Local Example

Advantages

- Pedestrian island
- RRFB
- High visibility cross-walk
- Buffered bike lanes
- Turning space

Local Example

Opportunities

- Ped signal resting on green
- Truck apron
- Ped access to businesses
- Two stage turn boxes for bicyclists
- Pedestrian-scale lighting

Questions

- What is a Complete Street?
- Users and their Needs
- A Complete Network
- Features of a Complete Street