Planning for Pedestrians & Bicyclists

Creating forgiving and inclusive roadways

HNTB

DEPARTMENT OF TRANSPORTATION

Sonja Piper, PE, MnDOT Bicycle and Pedestrian Safety Engineer

Hannah Pritchard, PE, MnDOT Pedestrian and Bicycle Engineer

Maria Donnelly, PE, PTOE, HNTB Corporation

Agenda

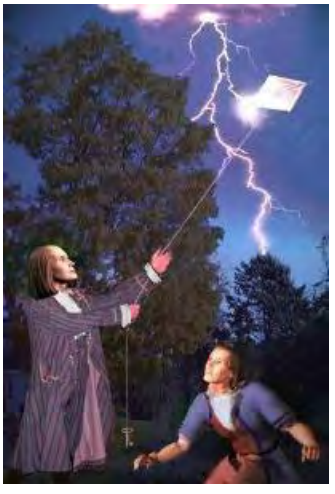
- Transportation Evolution
- Transportation Equity
- Safe Systems Approach
- Scoping and Balance
- STEP Countermeasures
- Project Examples and Benefits

10/23/2019

Transportation History

1789 AD - Belief in Technology

- We believe that science and technology can solve any problem
  - Disease
  - Poverty
  - Death?



It is quite generally understood that roads are for the common use of all and not the private property of a few rich enthusiasts…[these rights] come to [them] through no statute law. **The doctrine that streets are for the public is part of our common law** and is so old that we may safely hazard a guess that it is coeval with the existence of highways themselves…

-John Farson, President, American Automobile Association, 1906

We replace work animals with engines: 1885 - 1927

U. S. DEPARTMENT OF COMMERCE
ROY D. CHAPIN, SECRETARY
BUREAU OF THE CENSUS
W. M. STEUART, *Director*

MORTALITY STATISTICS
1929

From 1924 to 1929 there was a continuous increase in the death rate from motor-vehicle accidents in the registration States of 1900, the rates ranging from 19.8 in 1924 to 27.4 in 1929; in the States of 1910, the rates ranged from 19.8 to 28.8 and in the States of 1920, from 17.5 to 26.5. The District of Columbia is always included in the groups "States of 1900, 1910, or 1920."

Founded in 1913

Today's rate:
~12 fatalities / 100,000 people

1920's: Social Engineering

- Jaywalking first appears in the dictionary in 1924

2019: Crosswalk Law – MN Statute 169.21

- Subdivision 1.**Obey traffic-control signals.**
- Subd. 2.**Rights in absence of signal.**

  (a) …the driver of a vehicle shall stop to yield the right-of-way to a pedestrian crossing the roadway **within a marked crosswalk or at an intersection with no marked crosswalk**…

  (b) When any vehicle is stopped at a marked crosswalk or at an intersection with no marked crosswalk to permit a pedestrian to cross the roadway, **the driver of any other vehicle approaching from the rear shall not overtake and pass the stopped vehicle.**

2019: Crosswalk Law – MN Statute 169.21

- Subd. 3.**Crossing between intersections.**

(a) Every pedestrian crossing a roadway at any point other than within a marked crosswalk or at an intersection with no marked crosswalk shall **yield the right-of-way to all vehicles** upon the roadway.

(c) Between adjacent intersections at which traffic-control signals are in operation pedestrians **shall not cross** at any place except in a marked crosswalk.

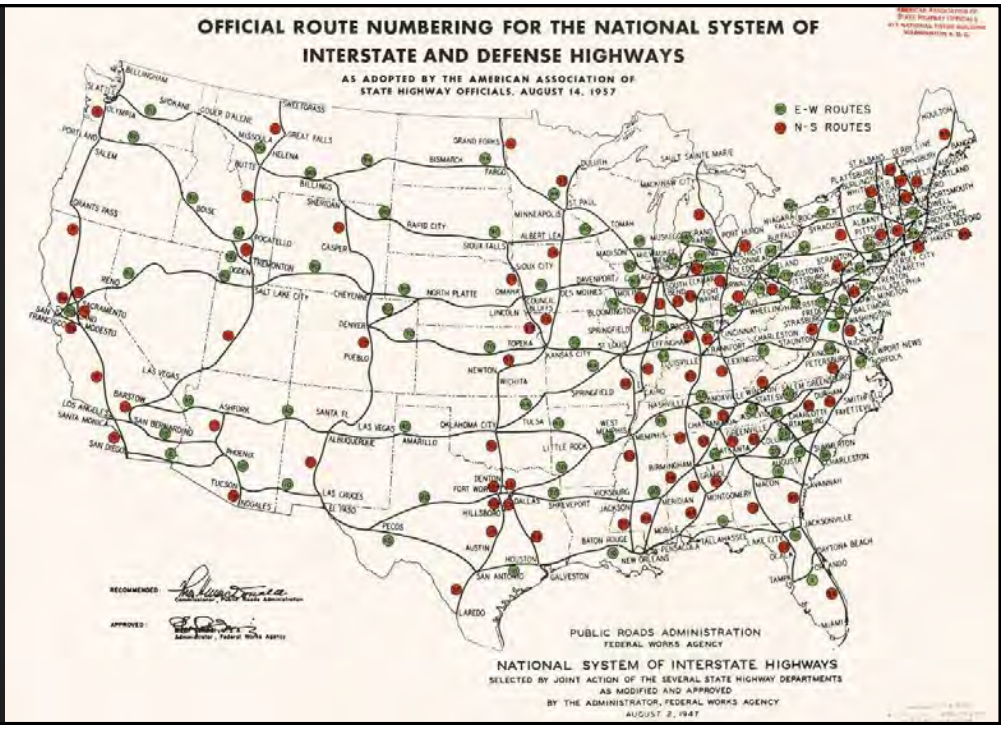
(d) Notwithstanding the other provisions of this section every driver of a vehicle shall (1) **exercise due care to avoid colliding** with any bicycle or pedestrian upon any roadway and (2) give an audible signal when necessary and exercise proper precaution **upon observing any child or any obviously confused or incapacitated person** upon a roadway.

The Interstate Freeway System

1956-1971

26,000 miles of highways built in

15 years



The matter of running Interstate routes through the congested parts of the cities was entirely against [his] original concept and wishes.

President Eisenhower, 1960

1966: National Highway Traffic Safety Administration

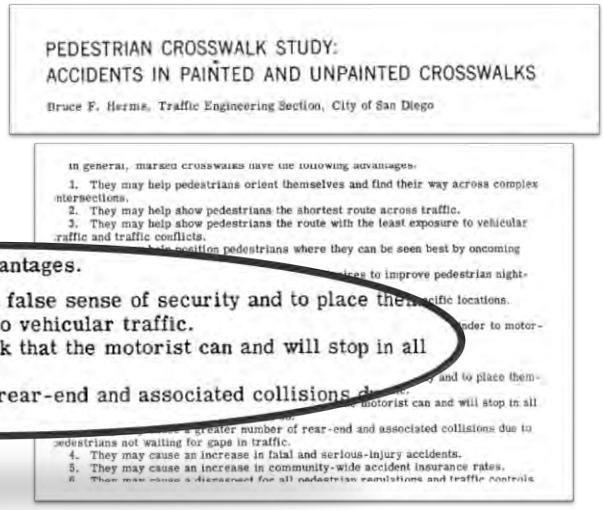
- Founded in 1966
- Shifted responsibility from driver to vehicle
- Crashes are inevitable and manufacturers have a safety obligation
- Reduced driver fatalities by addressing the "second collision"

We have drivers performing millions of maneuvers in their automobile adequately, even overpowering the deficiencies of their automobile…and then they make that one mistake, and **should they die for that one mistake**?…[W]e should build cars that take into effect that one, or those two mistakes…

-Ralph Nader, U.S. Senate traffic safety hearings, 1965

1972: False Sense of Security

- 1972 study by City of San Diego traffic engineer Bruce Herms.
- Risk adaptation taken to the next level



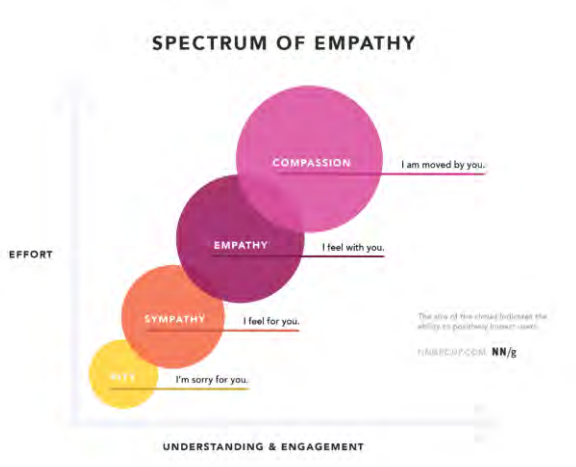
PEDESTRIAN CROSSWALK STUDY:
ACCIDENTS IN PAINTED AND UNPAINTED CROSSWALKS

Bruce F. Herms, Traffic Engineering Section, City of San Diego

...walks also exhibit some disadvantages.

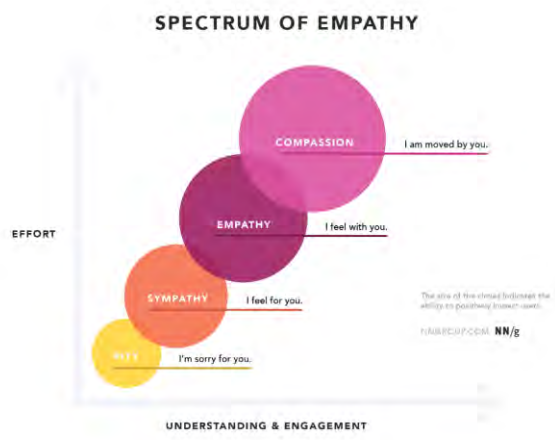
1. They may cause pedestrians to have a false sense of security and to place themselves in a hazardous position with respect to vehicular traffic.
2. They may cause the pedestrian to think that the motorist can and will stop in all cases, even when it is impossible to do so.
3. They may cause a greater number of rear-end and associated collisions due to ... waiting for gaps in traffic.

Compassionate road design



- 94% of crashes are the result of human error. Should people have to die for their mistakes?
- Do we have an ethical responsibility to design our communities for vulnerable users?
- How do our investments and decisions reflect our values?

Compassionate road design



- Lower speeds
- Add sidewalks & bikeways
- Improve crossings

Where Are We Now?

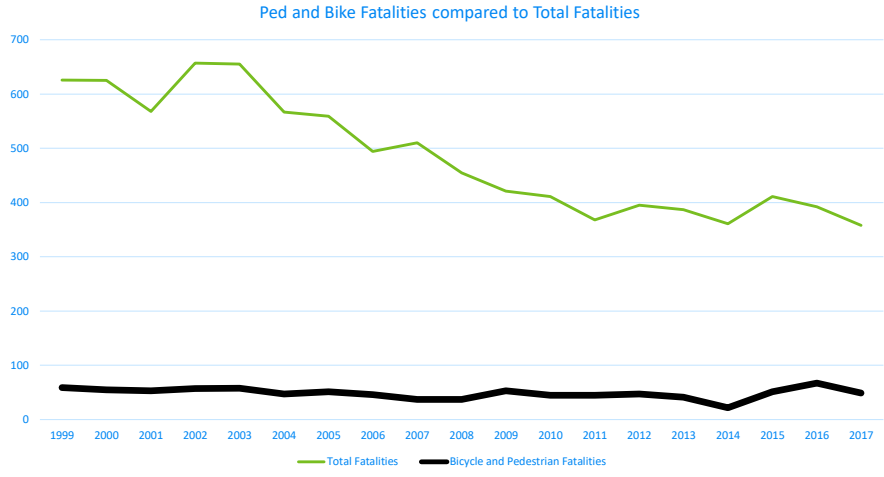
HNTB

DEPARTMENT OF TRANSPORTATION

Maria Donnelly, PE, PTOE

HNTB Corporation

Ped/Bike Fatalities Compared to Total Fatalities



19

From Minnesota Walks:

OVERARCHING THEME:

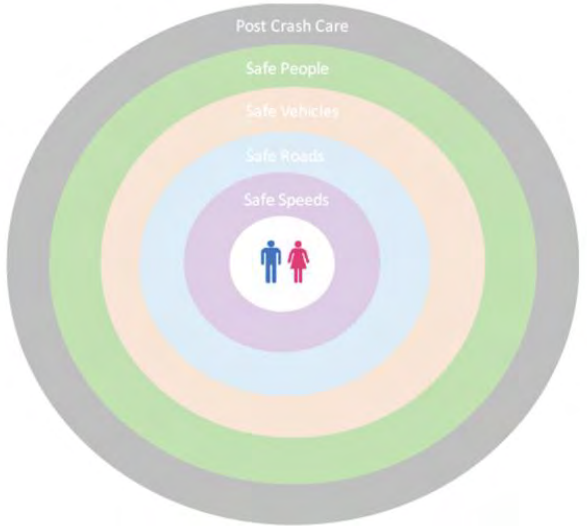
DESIGN FOR ALL

Plan and design streets so that all people are able to safely and comfortably walk or roll to their desired destinations.

The Safe System

Towards Zero Foundation Safe System:

- Nobody should be killed or seriously injured from using the road network
- Views human life and health as paramount
- Four principles

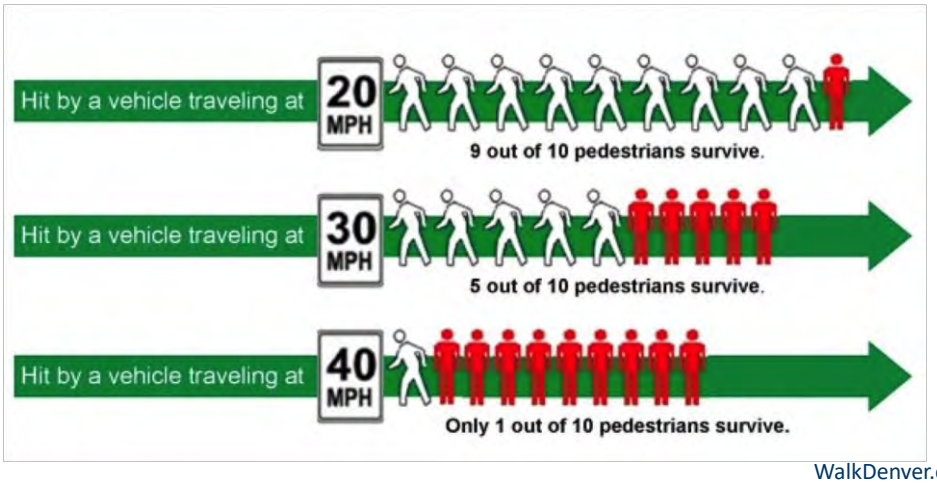


The Safe System – Principle 1

- People make mistakes

22

Pedestrian Vulnerability



WalkDenver.org

23

Pedestrian Catcher

Safety Scoop

24

The Safe System – Principle 2

- The human body has a **limited physical ability** to tolerate crash force
  - Towards Zero – Project Graham
  - "Cars have evolved a lot faster than we have"
  - We'll never (?) look like Graham – but a safe system provides protection

25

Project Graham

http://www.meetgraham.com.au/

26

The Safe System – Principle 3

- Road safety is a shared responsibility amongst everyone, including those that **design, build, operate and use the road system**

27

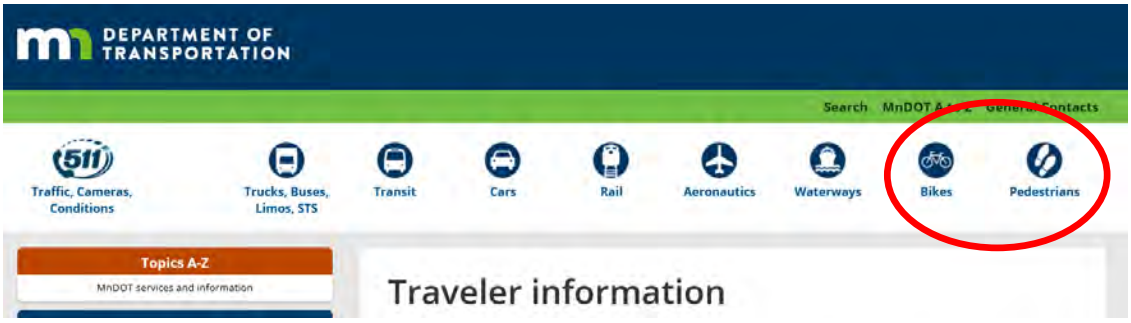
The Safe System – Principle 4

- All parts of the road system must be strengthened in combination to multiply the protective effects and **if one part fails, the others will still protect people.**
  - Build a forgiving system for vulnerable people

28

What is MnDOT Doing?

A lot!



29

MnDOT Mission & Vision

VISION

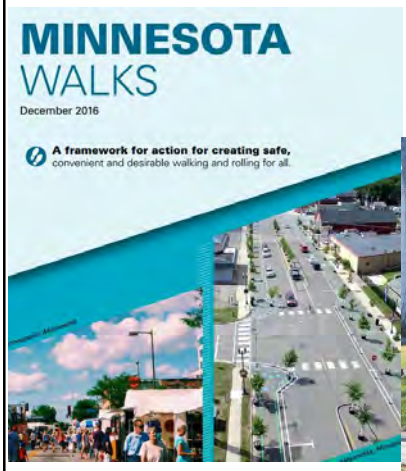
Minnesota's multimodal transportation system maximizes the health of the people, the environment and our economy.

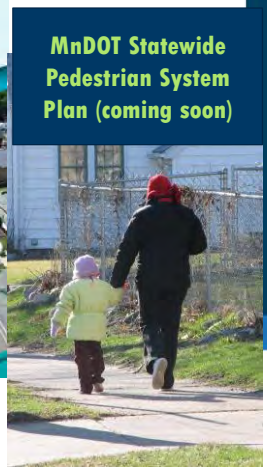
MISSION

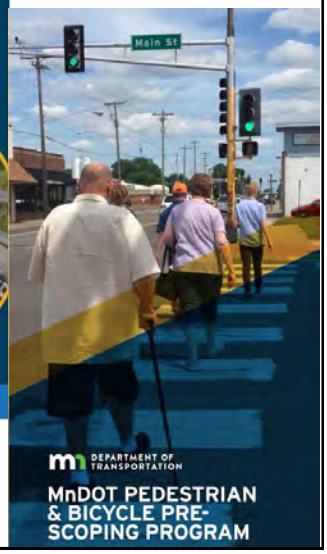
Plan, build, operate and maintain a safe, efficient and reliable multimodal transportation system that connects people to destinations and markets throughout the state, regionally and around the world.

30

MnDOT Initiatives







Non-Motorized Project Scoping

Sonja Piper | MnDOT

DEPARTMENT OF TRANSPORTATION

HNTB

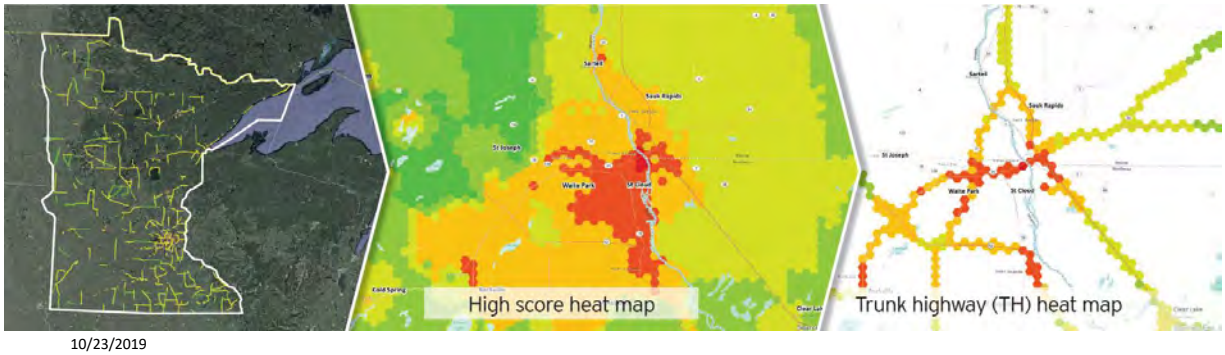
Scoping Field Walks

- Why add non-motorized scoping to projects
- Year 2: conducting non-motorized scoping field walks
- Approx. 60 field walks completed in 2018 and 2019

10/23/2019

Project Selection Process

- Coordinate project selection with Districts
- Suitability for the Pedestrian and Cycling Environment (SPACE) tool
  - Leverages public data to identify latent demand for non-motorized transportation



10/23/2019

Project Considerations

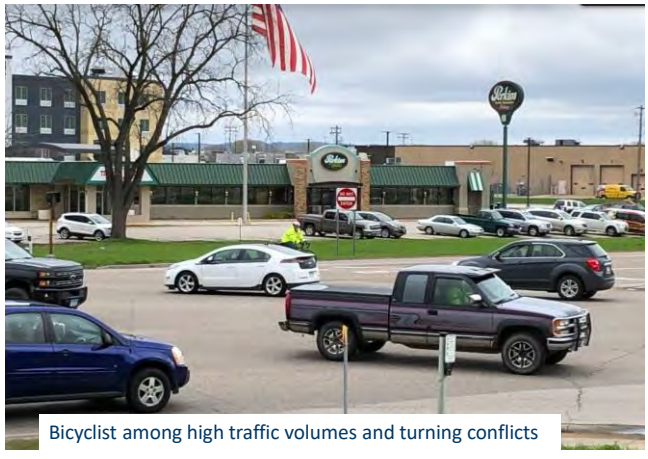
- Purpose and Need
- Mill and Overlay vs Reconstruction

10/23/2019

What to look for?

Roadway Conditions

- Speed limit and speed-related concerns
- Traffic volumes
- Truck volumes
- Cross section
- Crash rates



Bicyclist among high traffic volumes and turning conflicts

10/23/2019

What to look for?

Non-Motorized Conditions

- Crash history
- Intersection risk assessment
- Crossing distances
- Visibility
- Comfort on facilities

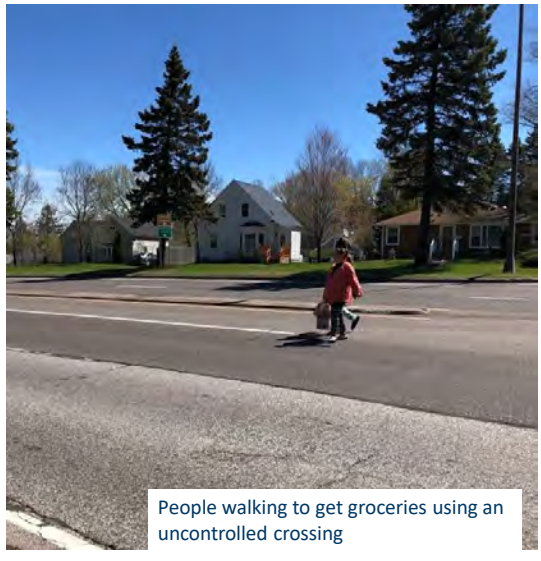
Poor pedestrian visibility at a major roadway intersection

10/23/2019

What to look for?

Types of users on the roadway

- Motorists
- Farm equipment
- Pedestrians
- Bicyclists
- ATVs
- Snowmobiles
- Amish



People walking to get groceries using an uncontrolled crossing

10/23/2019

What to look for?

Project context

- Destinations
- Origins
- Welcoming space
  - Sense of community

10/23/2019

What to look for?

Crossing locations and treatment

- Controlled
- Uncontrolled
- Mid-block

10/23/2019

What to look for?

10/23/2019

Countermeasure Selection

DEPARTMENT OF TRANSPORTATION

HNTB

FHWA STEP Countermeasures

Every Day Counts: Safe Transportation for Every Pedestrian (STEP)

- Systemic application of cost-effective countermeasures with known safety benefits
  - Crosswalk visibility enhancements
  - Raised crosswalks
  - Pedestrian crossing/refuge islands
  - Rectangular rapid flashing beacons
  - Pedestrian hybrid beacons
  - Leading pedestrian intervals
  - Road diet/reconfiguration

10/23/2019

Countermeasure Selection

Table 1. Application of pedestrian crash countermeasures by roadway feature.

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

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 signs
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)**

10/23/2019

- Roadway characteristics determine appropriate countermeasures
- Combinations of countermeasures can be used

Crosswalk Visibility Enhancements

- Warn motorists to expect pedestrian
- Indicate to pedestrians preferred crossing location

10/23/2019

Raised Crosswalks

- Typical Context:
  - 2-3 lane roads
  - 30 mph or less
  - AADT's less than 9,000
- Typical width 10-15 ft
- Effective speed reduction measure

10/23/2019

Pedestrian Refuge Islands

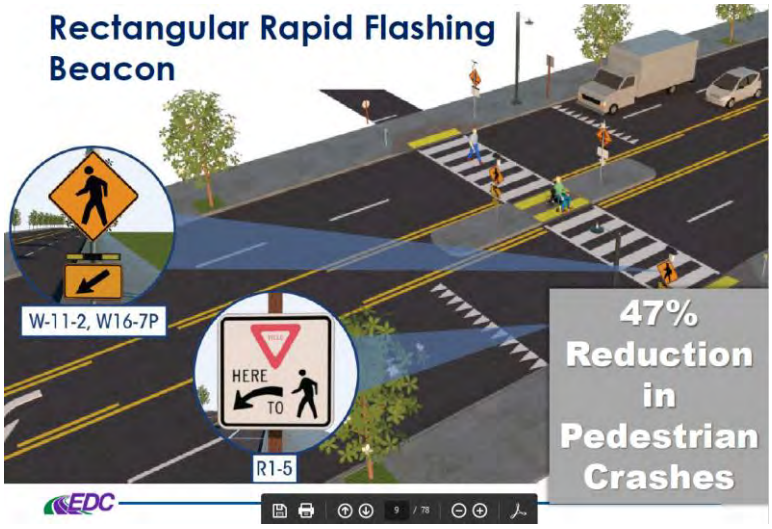
- Staged crossing
- Consider when:
  - Curbed roadway
  - Urban, surburban multi-lane roadways
  - Mid-block crossings
  - Near transit or other pedestrian generators

Source: FHWA

10/23/2019

Rectangular Rapid Flashing Beacon (RRFB)

- Warning lights and signs
- Unsignalized intersections or mid-block crossings
- Can be user actuated or automated

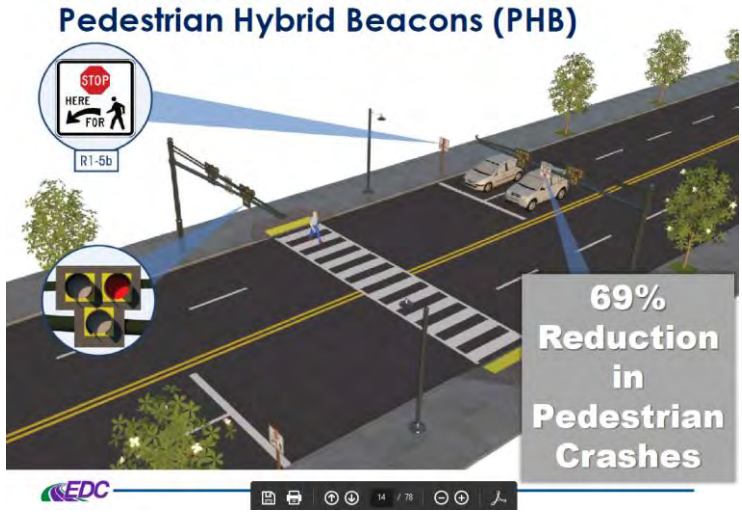


Source: FHWA

10/23/2019

Pedestrian Hybrid Beacons

- Beacon to warn and control traffic at unsignalized marked crosswalks
- Typically used on higher speed roadways
- Consider education and outreach efforts with installation



Source: FHWA

10/23/2019

Leading Pedestrian Interval

- Gives 3+ sec head start to pedestrians at traffic signal
- Pedestrians more visible to motorists
- Improves driver yielding
- **60% Reduction in Pedestrian Crashes**

Pedestrians wait for the walk signal.

Source: FHWA

10/23/2019

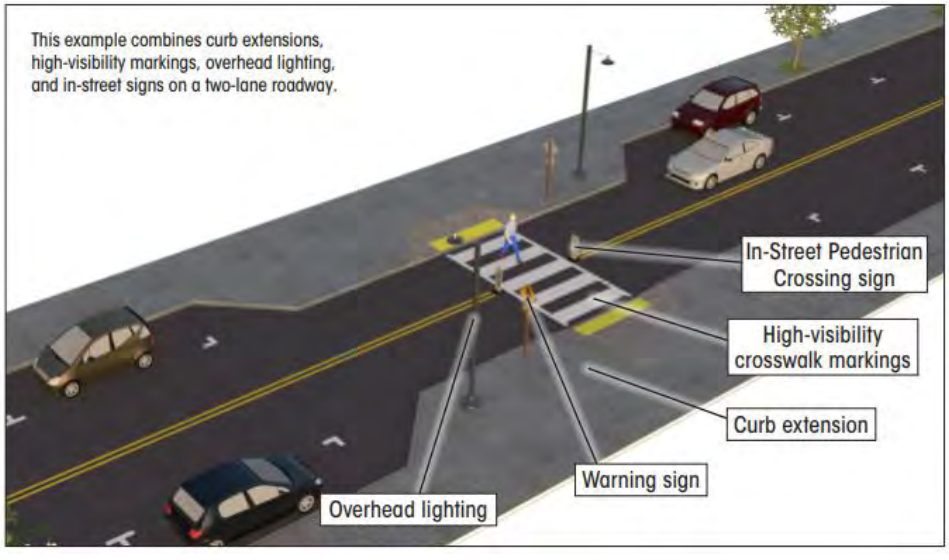
Road Diets or Roadway Reconfiguration

- Reduces speed differential
- Improved mobility and access
- Allows reclaimed space to be allocated for other uses
- See also: FHWA Road Diet Informational Guide
- **19-47% Crash Reduction**

Source: FHWA

10/23/2019

Combination of Treatments



10/23/2019

Example Projects

DEPARTMENT OF TRANSPORTATION

HNTB

Glenwood

- Intro to Glenwood
- Location
- Issues and process overview

10/23/2019

Glenwood - After

Mahnomen

- Highway 59 (AKA 3rd St NE)
  - Wide shoulders frequently used for walking
  - MnDOT project will add turn lanes and reduce shoulder width
  - Transportation Alternatives Grant
  - Free Bikes 4 Kids
  - Safe Routes to school Planning
- Partners: City, County, Headwaters RDC, White Earth, Norman – Mahnomen Co. SHIP

Source: Google Maps 2012

Mahnomen - After

10/23/2019

Hometown Transitions

DEPARTMENT OF TRANSPORTATION

HNTB

If you build it, they will come

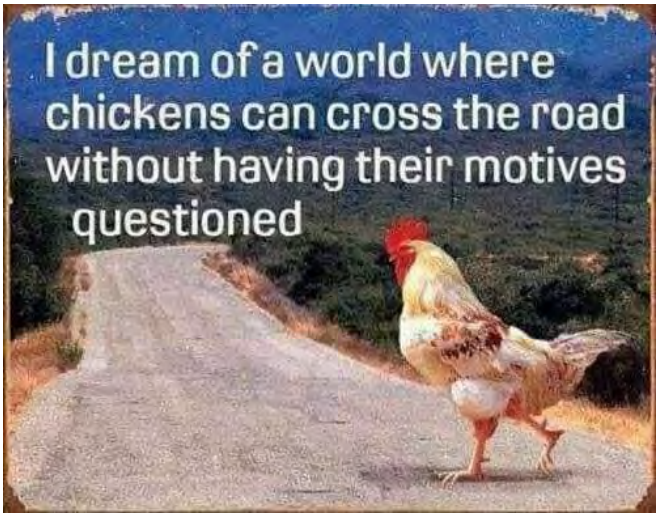
- Walking the Walk report found 1 point increase in the WalkScore correlates to
  - $700-$3,000 increase in home values
  - **Higher property tax revenues for local governments**
- For every $1 spent on implementing active transportation strategy
  - + $8.41 in sales output
  - + $2.65 in personal income
  - + $5.20 in value added


Source: mlb.nbcsports.com

Source: FHWA Strategies for Accelerating Multimodal Project Delivery
2016 Southern California Association of Governments

10/23/2019

Thank You!



Hannah Pritchard, PE
hannah.pritchard@state.mn.us
651-336-4168

Maria Donnelly, PE, PTOE
mdonnelly@hntb.com
414-559-4250

Sonja Piper, PE
sonja.piper@state.mn.us
651-234-7376

10/23/2019