# Developing Crosswalk Design Guidelines

Transportation Research Center for Livable Communities

4th Annual Summer Conference

# Today's Topics

- Why did the City choose to pursue this project?
- How did the project develop?
- Where are we going from here?

# Why pursue this project?

- City has a long standing devotion to complete streets and vulnerable road user safety
- Citywide interest in pedestrian mobility and safety led to the creation of the Pedestrian Safety and Access Task Force
- Repeated resident input that out crosswalks needed more consistency in design

# Direction from the Pedestrian Safety and Access Task Force

Adopt Design Guidelines that Promote Crosswalk Consistency.

- The City should develop and adopt context sensitive design guidelines that provide consistent regulatory and warning messages for motorists and pedestrians. These guidelines should be based on applicable research and reflect current best practices. The City should set up a process to evaluate the understanding and effectiveness of various crosswalk treatments and adjust practices accordingly.

# How Did the Project Develop?

- Defining the problem
- Defining the desired outcomes
- Developing a public process
- Developing engineering tools

# Defining the Problem

- Why are crosswalk designs inconsistent?
  - Changing regulations
  - Evolution of design practices
  - Individual variance of traffic engineers
  - Resource limitations
- Other contributing factors?
  - Line of sight issues: overgrowth, utilities
  - Maintenance: markings, signage
  - Overhead illumination
  - Varied understanding among users

# Defining the Desired Outcomes

- Consistent, recognizable look/feel for all crosswalks throughout Ann Arbor
- Help create clear, shared understanding among all users of how to interact with crosswalks

# Initial Public Engagement Plan

- Stakeholder engagement
  - Public sector partners
  - University of Michigan
  - Ann Arbor Disabilities Commission
  - Interest groups
- Public meetings (3 planned, 3 held)
- Community-wide survey (not utilized)

# Developing the Engineering Tools

- Review of best practices
  - National Association of City Transportation Officials (NACTO)
  - Ongoing MDOT research
  - National research
- Choose devices that
  - Reflect community preferences
  - Meet MMUTCD requirements
  - Are effective

# Developing the Engineering Tools

- Treatments that are context sensitive
  - Local
  - Collector
  - Minor & Major Arterials ≤ 3 Lanes
  - Minor & Major Arterial ≥ 3 Lanes
- Treatments that are progressive
  - Standard
  - Standard +
  - High Risk
- Treatments for different crossing control types

# Developing the Engineering Tools

- Need to apply the categories in away that is:
  - easily understandable,
  - data driven,
  - replicable, and
  - defensible.

- NCHRP 562/TCRP Report 112: Improving Pedestrian Crossings at Unsignalized Intersections
  - Spreadsheet developed by TTI that combines Worksheets 1 and 2 (Appendix A, pages 69-70)

# Developing the Engineering Tools

## GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

This spreadsheet combines Worksheet 1 and Worksheet 2 (Appendix A, pages 69-70) of TCRP Report 112/NCHRP Report 562 (*Improving Pedestrian Safety at Unsignalized Intersections*) into an electronic format. This spreadsheet should be used in conjunction with, and not independent of, Appendix A documentation.

This spreadsheet is still under development, please inform TTI if errors are identified.

**Key**

- Blue fields contain descriptive information.
- Green fields are required and must be completed.
- Tan fields are adjustments that are filled out only under certain conditions (follow instructions to the left of the cell).
- Gray fields are automatically calculated and should not be edited.

| **Analyst and Site Information** | | | |
|---|---|---|---|
| Analyst | C. Redinger | Major Street | Fifth Avenue |
| Analysis Date | March 16, 2017 | Minor Street or Location | Detroit Street (North) |
| Data Collection Date | | Peak Hour | Saturday Peak |

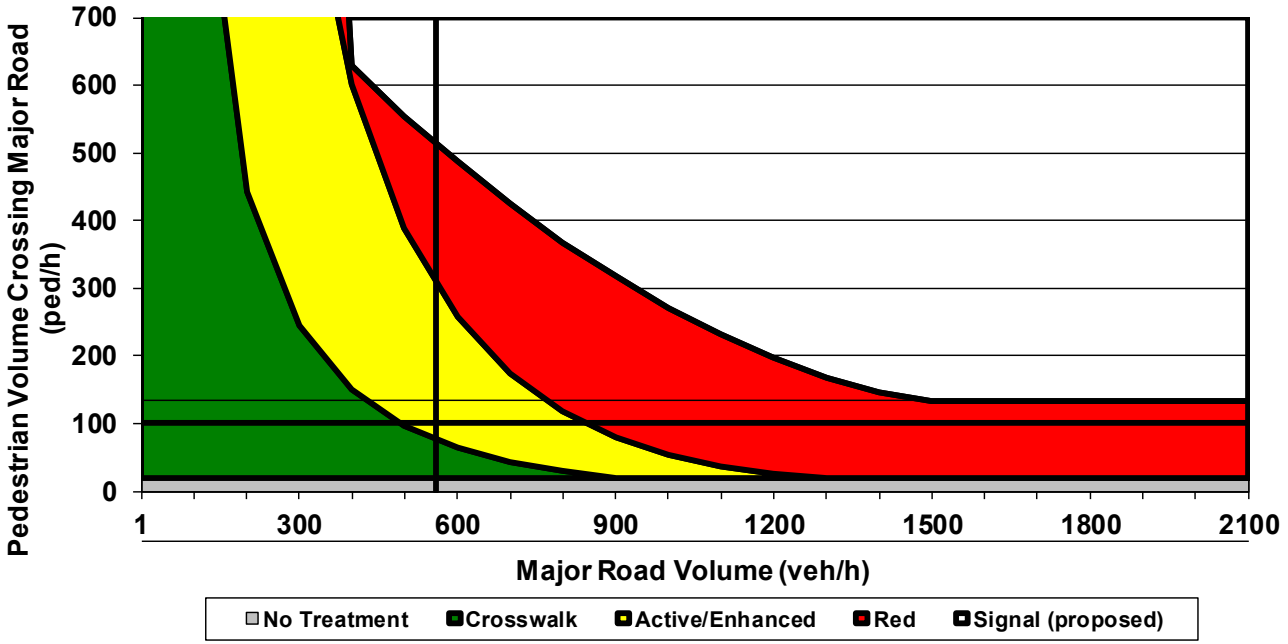
| **Step 1: Select worksheet:** | | |
|---|---|---|
| Posted or statutory speed limit (or 85th percentile speed) on the major street (mph) | *1a* | 25 |
| Is the population of the surrounding area <10,000? (enter ***YES*** or ***NO***) | *1b* | No |
| **Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?** | | |
| Peak-hour pedestrian volume (ped/h), $V_p$ | *2a* | 100 |
| **Result: Go to step 3.** | | |

# Developing the Engineering Tools

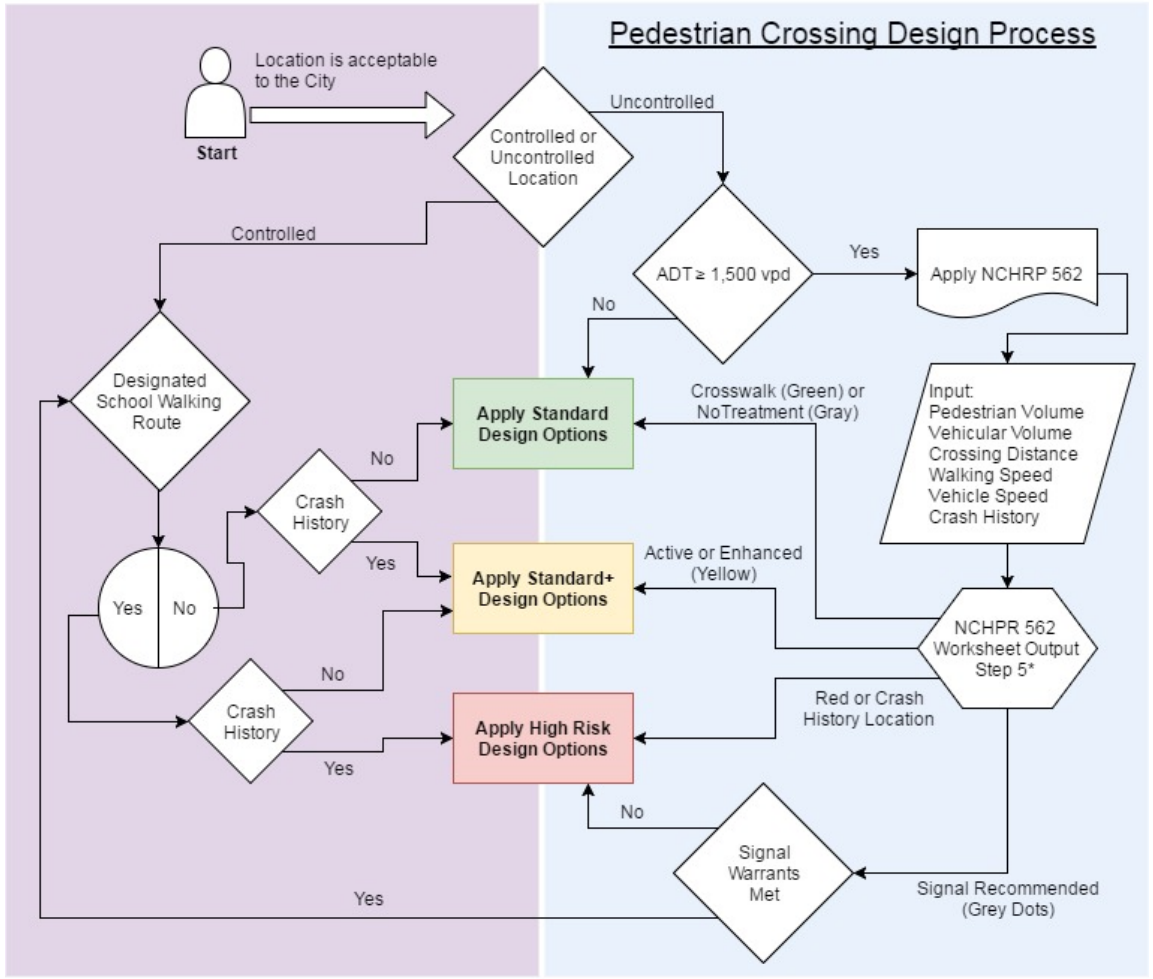
| **Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?** | | | |
|---|---|---|---|
| Major road volume, total of both approaches during peak hour (veh/h), $V_{maj-s}$ | | *3a* | 560 |
| [Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant | | *3b* | 514 |
| [Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant | | *3c* | 514 |
| Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter ***YES*** or ***NO***) | | *3d* | No |
| If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50%. | % rate of reduction for *3c* (up to 50%) | *3e* | |
| | Reduced value or *3c* | *3f* | 514 |
| **Result: The signal warrant is not met. Go to step 4.** | | | |
| **Step 4: Estimate pedestrian delay.** | | | |
| Pedestrian crossing distance, curb to curb (ft), L | | *4a* | 48 |
| Pedestrian walking speed (ft/s), $S_p$ (suggested speed = 3.5 ft/s) | | *4b* | 3.5 |
| Pedestrian start-up time and end clearance time (s), $t_s$ (suggested start-up time = 3 sec) | | *4c* | 3 |
| [Calculated automatically] Critical gap required for crossing pedestrian (s), $t_c$ | | *4d* | 17 |
| Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), $V_{maj-d}$ | | *4e* | 560 |
| Major road flow rate (veh/s), v | | *4f* | 0.16 |
| Average pedestrian delay (s/person), $d_p$ | | *4g* | 68 |
| Total pedestrian delay (h), $D_p$ The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h. | | *4h* | 1.9 |
| | | *4i* | |

# Developing the Engineering Tools

| Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance. | | |
|---|---|---|
| Expected motorist compliance at pedestrian crossings in region: enter ***HIGH for High Compliance*** or ***LOW for Low Compliance*** | *5a* | Low |
| **Treatment Category:** | **ACTIVE OR ENHANCED** | |



# Developing the Engineering Tools




*Uncontrolled locations that are on designated school walk routes are increased by one treatment level.

# Developing the Engineering Tools

| Street Type | Uncontrolled Design Options | | |
|---|---|---|---|
| | **Standard** | **Standard+** | **High Risk Location** |
| Local | Unmarked | Pavement Markings | High Visibility Markings |
| | | | Pedestrian Warning Series (W11-2) or |
| | | | School Warning Series (S1-1) |
| Collector | High Visibility Markings | Pedestrian Warning Series (W11-2) or | Bright Sides |
| | | School Warning Series (S1-1) | In-Lane Signs (R1-6a) |
| | | | Pedestrian Islands |
| | | | R1-6a Signs on Island |
| | | | Bump Outs |
| | | | Stop Here for Ped. (R1-5b) Signs w/ Stop Bar on Multilane Approach |
| Minor & Major Arterials ≤ 3 Lanes | High Visibility Markings | Pedestrian Warning Series (W11-2) or | Rectangular Rapid Flashing Beacon (RRFB) - Side Mounted |
| | | School Warning Series (S1-1) | Pedestrian Hybrid Beacon (PHB) |
| | | Bright Sides | Pedestrian Signal |
| | | In-Lane Signs (R1-6a) | |
| | | Pedestrian Islands | |
| | | R1-6a Signs on Island | |
| | | Bump Outs | |
| | | Stop Here for Ped. (R1-5b) Signs w/ Stop Bar on Multilane Approach | |
| Minor & Major Arterials ≥ 3 Lanes | High Visibility Markings | In-Lane Signs (R1-6a) | Rectangular Rapid Flashing Beacon |
| | Pedestrian Warning Series (W11-2) or | Pedestrian Islands | Pedestrian Hybrid Beacon (PHB) |
| | School Warning Series (S1-1) | R1-6a Signs on Island | Pedestrian Signal |
| | Bright Sides | Bump Outs | Overhead Mounted "Local Law, Stop for Ped" (R1-9a) |
| | Mid-block: Stop Here for Ped. (R1-5b) Signs w/ Stop Bar | Stop Here for Ped. (R1-5b) Signs w/ Stop Bar on Multilane Approach | |

# Where We Go From Here

- Finalizing the report documenting the process
- Developing graphic tools for the web site
- Working with other agencies in the county to develop design standards
- Incorporating into design standards

# Contact Information

**Cynthia Redinger, PE, PTOE**

**City of Ann Arbor Transportation Engineer**

(734) 794-6410, ext. 43632

CRedinger@a2gov.org