Uncontrolled Multi-Lane Crosswalks:
Hazards, Screening, and Prioritization

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Multiple Threat Crashes

Multiple Threat Crashes

- Pedestrians, too often, do NOT adequately check the next lane
- Usually the inner lane, but not always
- Most crosswalks are at intersections
  - State law prohibits passing another vehicle that is yielding to a pedestrian, but the pedestrian may not be visible
  - Stopping vehicles can be, and are, mistaken for turning vehicles
Markings Reduce Safety

"We need to reduce speeds"

"We need more education"

"We need more enforcement"

"We need narrower crossings"
Multiple Threat Crosswalk Analysis Tool (MTCAT)

The MTCAT spreadsheet makes it possible to calculate the maximum vehicle speed at which a driver is able to react and avoid colliding with a pedestrian who is crossing at a constant speed.

How Slow is Slow Enough?

- MTCAT spreadsheet uses a few basic assumptions:
  - Vehicles are box-shaped, and tall
    - Ignores rounded vehicle corners.
    - Assumes it’s not possible to see under or over.
    - BUT, many vehicles do fit this description.
  - The pedestrian crosses at a constant speed and does not check the adjacent lane for traffic.
  - Any crosswalk intrusion = presumed crash
How Slow is Slow Enough?

• MTCAT spreadsheet allows for numerous variables:
  – PIEV ("perception-reaction") time
  – Deceleration rate
  – Crosswalk user speed
  – Crosswalk width
  – Lane Width
  – Vehicle width
  – Advance stopping position
  – And more
Input Screen

Output Screen
The results are frightening

• Consider the following situation:
  – 12 ft lanes
  – 6 ft wide moving car, 6.5 ft stopped SUV
  – Stopped SUV is 5 ft from the crosswalk
  – Crosswalk is 6 ft wide
  – Pedestrian moving at 4.5 ft/s
  – Flat grade, locked-wheel braking (0.57G)
  – 2.5 second PIEV (Normal value = 2.5 sec)
  – A driver traveling at just 3 MPH will be unable to avoid hitting the pedestrian!

The results are frightening

• Urban example:
  – 10.5 ft lanes
  – 6 ft wide moving car, 8.5 ft stopped bus
  – Stopped bus is 8 ft from the crosswalk
  – Wider crosswalk – 8 ft wide
  – Slower pedestrian - 3.5 ft/s
  – Flat grade, locked-wheel braking (0.57G)
  – 1.0 second PIEV (Normal value = 2.5 sec)
  – A driver traveling at just 13 MPH will be unable to avoid hitting the pedestrian!
We need to ask…

Is it realistic to expect that we can condition drivers through education and/or enforcement to slow down enough every time that they pass a stopped vehicle?

To 13 mph?
To 3 mph?

Some Key Takeaways

• Reaction time has a large effect
• The stopping setback from the crosswalk has a large effect
• Pedestrian speed has a large effect
• Narrower lanes worsen this scenario
  – Creates a tighter sight triangle
  – Minimal effect on speeds
• Many such crossings are “induced”
Induced Crossings

The Agency Dilemma

- At intersections, the rules of right-of-way are the same, with or without markings.
- The multiple-threat crash can occur even without markings.
  - But markings DO influence crash rates.
  - Removing the markings should reduce crashes by about 75%
  - Leaving “as-is” is not a good strategy
  - Removing markings is better, still not good.
County-Wide Screening

- Washington County has 42 marked uncontrolled multi-lane crosswalks on our system
- All but 11 of these are on roundabout entries or exits (low speed + refuge)
- Crosswalk user counts not available
- Point system developed

County-Wide Screening

- Risk points assigned as follows:
  - Lane Points (per direction):
    - Turn lanes = 1 pt each (low speed & volume)
    - One thru lane = 2 pts
    - Plus 4 pts for each additional thru lane
      - Example: 3 thru lanes = 10 pts
  - Speed Points:
    - 15 mph = 0 pts
    - Add 1 pt for each 5 mph above 15 mph

- Volume Points assigned per approach using a formula (ADT² / 10⁷)
  - 3000 ADT = 0.9 pt
  - 6000 ADT = 3.6 pts
  - 9000 ADT = 8.1 pts
  - 12,000 ADT = 14.4 pts
  - 15,000 ADT = 22.5 pts

- Crosswalks with refuge islands are scored as two separate crosswalks
County-Wide Screening

Crosswalk Ranking System Points

- 2 SB thru lanes = 6 pts
- 15 mph = 0 pt
- 3500 ADT = 1.3 pts

TOTAL 7.3 pts
Low Concern
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<td>1 NB turn lane =</td>
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<td>40 mph =</td>
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<td>2800 ADT =</td>
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<td><strong>Low-Medium Concern</strong></td>
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|                       |       |       |
| 2 NB thru lanes =     | 6 pts |
| 1 SB thru lane =      | 2 pts |
| 1 SB turn lane =      | 1 pt  |
| 40 mph =              | 5 pts |
| 13,616 ADT =          | 9.3 pts |
| **TOTAL**             | 23.3 pts |
| **HIGH Concern**      |       |       |
Planned Improvements

Thank you!

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