Prioritizing Safety in Street Design

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MILONE & MACBROOM
**WHY SAFETY?**

**Traffic Death Rates by Country (OECD 2015)**

The U.S. has the highest traffic fatality rate among peer countries, nearly twice those of Australia and Canada, and three times those of European countries.

**Deadliest Year for Pedestrians and Cyclists in U.S. Since 1990**

On average, 17 pedestrians and two cyclists were killed each day in traffic crashes in 2015. Distracted drivers and bigger vehicles may be the culprits, experts say.
LITERATURE

DESIGNING ROADS THAT GUIDE DRIVERS TO CHOOSE SAFER SPEEDS

November 2009
John N. Ivan
Norman H. Garrett
Gilbert Benham

JRR 08-321  Project 04-6

A Practitioner's Handbook

Implementing Context Sensitive Design on Multimodal Thoroughfares

Global Designing Cities Initiative

Table 1. A model for setting credible speed limits in urban areas.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Threshold (mph)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2 or 3</td>
<td>2</td>
</tr>
<tr>
<td>Number of interchanges</td>
<td>4 or more</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>less than 20 or 1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>20 to 64</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>more than 64</td>
<td>0</td>
</tr>
<tr>
<td>Length of the homogeneous zone</td>
<td>less than 500 ft</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>500 to 1,500 ft</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>more than 1,500 ft</td>
<td>0</td>
</tr>
<tr>
<td>Percent of the street with on-street parking that is continuously occupied</td>
<td>under 5%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5% to 10%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>10% to 15%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>15% to 20%</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>20% to 25%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>25% or more</td>
<td>10</td>
</tr>
<tr>
<td>Percent width available</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1% to 3%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4% to 6%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>7% to 10%</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>more than 10%</td>
<td>8</td>
</tr>
</tbody>
</table>

The Advisory Council (IBAC) of the transportation and was performed through interviews.

We are responsible for the facts and accuracy of the information provided in all publications. The opinions, views, and policies of the authors do not necessarily reflect the official views or policies of the authors. This report does not have the status of a Transportation Planning Guide.

In the context of the design guidelines, the surface area becomes a critical parameter for effective pedestrian activity. In fact, shopping centers, parks, and big businesses are often seen as destinations. Usually, they have large parking lots with controlled access and limited parking for the general public. In addition, they discourage pedestrian activity by the opening speed of the streets.

The number of institutional services, parks, and residential areas in the vicinity serves as an important parameter. How we include public transportation, facilities such as parks and residential areas, and community facilities and community services in addition to generating large volumes of traffic, these facilities may satisfy the provision of sustainable road use.

We have observed that different streets tend to deteriorate quickly when approaching schools and colleges, even if their speed limits are generally lower than the permitted speed.

The occupancy rate of on-street parking in the urban area is a critical parameter. This rate indicates the percentage of a street with on-street parking that is continuously occupied. On certain spaces, on-street parking is not allowed. But these spaces are insufficient to establish an appropriate speed limit. In
#1 GOAL: REIN-IN SPEEDING THROUGH DESIGN

**HIGHER SPEED CRASH = WORSE OUTCOME**

Relationship between Speed and Risk of Fatal Injury – vehicle vs. pedestrian

Source: [https://www.propublica.org/article/unsafe-at-many-speeds](https://www.propublica.org/article/unsafe-at-many-speeds)
#1 GOAL: REIN-IN SPEEDING THROUGH DESIGN

- PEDESTRIAN FATALITY & SERIOUS INJURY RISK

- 18%
- 50%
- 77%

Motorists traveling at lower speeds are less likely to contribute to pedestrian fatalities and serious injuries. Credit: FHWA’s Achieving Multimodal Networks

FHWA (data from 2011 AAA Foundation study)
Not only are crashes less deadly when speeds are slower, crashes can also be less likely given that slower speeds require shorter stopping distances.

Source: Implementing Context Sensitive Design on Multimodal Thoroughfares (ITE & CNU) environment.transportation.org/pdf/context_sens_sol/ir-145-e.pdf
How To Reduce Vehicle Speeds Through Design:

• Minimize Lane Widths

• Reduce the Number of Lanes

• Roadside Elements
  (on-street parking, small building setbacks, street trees, etc.)

• Physical Traffic Calming
  (speed humps, raised intersections, median islands, roundabouts, etc.)

Goal is to have streets designed such that they cue/prompt motorists to drive with the feeling that they may need to slow or stop at a moments notice.
MINIMIZE HOW WIDE VEHICLE LANES ARE

Relationship Between Lane Width and Vehicle Speed

"As the width of the lane increased, the speed on the roadway increased... When lane widths are 1 m (3.3 ft) greater, speeds are predicted to be 15 km/h (9.4 mph) faster."


https://nacto.org/publication/urban-street-design-guide/street-design-elements/lane-width/
REDUCE THE NUMBER OF LANES

In order to reduce the possibility of the Multiple-Threat Crash

Example of a Multiple-Threat Collision

https://www.fhwa.dot.gov/publications/research/safety/04100/03.cfm
REDUCE THE NUMBER OF LANES

Allows for the reallocation of space for other users of the street
(the road diet)

[Diagram showing existing and redesign layouts]

https://nacto.org/publication/urban-street-design-guide/intersections/major-intersections/
ROADSIDE ELEMENTS CAN HELP AS WELL

Which street do you think people drive slower on?

Where x% of people look within the first few seconds

Zoning, regulations, architecture, and so on can help set the tone for how fast or slow people drive based on things like smaller building setbacks and active building frontages.

https://geneticsofdesign.com/2019/08/05/your-brain-on-streets-the-secret-revealed-how-car-centric-development-keeps-you-off-your-feet/amp/
PHYSICAL TRAFFIC CALMING EXAMPLES

Raised Intersection
*(Vertical Deflection Speed Control)*

Roundabout
*(Horizontal Deflection Speed Control)*
FEDERAL GUIDANCE BY-AND-LARGE AGREES

Office of Safety
Proven Safety Countermeasures

- Roadside Design Improvement at Curves
- Reduced Left-Turn Conflict Intersections
- Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections
- Leading Pedestrian Interval
- Local Road Safety Plan
- USLIMITS2
- Enhanced Delineation and Friction for Horizontal Curves
- Longitudinal Rumble Strips and Stripes on Two-Lane Roads
- Median Barrier
- Safety Edge™
- Backplates with Retroreflective Borders
- Corridor Access Management
- Dedicated Left- and Right-Turn Lanes at Intersections
- Roundabouts
- Yellow Change Intervals
- Medians and Pedestrian Crossing Islands in Urban and Suburban Areas
- Pedestrian Hybrid Beacon
- Road Diet
- Walkways
- Road Safety Audit
IT DOESN’T HURT TO LOOK AT GUIDANCE FROM OVERSEAS EITHER

4.1.2 Self-Regulating Streets

An appropriate design response can successfully balance the functional needs of different users, enhance the sense of place and manage speed in a manner that does not rely on extensive regulatory controls and physically intrusive measures for enforcement. In short, place can be used to manage movement. Such environments are referred to as being self-regulating. Within this self-regulating street environment, the design response is closely aligned with the design speed (see Figure 4.3).

There is no set formula of how a package of psychological and physical measures should be applied. The design team must take into account that:

- Physical and psychological measures are most effective when used in combination.
- The more frequently and intensely physical and psychological measures are applied, the lower the operating speed.
DOWNTOWN NEW LONDON REDESIGN EXAMPLE
DOWNTOWN NEW LONDON

Bank Street - BEFORE
DOWNTOWN NEW LONDON

VISION
ROAD DIET
Bank Street - AFTER

Afternoon traffic negotiates the new one-lane traffic pattern on Bank Street in New London Thursday, July 27, 2017. (Tim Cook/The Day)
DOWNTOWN NEW LONDON

THE RESULT: 74% Reduction in Crashes

Downtown New London Transportation and Parking Study

1-LANE BANK STREET ROAD DIET
Taking Into Account REROUTING That Will Likely Occur was an Important Part of the Study

Some motorists will drive a different route in the future to avoid what they personally deem as too much congestion, especially motorists who are only driving through, know the area, and if there is a street network.
If we don’t take into account rerouting (or mode shifts) that could occur, the traffic study may give you overly-alarming results in terms of congestion.

**Nonetheless, DON’T LET ‘BAD’ VEHICLE LEVEL OF SERVICE (LOS) GET IN THE WAY OF A STREET SAFETY REDESIGN**

*WE HAVE TO PRIORITIZE SAFETY OVER VEHICLE THROUGHPUT*
AND ‘BAD’ VEHICLE LOS IS IN THE EYE OF THE BEHOLDER

What’s important depends upon perspective

Traffic engineer: F A
Economist: A F

What we don’t want is to end up creating a ghost town as a result of our battles to solve traffic.
SOUTHBURY AND WATERTOWN MAIN STREET REDESIGN EXAMPLES
SOUTHBURY – MAIN STREET SOUTH REDESIGN EXAMPLE

Install pedestrian crossing signs at corner and median

Install staggered (Z-crossing) mid-block crosswalk at median

Install Rectangular Rapid Flashing Beacon (RRFB) and pedestrian crossing signs on median

Install (low-height) landscaped raised median

Remove unnecessary left turn lane(s) to minimize conflicts at unsignalized crosswalks

Extend concrete sidewalk and install ADA compliant curb ramp

Install ADA compliant curb ramps

Extend curb and sidewalk

Consider installing raised/level sidewalks across driveways to eliminate the up/down pedestrian travel

Install (low-height) landscaped raised median

Install sidewalk

Install high visibility dashed bike lane through the intersection

Consider installing raised/level sidewalks across driveways to eliminate the up/down pedestrian travel
SOUTH BURY – MAIN STREET SOUTH REDESIGN EXAMPLE
WATERTOWN – MAIN STREET REDESIGN EXAMPLE
WATERTOWN – MAIN STREET REDESIGN EXAMPLE

- Install concrete sidewalk abutting the stone wall
- Install flush corner bulbout
- Install supplemental pedestrian-scale lighting downtown
- Install flush bulbouts
- Install raised traffic calming median with RRFB
- Install yield lines and unsignalized pedestrian crosswalk signs per MUTCD
- The conversion of Heminway Park Rd to one-way eastbound will be analyzed after peak hour vehicle counts are conducted
WATERTOWN – MAIN STREET REDESIGN EXAMPLE

- Install concrete sidewalk abutting the stone wall
- Install raised bulbouts with RRFBs
- Install flush corner bulbout
- Install supplemental pedestrian-scale lighting downtown
- Install flush traffic calming median
- Install yield lines and unsignalized pedestrian crosswalk signs per MUTCD

The conversion of Heminway Park Rd to one-way eastbound will be analyzed after peak hour vehicle counts are conducted.
CHURCH STREET
quickly
CHURCH STREET REIMAGINED
(POSSIBLE INTERIM MEASURE UNTIL CONVERTED TO TWO-WAY)
All this will also help nudge mode shifts to more sustainable forms of transportation – which is needed to reduce pollution and emissions, and address climate change.
SUMMARY

Ways to Improve Traffic Safety Through Design:

• Minimize Lane Widths
• Reduce the Number of Vehicle Lanes
• Plan/Design a Better Surrounding Built-Environment
• Physically Calm Traffic
• Reduce/Eliminate Potential for Multi-Threat Crashes
• Prioritize Safety over vehicular LOS

(and realize that traffic will reroute if the street network is there, and that some motorists will switch modes if they have good multimodal options)
MINIMIZE HOW WIDE VEHICLE LANES ARE

Slows speeds and gives the potential for more separation from other street users.

**Standard Configuration: 12’-6’**

**8’ Buffered Bike Lane: 10’-8’**

Source: Roger Geller presentation to Bike Walk Connecticut – April 23, 2015