Balancing Operation & Safety for Motorized and Non-Motorized Traffic

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Iowa Director - MOVITE

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LEARNING OBJECTIVES:

When & Why should we measure the performance of complete streets?
Balance between all modes
Funding / Competitive Scoring

How can we measure the performance of complete streets?
2010 Highway Capacity Analysis
Traffic Simulation Software
Specific Case Studies
Complete streets are living streets as implemented in North America, which are designed and operated to enable safe, attractive, and comfortable access and travel for all users, including pedestrians, bicyclists, motorists and public transport users of all ages and abilities. (Wikipedia)
Value of modeling complete streets

Rural / Suburban Areas

- Very vehicle trip dependent
- Bus Rapid Transit
- Off-Street Paths

Urban / Campus Settings

- Significant Ped / Bike / Transit Demand
- Land Use Driven
- Affect mode choice with design

Measures of Effectiveness:

- Delay & Level of Service of all modes
- Impact of mode interaction
- Queuing / Access Management
- Emissions Reduction
**Funding / Competitive Scoring**

**Surface Trans Funding**
- Level of Service
- Traffic Volumes
- Vehicle Hours of Travel Reductions
- Crash Rates, B/C ratios
- Surface Conditions
- Geometric Improvements
- Facility Continuity
- Improving trips for workers/shoppers
- Freight Connectivity
- Connectivity to Public Places/Services
- Lane Modifications
- Environmental Considerations
- Sustainability Components

**Multi-modal**
- Sidewalks, Ped/Bike Signals, ADA, buffers between vehicles, pavement markings, signage, bike lanes, dedicated paths

**Transportation Alternatives**
- **Multi-modal** considerations in STP
- Local / Regional transportation plans
- Public Involvement / Support
- Overall community support
- Intermodal connectivity
- Multi-purpose facilities
- Impact to Tourism / Economic Development
- Relationship to surface transportation

**Example – Iowa City, Iowa**

STP – Up to 5 points for Multi-Modal

**Complete Streets Policy** states that every F.A. project MUST include ped and bike accommodations unless:

1. Not legal (i.e. Interstate)
2. > 20% of project cost
What can we measure?

**Vehicle / Pedestrian / Bicyclist Interaction**

Bike Lanes  
Raised Crosswalks  
Hybrid Pedestrian Signals

**Traffic Calming**

Speed Humps / Tables  
Roundabouts  
Narrower Lanes  
Curb Extensions  
Speed Feedback Signs  
Road Diets  
Crosswalk Refuge
**HOW** can we measure the performance of complete streets?

**Pedestrian & Bicycle Mode**
Motorized Vehicle, Bicycle, Pedestrian Flow Rates
Occupied On-Street Parking
Street width (lanes / bike lanes / shoulders)
Walkway (crosswalk width/length / sidewalk width / corner radius)
Signal phasing (motorized & pedestrian)

More…

Table 4: Pedestrian Mode LOS Criteria (Exhibit 18-5 in HCM2010)

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>LOS Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≤ 2.00</td>
</tr>
<tr>
<td>B</td>
<td>&gt; 2.00 – 2.75</td>
</tr>
<tr>
<td>C</td>
<td>&gt; 2.75 – 3.50</td>
</tr>
<tr>
<td>D</td>
<td>&gt; 3.50 – 4.25</td>
</tr>
<tr>
<td>E</td>
<td>&gt; 4.25 – 5.00</td>
</tr>
<tr>
<td>F</td>
<td>&gt; 5.00</td>
</tr>
</tbody>
</table>

Table 3: Description of Pedestrian Space (Exhibit 18-24 in HCM2010)

<table>
<thead>
<tr>
<th>Pedestrian Space (ft² / p)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 60</td>
<td>Ability to move in desired path, no need to alter movements</td>
</tr>
<tr>
<td>&gt; 40 – 60</td>
<td>Occasional need to adjust path to avoid conflicts</td>
</tr>
<tr>
<td>&gt; 24 – 40</td>
<td>Frequent need to adjust path to avoid conflicts</td>
</tr>
<tr>
<td>&gt; 15 – 24</td>
<td>Speed and ability to pass slower pedestrians restricted</td>
</tr>
<tr>
<td>&gt; 8 – 15</td>
<td>Speed restricted, very limited ability to pass slower pedestrians</td>
</tr>
<tr>
<td>≤ 8</td>
<td>Speed severely restricted, frequent contact with other users</td>
</tr>
</tbody>
</table>

**Pedestrian Performance Measures**
Corner Circulation Area
Crosswalk Circulation Area
Pedestrian Delay
Pedestrian LOS score
**HOW** can we measure the performance of complete streets?

Microscopic simulation/animation of traffic

Cars/trucks/mopeds/pedestrians/bikes/transit/Eggasus?

3-D Visualization

Measurements based on the traffic mix interaction

- Delay / Queuing
- Traffic Speed (Arterial Speeds)
- Transit Route Implications (TSP modeling)
The Issues
25 MPH Posted Speeds
ADT – Riverside Drive 6k / River Street 3k
>200 pedestrians cross raised crosswalk during peak hours (class change)
NB movement is free @ River Street
175’ between intersections
Riverside Drive Raised Crosswalk

Conclusions

Proposed Entrance / Raised Crosswalk combination will cause more congestion to vehicular traffic, but is acceptable due to increased pedestrian safety provided by raised crosswalk.

Table 5: Queue Lengths

<table>
<thead>
<tr>
<th>Movement</th>
<th>Existing</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td><strong>Riverside Drive &amp; River Street</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB Through/Left</td>
<td>65'</td>
<td>55'</td>
</tr>
<tr>
<td>SB Through/Right</td>
<td>120'</td>
<td>125'</td>
</tr>
<tr>
<td>EB Left/Right</td>
<td>55'</td>
<td>95'</td>
</tr>
<tr>
<td><strong>Lot 42 Entrance &amp; Riverside Drive</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB Through/Left</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>SB Through/Right</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>EB Left/Right</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Burlington Street / Madison Street
Burlington Street / Madison Street

The Issues
25 MPH Posted Speeds
ADT – Burlington Street 25k / Madison Street 7k
>300 pedestrians cross Burlington Street during PM Peak Hour (commuter)
N/S permitted only left turn phasing
Significant NB queuing during PM Peak
No pedestrian crashes recorded
Conclusions

Several alternatives were tested and Alternative 3 (modified signal timings) was recommended to maintain a safe and efficient pedestrian crossing and to help reduce the congestion for northbound left turning traffic.
Burlington Street / Madison Street

3-D representation of analysis
Burlington Street / Clinton Street
The Issues

25 MPH Posted Speeds
ADT on Burlington Street 25k
ADT on Clinton Street 2k-9k

>500 pedestrians cross intersection during peak hours

N/S left turn lane alignment issues

Heavy traffic congestion on Burlington Street

Clinton Street is being developed as bicycle corridor

Needs to tie into downtown streetscape plans

Consideration of future development
Concept Plan to Address Left Turn Lane Issues
Clinton Street section looking north

Context Map

CLINTON STREET PLAN
Conclusions

Several mode split scenarios were tested as well as lane configurations to include bike lanes consistent with proposed Clinton Street north of Burlington Street. Determined traffic signal timing plans to maintain ped / bike Level of Service but also considered queuing/delay of vehicle traffic.
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