Highway Capacity Software

Developed and maintained by McTrans

- Originally founded by the FHWA in 1986 as the Center for Microcomputers in Transportation (McTrans)

- Now a full-service software support center, associated with the University of Florida

HCS 2010

- HCS 2010 implements the procedures defined in the Highway Capacity Manual (HCM) 2010 published by the Transportation Research Board (TRB)

- This release includes the new Streets module that combines the Signalized Intersections with the Urban Streets Segments, Facilities and Multimodal procedures.
Fourteen Modules

Intersection Module
- Streets
- TRANSYT-7F
- TWSC
- AWSC
- Roundabouts
- Warrants
- DAIITA

Highway Module
- Facilities
- Freeways
- Weaving
- Ramps
- Multilane
- TwoLane
- LOSPLAN

2010 Demonstration
Street Module

Signalized Intersections

- Signal analysis
- Interchange analysis
- Multimodal analysis
- LOS
Signalized intersections

- Traffic Conditions
  - Approach volumes (left, through, right)
  - Vehicle type (heavy vehicle, bicycles)
  - Pedestrian movement
Signalized intersections

- Roadway Conditions
  - Number and width of lanes
  - Grades
  - Lane use

- Traffic Signal Characteristics
  - Signal phasing
  - Signal timing
  - Type of control (Actuated/pre-timed)
  - Signal progression (un/co-ordinated)
Signalized intersections

- Total delay:
  - Difference between actual travel time and ideal travel time
    - In the absence of traffic control, delay due to roadway geometries, incidents and when there are no vehicles on the road
  - In HCS control delay is quantified
    - initial deceleration delay
    - Queue move-up time
    - Stopped delay
    - Final acceleration delay
Level of Service (LOS)

- LOS criteria are stated in terms of average control delay per vehicle
  - Delay on signal control depends on
    - Quality of progression
    - Cycle length
    - Green ratio
    - V/c ratio for lane group
    - ICU (Intersection Capacity Utilization)
- Designated by letters A - F
# Level of Service (LOS)

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Control Delay per Vehicle (Sec/Vehicles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>( \leq 10 )</td>
</tr>
<tr>
<td>B</td>
<td>( &gt;10 ) and ( \leq 20 )</td>
</tr>
<tr>
<td>C</td>
<td>( &gt;20 ) and ( \leq 35 )</td>
</tr>
<tr>
<td>D</td>
<td>( &gt;35 ) and ( \leq 55 )</td>
</tr>
<tr>
<td>E</td>
<td>( &gt;55 ) and ( \leq 80 )</td>
</tr>
<tr>
<td>F</td>
<td>( &gt;80 )</td>
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</table>

<table>
<thead>
<tr>
<th>ICU</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 55%</td>
<td>A</td>
</tr>
<tr>
<td>&gt;55% to 64%</td>
<td>B</td>
</tr>
<tr>
<td>&gt;64% to 73%</td>
<td>C</td>
</tr>
<tr>
<td>&gt;73% to 82%</td>
<td>D</td>
</tr>
<tr>
<td>&gt;82% to 91%</td>
<td>E</td>
</tr>
<tr>
<td>&gt;91% to 100%</td>
<td>F</td>
</tr>
<tr>
<td>&gt;100% to 109%</td>
<td>G</td>
</tr>
<tr>
<td>&gt;109%</td>
<td>H</td>
</tr>
</tbody>
</table>

Source: Highway Capacity Manual 2010
Operational Analysis Procedure

1. INPUT
   - Roadway conditions
   - Traffic conditions
   - Signalization conditions

2. VOLUME ADJUSTMENT
   - Peak hour factor
   - Establish lane groups
   - Assign volumes to lane groups

3. SATURATION FLOW RATE
   - Ideal saturation flow rate
   - Adjustments

4. CAPACITY ANALYSIS MODULE
   - Compute lane group capacities
   - Compute lane group v/c ratios
   - Aggregate results

5. LEVEL OF SERVICE MODULE
   - Compute lane group delays
   - Aggregate delays
   - Determine levels of service
Getting Started:

1. Open HCS 2010
2. Select the Streets *(handles signals and signalized corridors)*
Getting Started:

3. Complete The Quick Start Screen
4. Enter Information in the **General** Section
5. Enter Lane Configuration
6. Enter **Traffic** Data

![Traffic Data Table](image-url)
7. Enter **Phasing** data
Quick Exercise on Phase Diagram
8. Enter **Timing**

<table>
<thead>
<tr>
<th>Timing</th>
<th>EBL</th>
<th>EBT</th>
<th>WBL</th>
<th>WBT</th>
<th>NBL</th>
<th>NBT</th>
<th>SBL</th>
<th>SBT</th>
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<td>40.0</td>
<td>0.0</td>
<td>45.0</td>
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<td>4.0</td>
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<td>1.0</td>
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<td>Lag Phase</td>
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<td>Mir</td>
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<td>Dual Entry</td>
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<tr>
<td>Dallas Phasing</td>
<td>E/W</td>
<td>N/S</td>
<td>Simultaneous Gap</td>
<td>E/W</td>
<td>N/S</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Graphical Representation**

- **Green**:
  - 40.0
  - 0.0
  - 0.0
  - 0.0
- **Yellow**:
  - 4.0
  - 4.0
  - 4.0
  - 0.0
- **Red**:
  - 1.0
  - 1.0
  - 1.0
  - 0.0
9. Enter the **Detailed** Data
10. Run **Full Optimization**
11. **Optimization** Results

![Optimization Status](image)

**Overall Delay**
- Original: 263.7 sec/veh
- Optimum: 169.1 sec/veh
- Average: 175.0 sec/veh
- Improvement: 35.9%

**Run Status**
- Generation Number: 200 out of 200
- Generation Optimum: 101
- Total Time Elapsed: 43 sec
- Termination via max number of generations

**Diagnostic Messages**
No messages to report at this time.
12. View/Print **Results** Summary Report
13. View Messages Report

- Look for any warnings

--- Messages ---

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

--- Comments ---
Some More Examples