Lecture 7
(Handouts)

Special Issues on Signal Coordination
Signal Timing with Large Systems

- Difficult to obtain high bandwidth efficiency with a large number of signals in a system.
- Only a small portion of the traffic goes through the entire arterial.
- Seeking a system progression band with low efficiency may not be a good signal timing strategy.
System Partition Technique

- **Step 1.** Divide the system into sub-systems (3~5 signals)
  - Divide at locations of capacity bottleneck and large spacing

- **Step 2.** Obtain maximum bandwidth solution for each subsystem

- **Step 3.** Form the peak direction progression band
  - Adjust offsets to achieve an one-direction bandwidth (peak)
  - Subsystem progression is retained for the other direction

- **Step 4.** Fine tune the solution
  - Possible signal phasing change to improve the off-peak direction progression band;
  - Cross street with split phasing should be set at a sequence favoring progression of the left turns.
Speed Comparison – Arterial All Vehicles

Northbound

Southbound

System

Travel Speed, km/h

PASSER II  Pro1  Pro2
Speed Comparison – Through Vehicles

<table>
<thead>
<tr>
<th></th>
<th>PASSER II</th>
<th>Pro1</th>
<th>Pro2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound</td>
<td>45.8</td>
<td>50.1</td>
<td>53.3</td>
</tr>
<tr>
<td>Southbound</td>
<td>48.9</td>
<td>47.7</td>
<td>55.7</td>
</tr>
<tr>
<td>System</td>
<td>47.3</td>
<td>48.9</td>
<td>54.5</td>
</tr>
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Travel Speed, km/h
Advantages

- **Maintain maximum progression for the peak direction.**
  - The one directional progression band for the peak direction is the maximum that can be achieved from any optimization solutions.

- **Maintain maximum progression for the subsystems.**
  - Subsystems have larger bandwidths on both directions.

- **More control and handle on queue and stops**
  - Progression on the off-peak direction is partially maintained. But the users have complete control on where to stop vehicles and store queues.
Pedestrian Timing Treatment

- Pedestrian crossing times are handled by concurrent vehicle through phases
- Green time of vehicle phase must satisfy the WALK + FDW
- Vehicle demands are low at minor streets, but pedestrian crossing times are high (wide street)
- Split phasing presents more challenges
- Two timing treatments
  - Vehicle minimum
  - Pedestrian minimum
Pedestrian Timing Treatment

Left Turn Leading

Lead/Lag

Time
Pedestrian with Split Phasing
Advantages/Disadvantages

<table>
<thead>
<tr>
<th>Vehicle Minimum</th>
<th>Pedestrian Minimum</th>
</tr>
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<tbody>
<tr>
<td>➢ Optimal Cycle Length</td>
<td>➢ Cycle Length Constraint</td>
</tr>
<tr>
<td>➢ <strong>Signal Out-of-Coordination</strong></td>
<td>➢ <strong>Remain Coordination</strong></td>
</tr>
<tr>
<td>➢ Timing Plan Reflects Actual Progression</td>
<td>➢ Progression According to Early Release</td>
</tr>
<tr>
<td>➢ Easy Timing Plan Development</td>
<td>➢ Major Manual Adjustments</td>
</tr>
</tbody>
</table>
IDENTIFY EARLY RELEASE POINT
EFFECTIVE USE OF PHASING SCHEME

<table>
<thead>
<tr>
<th>Movement</th>
<th>Average Demand, sec</th>
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<tbody>
<tr>
<td>Southbound Left Turn</td>
<td>10</td>
</tr>
<tr>
<td>Southbound Through</td>
<td>15</td>
</tr>
<tr>
<td>Northbound Left Turn</td>
<td>20</td>
</tr>
<tr>
<td>Northbound Through</td>
<td>20</td>
</tr>
<tr>
<td>Pedestrian Crossing</td>
<td>35</td>
</tr>
</tbody>
</table>

Total = 55 (A)

Total = 45 (B)