HCM 6 (2020 update) – Signalized Intersections

Concepts (Chapter 19, Section 2)

- Traffic signal concepts
  - Types of traffic signal control
  - Intersection traffic movements
  - Signal phase sequence
  - Operational modes
  - Left turn phase sequence
  - Traffic flow characteristics
  - Phase duration
- Analysis type
- Spatial and temporal boundaries
- LOS criteria

Core Motorized Vehicle Methodology (Chapter 19, Section 3)

- Scope of methodology
- Required data and sources [Exhibits 19-11, 19-12]

Step 1. Determine movement groups and lane groups

- Determine movement groups
- Determine lane groups

Step 2. Determine movement group flow rate

Step 3. Determine lane group flow rate

- [Basic procedure]
- [Chapter 31, Section 2, Lane group flow rate on multi-lane approaches]

Step 4. Determine adjusted saturation flow rate

- Base saturation flow rate
- [Field measurement of saturation flow rate, Chapter 31, Section 6]
- [Equation 19-8]
- Adjustment for lane width [Exhibit 19-20]
- Adjustment for heavy vehicles and grade [Equation 19-9, Equation 19-10]
- Adjustment for parking [Equation 19-11]
- Adjustment for bus blockage [Equation 19-12]
- Adjustment for area type
- Adjustment for lane utilization
- Adjustment for right turns [Equation 19-13]
- Adjustment for left turns [Equation 19-14]
- Adjustment for pedestrians and bicycles [Chapter 31, Section 2]
- Adjustment for work zone presence [Chapter 31, Section 2]
- Adjustment for downstream lane blockage [Chapter 30, Section 3]
- Adjustment for sustained spillback [Chapter 29, Section 3]

Step 5. Determine proportion arriving during green

- [Equation 19-15]
- [Chapter 30, Section 3: projected arrival flow profile]

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Step 6. Determine signal phase duration
- [Pretimed method, Chapter 31, Section x]
- [Actuated control method, Chapter 31, Section 2]

Step 7. Determine capacity and volume-to-capacity ratio
- [Capacity equation 19-16]
- [X equation 19-17]

Step 8. Determine delay
- [Three term delay equation: Equation 19-18]
- [Field measurement of intersection control delay: Chapter 31, Section 6]
- [Queue accumulation polygon, Chapter 31, Section 3]
- Compute uniform delay [Equation 19-19]
- [Chapter 19, Section 4: Extensions to Motorized Vehicle Methodology]
- Compute initial queue delay
- Compute incremental delay factor [Equation 19-22]
- Compute incremental delay [Equation 19-26]
- Compute lane group control delay
- Compute aggregated delay estimates [Equation 19-28, Equation 19-29]

Step 9. Determine LOS [Exhibit 19-8]

Step 10. Determine queue storage ratio
- [Chapter 31, Section 4]

Extensions to motorized vehicle methodology (Chapter 19, Section 4)
- Critical intersection volume-to-capacity ratio [Equation 19-30]
- Uniform delay calculation using QAP
- Initial queue delay calculation

Planning Level Analysis (Chapter 31, Section 5)
- Overview of the application
- Required data and sources
- Methodology
- Worksheets

Queue Accumulation Polygon (Chapter 31, Section 3)
- Concepts
- General QAP construction procedure
- QAP construction procedure for selected lane groups
    - Step 1. Determine permitted green time
    - Step 2. Determine time before first left turn vehicle arrives
    - Step 3. Determine permitted left turn saturation flow rate
    - Step 4. Determine through-car equivalent
    - Step 5. Determine proportion of turns in a shared lane
    - Step 6. Determine lane group saturation flow rate
    - Step 7. Define QAP

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Queue Storage Ratio (Chapter 31, Section 4)

- Concepts
- Procedure for estimating back of queue for selected lane groups