CE 452

Determination of Roadway Capacity

Objective

1. Determine volume from classified vehicle count

2. Calculate Speed

3. Calculate capacity of a roadway depending on **roadway and traffic characteristics**

Standard

- **Highway capacity manual** by Transportation research board of the national academy of sciences in the USA

- Provides procedure for computing capacity of various **highway** capacity including
  - Freeways
  - Highways
  - Arterial roads
  - Roundabouts
  - Signalized and unsignalized intersections
  - **Rural highways**

Volume/Flow

- Definition: Number of vehicles that can pass a given cross-section of a roadway per unit of time

- Unit: Passenger vehicle per hour
  - Other options:
    - passenger vehicle per hour per lane
    - Passenger vehicle per hour per direction
    - Passenger vehicle per hour per lane per direction

- What about other types of vehicles crossing the roadway?
  - Need to convert to passenger vehicle using appropriate factor

Vehicle Conversion Factor

Type of Vehicle	Passenger Car Equivalence (PCE)
Passenger car	1.0
Auto rickshaw (e. g. CNG, scooter, tempo)	1.5 (some place assume 1)
Cycle	0.5
Bus, Truck	3.0
Motorcycle	0.75
Cycle Rickshaw	2.0

Determine volume from 15-minutes count

Vehicle type	Count
Car	15
CNG	25
Bus	7
Cycle	5
Total	52

Determine volume from 15-minutes count

Vehicle type	Count	PCE	Vehicle (PCU)
Car	15	1	15 x 1 = 15
CNG	25	1.5	25 x 1.5 = 37.5
Bus	7	3	7 x 3 = 21
Cycle	5	0.5	5 x 0.5 = 2.5
Total	52	---	76

Determine volume from 15-minutes count

Vehicle type	Count	PCE	Vehicle (PCU)
Car	15	1	15
CNG	25	1.5	37.5
Bus	7	3	21
Cycle	5	0.5	2.5
Total	52	---	76

Volume = 76 * 4 = 304 PCU per hour

We are using factor 4 to convert 15- minutes count to the hourly count

Speed

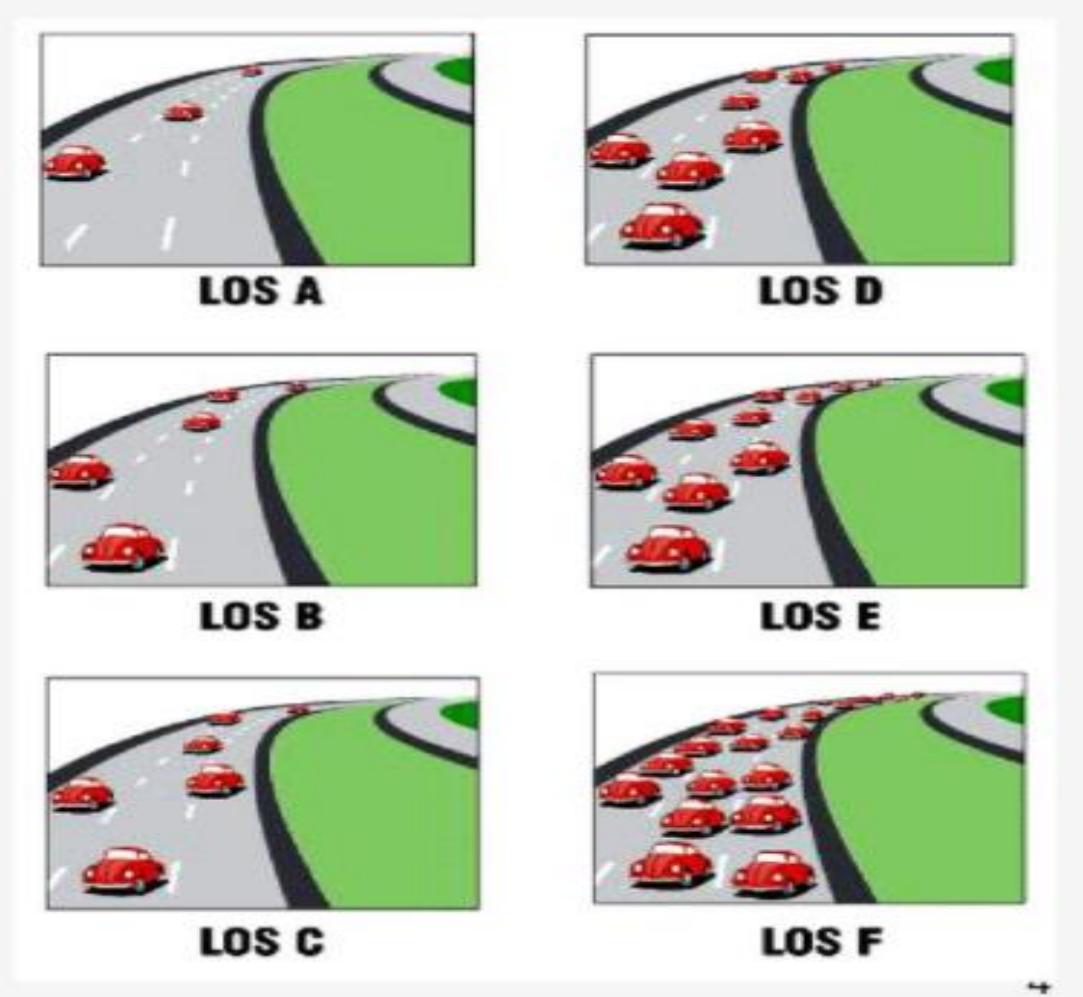
- Spot speed: Instantaneous speed of a vehicle
  - Calculated using time required to pass a short distance

- Measurement
  - Measure the time requires to pass a short distance using stop watch, or
  - Use radar gun

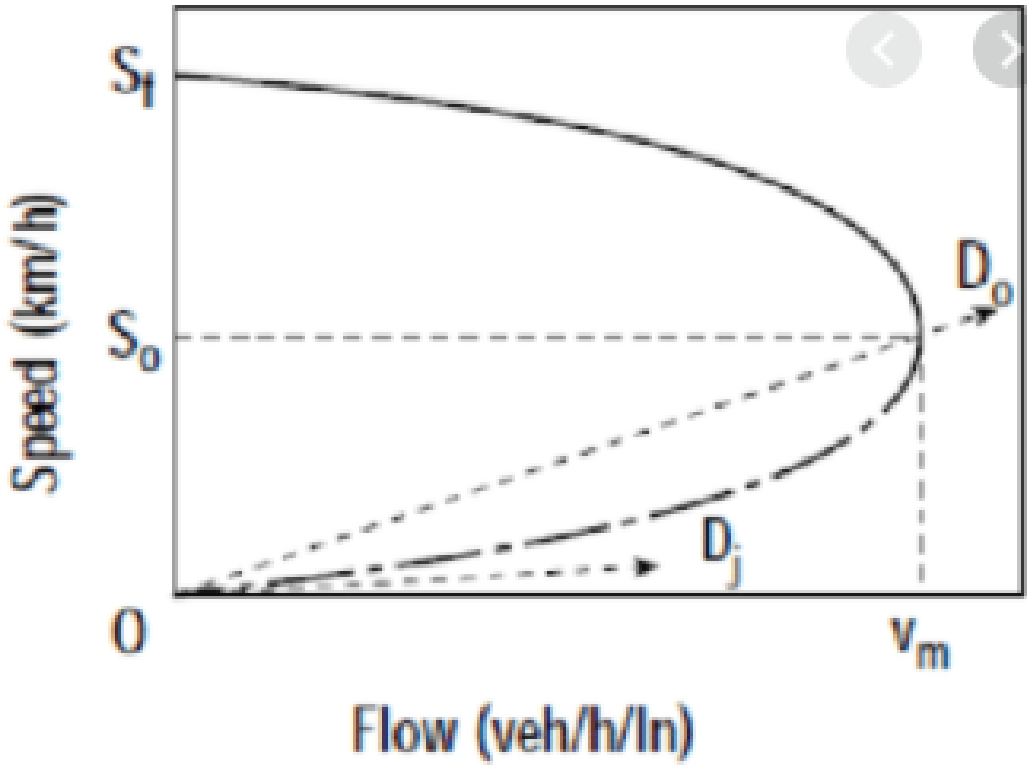




Speed-flow relation: Level of Service (LOS)



- Speed decreases as flow increases



Capacity

- Capacity is measured by the roadway's ability to accommodate traffic at a given speed
  - Unit same as volume
- Capacity is usually specified during the design of the road
- Depends on **the geometry** and the **level of service** you want to provide
- Typical capacities given in Table 1 of the manual (Page 55 of PDF)

Effect of LOS on Capacity

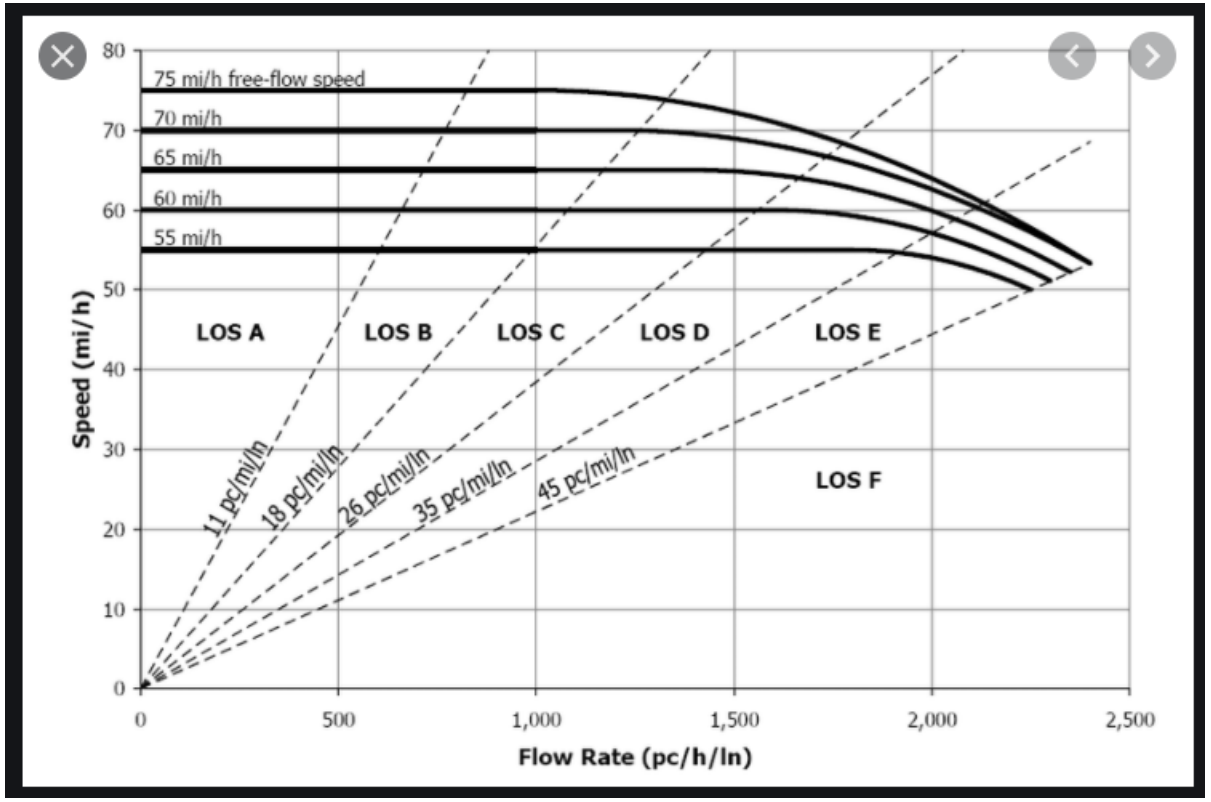
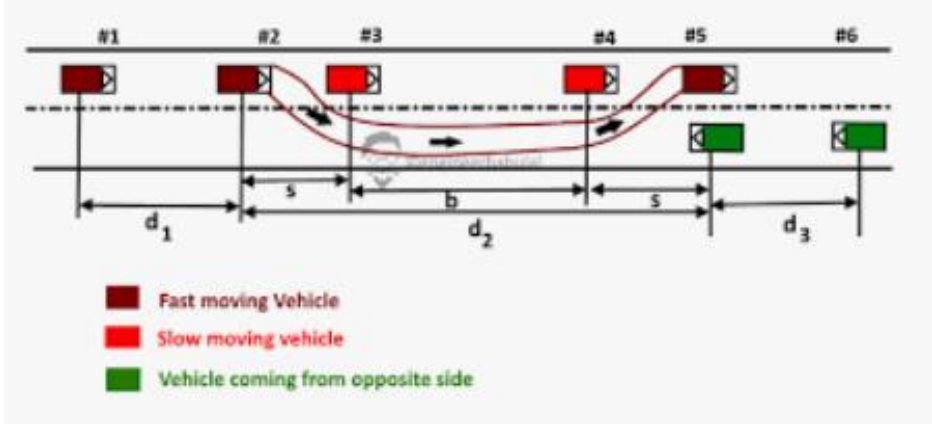


Table 2 PDF page # 59

- You can modify capacity based on which LOS you want to provide
- Need to account for passing sight distance
  - Measures the length of uninterrupted view of the driver



Road Geometry

- Lane width
- Shoulder width



Dhaka-Chottogram Highway



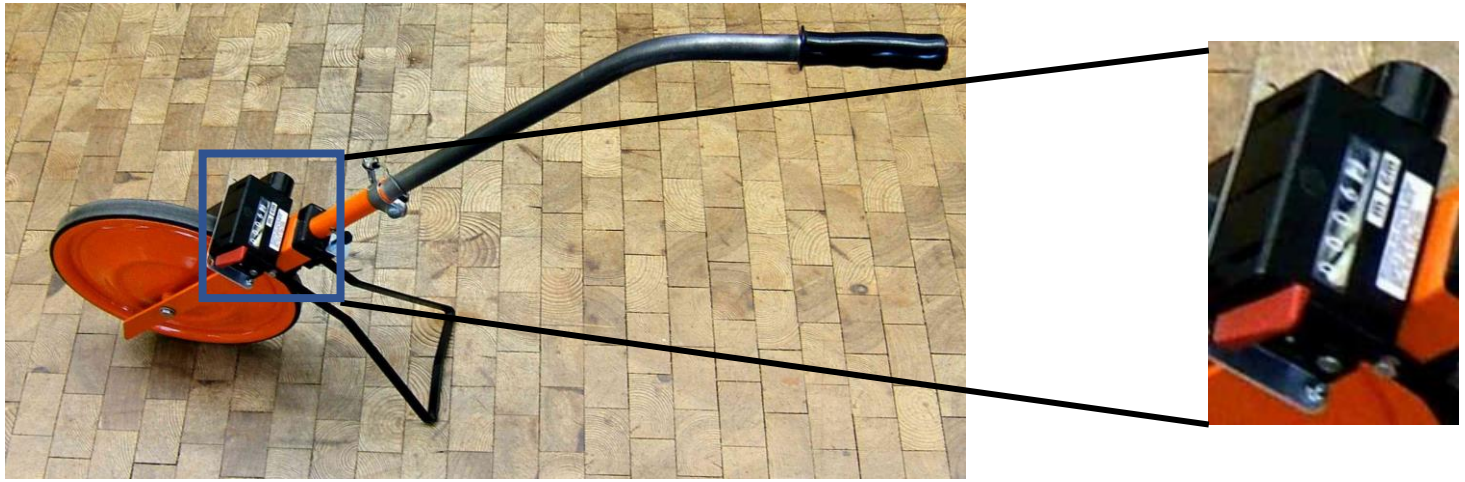
Typical two-lane rural highway

Typical width of a lane: 12 feet

Typical width of shoulder: 6 ft on both direction

Effect of Road geometry

- Lane width, shoulder width can be measure using surveyor's wheel



- Effect of lane width Table 3 (PDF page # 60)

- Effect of shoulder width Table 3 (PDF page # 60)

Capacity determination (01)

- Given:
  - Two-lane, two-way
  - Operating speed 40 mph, LOS C
  - Passing sight distance = 80%
  - Lane width: 11 feet
  - Shoulder width: 4 feet

- Roadway capacity
  - Capacity from Table 1 * factor for LOS (from table 2) * factor for lane width (from table 3) * factor for shoulder width (from table 4)

Capacity determination (02)

- Given:
  - Two-lane, two-way
  - Operating speed 40 mph, LOS C
  - Passing sight distance = 80%
  - Lane width: 11 feet
  - Shoulder width: 4 feet

- Roadway capacity
  - **2000** * factor for LOS (from table 2) * factor for lane width (from table 3) * factor for shoulder width (from table 4)

Capacity determination (03)

- Given:
  - Two-lane, two-way
  - Operating speed 40 mph, LOS C
  - Passing sight distance = 80%
  - Lane width: 11 feet
  - Shoulder width: 4 feet

- Roadway capacity
  - 2000 * **0.68** * factor for lane width (from table 3) * factor for shoulder width (from table 4)

Capacity determination (04)

- Given:
  - Two-lane, two-way
  - Operating speed 40 mph, LOS C
  - Passing sight distance = 80%
  - Lane width: 11 feet
  - Shoulder width: 4 feet

- Roadway capacity
  - 2000 * 0.68 * **0.88** * factor for shoulder width (from table 4)

Capacity determination (05)

- Given:
  - Two-lane, two-way
  - Operating speed 40 mph, LOS C
  - Passing sight distance = 80%
  - Lane width: 11 feet
  - Shoulder width: 4 feet

- Roadway capacity
  - 2000 * 0.68 * 0.88 * **0.92** = 1101 pass veh per hour (both direction)