SIMPLIFIED CAPACITY CONCEPTS FOR ACCESS MANAGEMENT

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WHY – SIMPLIFIED APPROACHES

- TO RESPOND QUICKLY IN FIELD AND OFFICE
- TO RECOGNIZE UNCERTAINTIES IN FUTURE TRAFFIC

THREE AREAS EXPLORED

- USING AVERAGE DAILY CAPACITIES
- PERMISSIVE LEFT TURNS IN EXCLUSIVE LANE ("SURROGATE SIGNAL CONCEPT")
- SHARED LEFT TURN LANES

AVERAGE DAILY CAPACITY

AV. DAILY CAPACITY

$$\text{PER LANE} = \frac{\text{GREEN}}{\text{CYCLE}} \cdot \text{ADT/LANE} \cdot \text{LOS FACTOR}$$

$$\frac{g}{C} \cdot 20{,}000 \cdot (0.8 \text{ to } 1.0)$$

CONCEPT FOR PERMISSIVE LEFT TURN LANES AT SIGNALIZED INTERSECTIONS

- 1. THROUGH VEHICLES AND OPPOSING LEFT TURNS MUST "SHARE" THE SAME GREEN TIME (CRITICAL LANE ANALOGY)
- 2. MORE OF ONE IMPLIES LESS OF THE OTHER.
- 3. "UNUSED" GREEN TIME PER CYCLE CAN BE ALLOCATED IN 3 WAYS
  - ALL TO THROUGH MOVEMENT
  - PROPORTIONAL TO BOTH MOVEMENTS (EQUAL V/C RATIOS)
  - ALL TO LEFT TURNS

EXAMPLE

- **THROUGH CAPACITY (NO LEFT TURNS) 700 VPH**
  - **EXISTING THROUGH VOLUMES - 400**
  - **OPPOSING LEFT TURNS - 100**

RESERVE CAPACITY 200

ALLOCATION	THROUGH	LEFT	TOTAL
CASE 1	600	100	700
CASE 2	560	140	700
CASE 3	400	300	700

FORMULAS

TOTAL "CONFLICT VEHICLES"

(1) CAPACITY = $\frac{\text{SAT. FLOW. (GREEN TIME - 2 LOST TIMES)}}{\text{CYCLE LENGTH}}$

VPH

NOTE: 2 LOST TIMES SINCE LEFT TURNS CAN START ONLY AFTER THROUGH MOVEMENT CLEARS

(2) APPROACH CAPACITY

EQUALS THROUGH CAPACITY IN DIRECTION 1 PLUS LEFT TURN CAPACITY IN DIRECTION 1 WHICH IS A FUNCTION OF OPPOSING THROUGH VOLUMES PER LANE

SHARED LEFT TURN LANE CAPACITY

- **SUMMARIZED/EXTENDED**
  FROM LEVINSON & PRASSAS
  "CAPACITY OF SHARED LEFT TURN LANES –
  A COMPARATIVE ANALYSIS"

  ASCE JOURNAL OF TRANSPORTATION ENGINEERING – VOL. 127 NO. 2
  MARCH-APRIL 2001

FOUR METHODS COMPARED

- HCM
- CANADA
- SIDRA
- LEVINSON

LEVINSON MODEL

- **CAPACITY REDUCED BY BLOCKAGE EFFECT OF LEFT TURNS IN SAME DIRECTION, OR CONFLICTS WITH OPPOSING TRAFFIC**

- **TYPICALLY BLOCKAGE GOVERNS**

SINGLE SHARED LANE ON TWO-WAY STREET (BLOCKAGE)

	(Per Cycle)	Constraints
Initially	$C_s = \frac{g - B(O_2 - I_2)}{h}$	$O_2 \geq I_2$
"Revised"	$C_s = \frac{g - [BO_2 - I_2]}{h}$	$BO_2 - I_2 \geq O$

O_2 = Opposing traffic per lane/cycle

I_2 = Opposing lefts per cycle

B = "Blockage" factor

SHARED LANE ON MULTI-LANE STREET

- $C = g - BO_2$ [+ sneakers]

$$\frac{}{h}$$

BLOCKAGE FACTOR B

LEFTS/CYCLE	B
0.5	0.30
1.0	0.48
2.0	0.72
3.0	0.84
4.0	0.90
5.0	0.96
6.0 OR MORE	1.00

EFFECTIVE LANES FOR O_2

- DIVIDE TOTAL OPPOSING TRAFFIC BY
  - 1 LANE 1.0
  - 2 LANES 1.5
  - 3 LANES 2.5

SIMPLIFIED APPROACHES ARE ALSO NEEDED FOR

TWO-WAY/FOUR WAY STOP CONTROLS

“WEAVING” ALONG ARTERIAL ROADS