Continuous Flow Intersection - ITE Presentation

1. Continuous flow – crossover

In a continuous flow layout, turners enter a right turn lane as usual and, in the shadow of the red, weave across the opposing departure to a right hand service road. The departure has through road alignment standards. The right turn has 30m radius curves. Signals have only two phases, cycle length can be 60 seconds and both storages half the normal length. Both left and right turns are in slip lanes and signal controlled. Right turns have priority over left turns at the departure.

2. Continuous flow – timing & pedestrians

Right turns have an early cut-off (ECO) and left turns a late start (LS). Pedestrians in slip lanes run after the ECO from one approach and before the LS from the adjacent approach. Pedestrians cross fewer lanes than for conventional intersections.

3. Continuous flow – crossover options

Tandem or tridem crossovers, create 6 turning lanes instead of 2 and are synchronized. So the crossover is not critical. The crossover is timed to start after the departure through-traffic clears. Right turns, then left turns from the cross road queue and early start.

4. Continuous flow – widen departure

Heavy left or right turn volumes may require additional through lanes at the crossover.

5. Continuous flow – rejected variations, continuous left, pedestrian crossings

Utah uses a continuous left turn for the length of the right turn service road and a taper to rejoin the departure. Utah's continuous left may be better used as an additional through lane or right turn lane. Utah pedestrians cross extra carriageways and need extra staging if turns do not stop together. Continuous left is not as safe for pedestrians; better to expect to stop.

6. 2Pi – capacity improvement, cycle time

The conventional 4 phase intersection with a cycle time of 120 seconds, has 64 seconds through traffic (53%). A two phase intersection (2Pi) with a cycle time of 120 seconds, has 108 seconds for both through and turns (90%), 69% more capacity.

7. 2Pi – continuous flow & P turn

Having 2Pi is critical but approaches can be; continuous flow; “P” turn; or a diverging diamond interchange. The west and north approaches shown are continuous flow. Traffic only passes through the intersection once. But on the south approach, the right turn (100+vph) is replaced with a P turn to gain an extra through lane (1000+vph).

On the east approach, the right turn is replaced with a P turn to prevent queuing on the tram track.

8. Metering – bus lane vs practical capacity

To get free flowing conditions for buses, metering traffic to practical capacity reduces capacity by 10%. Or to set aside a bus lane reduces capacity by 25% for a 4 lane carriageway, but retains congestion.

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9. Metering with signals

Signals turn red when the right turn from Gipps St reaches 2 vehicles per cycle; the left turn 7 vehicles; and through traffic 86 vehicles, cumulative with small allowance for variation. Test the spare capacity/cycle at Victoria St for 7 through and 3 right (11% of 62 & 21) and if necessary, reduce/increase the flow target for the next cycle.

10. 2Pi – diverging diamond, bus set back, HOV & tolled Q jump

Half a diverging diamond interchange (2Pi) is shown. Peak traffic demand is constrained by queue delay for one lane where access is free and delay (21Min) will grow over time. Separate lane signals and low tolls entice two lanes to jump the queue saving 13 min for a toll that grows with time, but travel time does not. Buses and HOV are toll-free.

11. Metering – linking & mini linking

Travel time can be less than 5 minutes each way in Hoddle St. But minor intersections and pedestrian crossings must be perfectly linked in both directions.

12. Metering – no mini linking

If there is no mini-linking (LI-LO-RI), half the counter peak traffic gets caught at the next signal and travel time is 6 minutes each way with too many stops. This justifies mini-linking between major intersections.

13. Metering – mini linking layout

Example of LI-LO-RI.

Continuous flow, P turn, diverging diamond, Qjump, metering and LI-LO-RI are 6 alternative intersections used together with outcomes as follows:

14. Outcome – capacity - metering & 2Pi

Existing practical capacity at Victoria St is 2289vph, 2Pi practical capacity is 5240vph (Sidra) & congested capacity is 3341vph (signal count). Capacity of every intersection on Hoddle St is only 40-50% of what is achievable.

15. Example movement

For an example movement from Yarra to Yarra:

16. Outcome - Travel time – existing paradigm, +metering, +2Pi +Qjump

Existing travel time is 40 minutes.

Replacing bus lanes with metering & mini-linking would reduce TT to 25 minutes.

Also installing 2Pi would reduce TT to 16 minutes.

Also promoting Qjumping would reduce TT to 8 minutes (tolled) and 21 minutes (toll-free) and provide future proofing. Buses & HOV toll-free.

17. Outcome – Capacity, TT, demand, Q, :Ex, +M +C +Q

Capacity, travel time, demand and queues are shown. Demand increases by 2% for every 1 minute saved Metering increase freeway queues. Options shown are:

*Existing layout with bus lanes;

*Metered, no bus lane;

*Metered with 2Pi;

*Metered with 2Pi, a single lane toll-free queue & 2 lanes of HOV/tolled queue-jump.