Intersections

Principles
Design Tools
Interim Treatments
Designing Intersections for Transit
a.k.a. “Getting the Bus through the Signal”
Minimize Person Delay, Maximize Safety
Minimize Person Delay, Maximize Safety

LOS D
(45 seconds of delay)
Minimize Person Delay, Maximize Safety

LOS D
(45 seconds of delay)

20 vehicles

= 900 seconds of delay
Minimize Person Delay, Maximize Safety

LOS D
(45 seconds of delay)

120 people

= 5,400 seconds of delay
Minimize Person Delay, Maximize Safety

LOS F
(90 seconds of delay)

90s x 20 people
+
15s x 100 people
=
3,300 seconds of delay
Minimize Person Delay, Maximize Safety
Minimize Person Delay, Maximize Safety
Prioritize for Reliability
Reliability Matters for Riders

Max. Wait Time: 10 min  Avg. Wait Time: 5 min

Max. Wait Time: 18 min  Avg. Wait Time: 8 min
Reliability Matters for Operators
Reliability Matters for Operators

Unreliable Service means LESS service
Reliability Matters for Operators

Unreliable Service means MORE buses
Combine Signals & Dedicated Lanes
Combine Signals & Dedicated Lanes
Separate Problematic Movements
Separate Problematic Movements ... and Combine Compatible Movements.
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Dedicate, then Filter
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Prioritize in Context
Intersection Design Tools

... for letting the bus go straight
Queue Jump Lane

- Especially applicable at pull-out stops or congested intersections
- Requires signalization
Queue Jump Lanes
Shared Right Turn / Transit Lane

- Where right turns are low to moderate but cannot be prohibited
- Operational benefits are for vehicles
- Separate movements where ped volumes are moderate or high
Shared Right-Turn Lane

Broadway, Denver
Right Turn Pocket

• Separate turns from thru transit & reduce delay
• Lengthen pedestrian crossing distance
• Longer signal phasing / cycle
• May increase safety / comfort of protected bike lanes
Right Turn Pocket
Transit Approach Lane

- Congested “trouble spots”: high turn counts, bicycle intersections.
- Can be lengthened for longest regular queue
- May be configured in any lane.
Westlake Ave, Seattle
Dropped Transit Lane

- Moderate turn volumes
- Right- and Left-turns are balanced
- Operational benefits accrue to vehicles primarily
Intersection Design Tools

... for turning the bus
Curb Extensions
Turn Radii

- Effective radius ≠ Curb radius
Daylighting

- Removing parking at corners can increase effective radius
- May increase turn speeds
Channelized Center Line

- Allow turning vehicles to use part of approach lane / median
Recessed Stop Bar
Turn Wedge

- Tighter turn geometry, especially on minor-to-major streets
- Allows for emergency vehicles easily
Turn Wedge & Hardened Center Line
Mountable Curb Extension
Testing Interim Treatments