



# Signal Optimisation and Road Safety

## Fact Sheet



### WHAT IS SIGNAL OPTIMISATION?

Historically, signal optimisation has been focussed on reducing congestion and traffic delays.

However, there are numerous ways signal phases may be optimised to improve road safety performance.

Traffic signals rely on drivers being alert, compliant and making correct judgements. Unfortunately, road users are not always driving in this state, and mistakes are inevitable. The high vehicle speeds and harsh conflict angles at some signalised intersections result in high levels of road trauma.

Fortunately, there are ways to modify the operation of signalised intersections to maximise safety and reduce crash risk.



**Intervention:**  
Banning right-turns at signalised intersections

**Description:**  
A major source of conflict at intersections is vehicles turning right across the path of oncoming traffic which is often travelling at high speed. Banning right turns, either permanently or at high-risk times of the day, removes this conflict.

#### Pros:

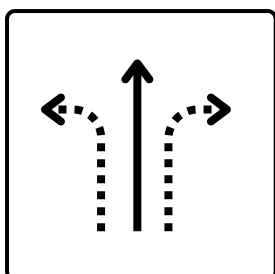
- Removes the conflict between vehicles turning right and oncoming traffic
- Removes the conflict between vehicles turning right and the side road
- Can be full time operation or part-time, for example during peak hours

#### Cons:

- Some motorists may ignore the restriction sign
- Can divert traffic to other less-safe right turns
- May have major impact on traffic movements within the network



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**Intervention:**  
Split phasing

**Description:**

Each leg of the intersection, or just two opposing legs, is assigned a dedicated phase, allowing unhindered left turn, through and right turn movements.

**Pros:**

- Addresses problems with forward visibility, for example where the intersection is sited on a crest
- Removes the conflict between vehicles turning right and oncoming traffic
- Can be used where opposing right turn movements would conflict in the middle

**Cons:**

- Generally less efficient than traditional diamond-overlap arrangement
- Pedestrian delays increase
- Potential to reduce intersection capacity, leading to queuing



**Intervention:**  
Pedestrian Head Starts

**Description:**

Pedestrians get a green signal whilst through traffic in the same direction is held on a red signal. This allows pedestrian to get into the road space and be clearly visible to drivers turning left (or right).

**Pros:**

- Pedestrians get a head start, improving amenity and reducing their wait times
- Reduces the risk of motorists 'racing' around a corner to beat the pedestrians
- Can be used for bicyclists as well (referred to as Bicycle Head Starts)

**Cons:**

- Drivers may be unfamiliar with the treatment and either continue to wait even after the red signal has dropped out or assume that a green turn arrow should be showing (and make the turn when pedestrians are crossing)





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## DWELL ON RED / REST ON RED

### Description:

Dwell on Red/Rest on Red is a traffic signal phasing arrangement that prioritises pedestrian safety. It displays red for all vehicle approaches and only phases to green when a vehicle is detected (and that vehicle has stopped).

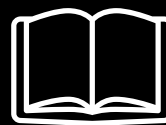
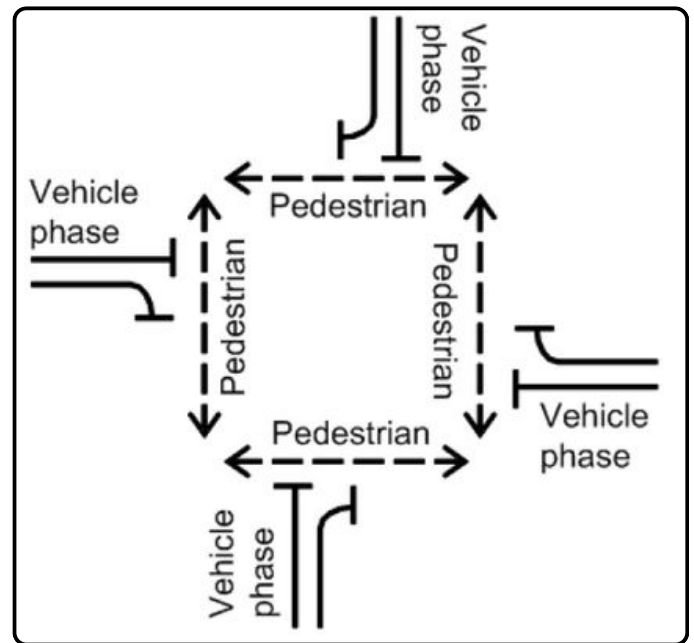
The treatment is recommended in central activity areas and can be switched on during high risk pedestrian times (eg. Friday night, Saturday night) when there is lower vehicle traffic demand.

### Pros:

- Pedestrians have priority as the benchmark
- The signal timings will discourage hooning behaviours
- Serves to discourage through traffic from using the route(s)

### Cons:

- Continuous, regular traffic flow will mean that the signals have little opportunity to dwell on red. This means the treatment will unlikely be viable on many arterial roads.



## READ THE RESEARCH

### Effectiveness of the Dwell-on-Red Signal Treatment to Improve Pedestrian Safety during High-Alcohol Hours

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#### Abstract

The Dwell-on-Red (DoR) signal treatment aims to reduce the number and severity of pedestrian-vehicle crashes that occur during high-alcohol hours (HAH) at signalised intersections. The treatment involves reverting to an all-red phase when there is no traffic demand during late evening and early morning. This causes vehicles to slow down or stop thereby reducing average speeds on intersection approaches. Lower speeds is known to be beneficial to traffic safety particularly for vulnerable road-users. DoR was trialled at a metropolitan intersection in Melbourne. An observational study was carried out at this intersection and a number of serious safety problems during late evening hours. As part of the evaluation of effectiveness speed and flow data were collected using detectors placed 10 and 50 metres upstream of the intersection. The treatment was found to bring about a significant reduction in average speed at both detector positions. Significant changes were also found in the proportions of vehicles travelling at less than or equal to 50 km/h and greater than 50 km/h at the 10 metre detector position, and for speeds greater than 50 km/h at the 50 metre detector position. These findings indicate a potential reduction in fatal and serious injury risk. While DoR has a minimal impact on traffic performance, its effectiveness was found to be heavily dependent on traffic-flow. This aspect has an important bearing on future applications.

#### Keywords

Traffic signals, Pedestrian safety, High-alcohol hours

#### 1. Introduction





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## FULLY CONTROLLED RIGHT TURNS (FCRT)

### Description:

Right turning traffic is fully controlled by arrows. The right turners get a red turn arrow until they get a dedicated turn phase (green arrow).

Crash Reduction Factor of  
80% for right-turn against  
and U-turn crashes.

### Pros:

- Reduces the likelihood of collisions between pedestrians and vehicles turning right.
- Drivers waiting to turn right are not required to make any gap acceptance decisions, reducing crash risk
- Can often use the existing signal hardware

### Cons:

- May increase delays
- May increase risk of vehicles running the red - potentially colliding with pedestrians
- Motorists may avoid these intersections and 'rat-run' - pushing the risk elsewhere



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**Intervention:**

Fully controlled left turns

**Description:**

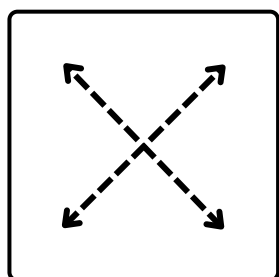
Traffic in the left turn lane is held to allow pedestrians to cross. Control can be partial to provide pedestrians a head start so that they are visible on the crossing before vehicles commence their turn

**Pros:**

- Pedestrians are separated in time from left-turning vehicles
- Pedestrians get a head start, making them more visible
- Tends to be most effective where used adjacent a dedicated left-turn lane (as opposed to a left and through lane)

**Cons:**

- Red turn arrow drop off can be confusing for motorists, especially when full controls are active on some parts of the signal phasing



**Intervention:**

Scramble crossings (Barnes Dance)

**Description:**

All traffic approaches to an intersection get held on red and pedestrians are given a dedicated phase to cross the road including diagonally.

**Pros:**

- Effective where pedestrian demand to cross multiple legs of the intersection is high
- Effective where there is a destination in the centre of one of the roads (e.g. tram or bus stop)

**Cons:**

- At intersections away from activity centres, the full pedestrian phase can create delays for traffic and pedestrians since the crossing phases are now split rather than running concurrently



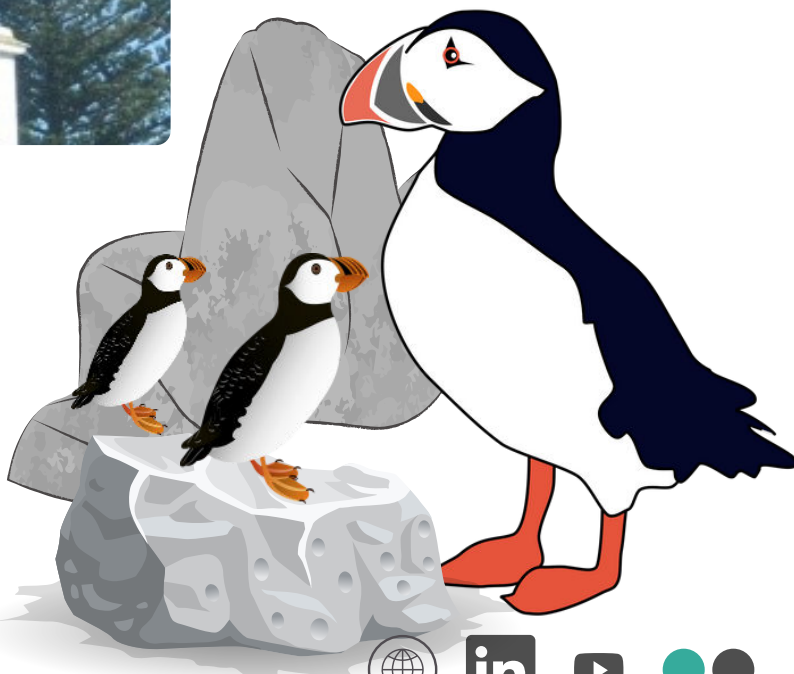
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## PEDESTRIAN USER- FRIENDLY INTELLIGENT CROSSINGS (PUFFIN)

### Description:

The Puffin control uses radar to detect the presence of pedestrians on a signalised crossing. The green crossing time can then be extended if slow moving pedestrians are detected, or reduced if the pedestrian has left the zone.



### Pros:

- Improved amenity for pedestrians as they have more time to cross if needed
- Reduced delays for traffic when no pedestrians are present

### Cons:

- May increase traffic delays if pedestrians are loitering





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## FURTHER READING

### GUIDANCE / NOTES:

- [Austroads Guide to Traffic Management, Part 6: Intersections, Interchanges and Crossings Management](#)
- [Austroads Guide to Traffic Management, Part 7: Activity Centre Transport Management](#)
- [Fully Controlled Left Turn](#)
- [Scrambled Crossing \(Barnes Dance\)](#)
- [PUFFIN Crossing](#)

### INTERVENTION EXAMPLES:

- [Banning right-turns at signalised intersections](#)
- [Split Phasing](#)
- [Pedestrian Head Starts](#)
- [Dwell on red / Rest on red](#)
- [Fully Controlled Right Turn](#)

## MORE INFO?

*We're here to help.*

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