Technical Note TN191

Reducing pedestrian delays

August 2020

Queensland Government

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1 Introduction

Table 6.6 in Section 6.3.2 of Austroads' *Guide to Traffic Management Part 9: Traffic Control Systems – Strategies and Operations* outlines treatments to support pedestrian priority at traffic signals. The treatments listed by Austroads are accepted as methods for prioritising pedestrians and reducing delays at traffic signals in Queensland with the following additional advice.

The department's *Guideline: Reducing pedestrian delays at traffic signals* provides context, background information, research and considerations for practitioners to use when investigating operational treatments for pedestrians at traffic signals in high pedestrian use areas such as central business districts (CBDs) or activity centres. These locations are beginning to focus more on the pedestrian scale and place function with an emphasis on reducing pedestrian delays and supporting pedestrian activity.

2 Existing listed treatments

The following advice applies to the existing treatments listed in Table 6.6 of Austroads' *Guide to Traffic Management Part 9* and requires additional consideration and investigation in Queensland.

Table 2 – Advice for existing treatments identified in Table 6.6 of Austroads' Guide to Traffic Management Part 9

Traffic signal treatment	Queensland context
Exclusive 'scramble crossing' or 'Barnes dance' phase	Reduced pedestrian delays are likely when there is a high proportion of diagonal pedestrian movements as this configuration allows two movements to be converted into one single movement
Dwell on red for all users, or dwell on WALK (green) for pedestrians	The implementation of dwell on WALK in Queensland needs careful consideration of the safety issues and effects for each user; for example, implementation of dwell on WALK along light rail corridors was considered unsafe
Extended clearance intervals	This treatment is considered part of the smart pedestrian crossings being rolled out in Queensland
Extended WALK / stretch WALK / rest in WALK	This treatment tends to be technically difficult to implement with STREAMS and additional consideration would be required
Fixed demand	Austroads identifies traffic signal controllers can be set to register a fixed demand for any pedestrian movement to operate each cycle but should only be considered in high-use pedestrian areas where the cycle time is enough to accommodate all phases; a balance would need to be achieved between fixed cycle times and signal coordination – however, a lower cycle time may be more desirable than signal coordination
Pedestrian countdown timers	This treatment tends to be incompatible with smart pedestrian crossings

3 Additional treatments

Road authorities may consider two additional operational treatments to improve pedestrian priority and reduce pedestrian delays at traffic signals within Queensland. These two treatments are identified in the table following.

Table 3 – Additional operational treatments to support pedestrian priority and reduce delays

Traffic signal treatment	Description
Setting an optimal maximum cycle time	Refers to minimising or reducing the total cycle time to cater for the priority mode and support the movement and place function of the intersection. For intersections with high pedestrian activity and volumes, the focus for an optimal maximum cycle time should be on pedestrian level of service and reduced waiting times
Pedestrian green wave	Refers to coordinating adjacent traffic signals or linking several signals along a corridor so pedestrians are met with consecutive green signals as they approach, without the need to stop or be delayed from red signals

4 Setting an optimal maximum cycle time

4.1 Elements to assess

The following elements and investigations will assist in determining if setting an optimal maximum cycle time prioritising pedestrian level of service is beneficial for an intersection with high pedestrian activity.

Maximum cycle time – There is no set time recommended for a maximum cycle time (refer to Austroads' *Guide to Traffic Management Part 9* Section 6.7.12 for suggested range of times); therefore, site-specific analysis of the road network, volumes and environmental factors will be required to determine an appropriate maximum cycle time.

Posted speed limit – A reduction in the posted speed limit to slow traffic between intersections may assist in reducing wait time effects on vehicles. A lower speed limit, coupled with reduced cycle times, could improve flow of traffic. A further consideration required in this context is the distance between each signalised intersection and the potential effects a lower speed and lower cycle time may have on total intersection performance and throughput for pedestrians and vehicles.

Traffic modelling – Site-specific modelling of the intersection, corridor or network may be required to reflect the actual situation and likely changes to the travel patterns and route choice of users. The following information should be required for traffic modelling to be effective:

- pedestrian volumes – traffic counts will be required to identify the volume of pedestrians and their movements
- signal timings – current signal timings to test the current situation and performance of the intersection will need to feed into the traffic model used to replicate actual operations, and
- optimisation – future signal timing with the lower cycle times needs to be optimised for improved pedestrian level of service.

Site assessment – Observations of user (pedestrian, cyclist and vehicle) behaviour to ascertain any compliance or safety issues that are occurring. Critical issues may require considering alternative or additional treatments, along with setting an optimal maximum cycle time.

Review of performance measures – Performance measures need to be reviewed to determine the existing level of service provided to different modes. The Movement and Place Framework is an appropriate framework to identify the desired level of service of different modes and the necessary adjustments required to optimise the maximum cycle time for pedestrian level of service.

Right-turn conflicts – An existing intersection with a filtered right turn may have additional conflicts with pedestrians and opposing traffic movements if an optimal maximum cycle time for pedestrians results in a reduction in green time for vehicles. The department's *Road Safety Policy* excludes filtered green arrows for right turns which would remove this conflict. Any changes to intersections will need to comply with the *Road Safety Policy*.

Network planning – Traffic signals in high-use pedestrian areas will require coordination to reduce pedestrian delays. The reduced or increased cycle time may affect adjacent intersection performance, depending on intersection spacing. A network approach is required to modify the cycle times so the same cycle times or double cycle times are implemented across the corridor.

4.2 Considerations for implementation

Table 4.2 outlines some of the barriers, effects and considerations required when implementing an optimal maximum cycle time prioritising pedestrian level of service.

Table 4.2 – Considerations for implementation

	Considerations
Technical	• No technical barriers. • Road operators need to select an appropriate reduced maximum green time for vehicle actuated operations and update these in the controller personality. • New green splits need to be calculated for each STREAMS plan and the plans updated in STREAMS. • Aim to optimise the cycle time for pedestrians while providing an acceptable level of service for all movements in accordance with the place function in the Movement and Place framework.
Physical	• No physical barriers. • Additional intersection infrastructure enhancements could further enhance the pedestrian environment. • Infrastructure enhancements may be required to respond to site-specific characteristics.
Social	• Vehicles may not clear the intersection in a single cycle, resulting in additional delay to drivers and consequent complaints. • Clearly defined objectives supported by the road authority's policy for prioritising pedestrians will be required.
Environment	• No environmental barriers. • Potential for additional emissions from stop-start traffic and increased congestion.

5 Pedestrian green wave

5.1 Elements to assess

The following elements and investigations will assist in determining if a pedestrian green wave is appropriate along a corridor and effective for signal coordination.

Volume of pedestrians – There needs to be a high volume of pedestrian activity to offset the potential effects and delays to traffic on side corridors. Suburban locations are unlikely to generate sufficient pedestrian volumes to warrant a green wave, whereas major activity centres and CBDs will attract high pedestrian volumes.

Travel destination – There needs to be strong destination or land use attractor to encourage a high volume of pedestrians to travel in the same direction. If attractors are dispersed, pedestrian travel is likely to be dispersed as well. Potential opportunities include from a public transport station, university or sporting stadium during an event.

Conflicts with other modes – A corridor with several transport modes can potentially affect the flow of all transport users, such as the on-time reliability of public transport.

Quality of footpath – Sufficient width is needed to support the higher volume of pedestrians travelling in the same direction, as well as a clear path free from obstacles or obstructions.

Signal coordination – The selected corridor needs to include traffic signals on the same software coordination system.

Intersection type – The selected corridor needs to include traffic signals on all intersections; otherwise, the continuous green wave may be difficult to achieve. Alternately, if an intersection midway along the corridor is not signalised, it would need to include a priority crossing, such as a wombat or zebra crossing, to ensure continual travel for pedestrians.

Speed of travel – Pedestrians travel at varying speeds and their individual mobility concerns may further reduce the speed of travel. It is important to consider varying speeds of travel and the distance between intersections for enough green time for pedestrians and other road users. The use of a time / distance diagram will assist in planning cycle times at intersections along the corridor.

5.2 Considerations for implementation

Table 5.2 outlines some of the barriers, effects and considerations required when implementing a pedestrian green wave.

Table 5.2 – Considerations for implementation

Considerations	Description
Technical	• The controller software needs to be the same for all intersections along the corridor. • STREAMS can be used to coordinate intersections and produce a green wave. • SCATS may have difficulty adapting to a continual coordinated green wave unless a fixed timing approach is adopted.
Physical	• No physical barriers. • The distance between intersections along the corridor may affect signal phasing. Intersections spaced too close or too far may not allow continual pedestrian movement. • Physical footpath environment needs to be free of street furniture to provide a clear and safe path for continual movement.
Social	• Potential effects on traffic flows such as loss of signal coordination for vehicles or increase in delays at intersections. • Resource requirements by road authorities.
Environment	• No environmental barriers.