Network Technical Guide (NTG)

Supplement to AS 1742.14:2014

Traffic Signals

Version 2.0

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Document Information

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Version	Date	Description
1.0	October 2015	First Release
2.0	October 2023	Revision to incorporate current Victorian practice with respect to traffic signal design, operation and installation, signs and turn lines.

Preface

Under the Transport Integration Act 2010 (Vic) the functions of the Head, Transport for Victoria include the development and implementation of standards, guidelines and practices for the public transport system, the road system and related matters.

Standards and Guidelines are administered by the Department of Transport and Planning (DTP) on behalf of the Head, Transport for Victoria.

DTP Standards and guidelines respond to the Head, Transport for Victoria objectives and responsibilities, legislative requirements, Victorian Government policies and guidelines, industry best practice and emerging technologies.

Any reference in this document to another document, standard or procedure that is expressed to be a VicRoads, Roads Corporation, Department of Transport (DoT), or Department of Transport and Planning (DTP) document, standard or procedure shall be interpreted and applied as though it was a document, standard or procedure of Head, Transport for Victoria. Any reference in any such document, standard or procedure to a legal right or obligation of VicRoads, Roads Corporation, Department of Transport or Department of Transport and Planning shall be deemed to be a right or obligation of Head, Transport for Victoria.

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Interpretation

In this document, except where the context otherwise requires—

- The words “shall” and “must” is to be understood as denoting a requirement which is mandatory.
- The word “should” is to be understood as denoting a requirement which is not mandatory but recommended.
- The word “includes” in any form is not a word of limitation. Mentioning anything after "includes" or similar expressions (including "for example") does not limit what else may be included.
- A reference to a section, clause, schedule or appendix is a reference to a clause of or schedule or appendix of this document.

Nomenclature

ⓘ This symbol intends the accompanying text to be read as INFORMATION. Common information accompanying this symbol includes RATIONALE and GUIDANCE for the associated requirement.

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Contents

1 Introduction

1.1 Purpose

All road agencies across Australia are working towards greater consistency between States/Territories in how road networks are managed. To achieve this, the Austroads Guide to Traffic Management and Australian Standards relating to traffic management have been adopted to assist in providing that level of consistency and harmonisation across all jurisdictions. This agreement means that these Austroads Guides and the Australian Standards are the primary technical references.

Australian Standards AS 1742.14 – Traffic Signals is a nationally agreed standards document outlining the use of traffic control devices on the road network and has been adopted by all jurisdictions, including DTP.

All jurisdictions will be developing their own supplement to clearly identify where its practices currently differ and to provide additional guidance to that contained within AS 1742.14. This document is the DTP supplement and shall be read in conjunction with AS 1742.14.

1.2 How to Use this Supplement

There are two key parts to this document:

- **Classification of Supplement Information:** this table classifies supplement information as a Departure, Additional Information or both. This information assists with identifying its hierarchy in relation to the Australian Standard.

- **Details of Supplement Information:** this section provides the details of the supplement information.

  - **Departures:** where DTP practices differ from the guidance in the Australian Standard. Where this occurs, these differences or 'Departures' will be highlighted in a box. The information inside the box **takes precedence** over the Australian Standard section or clause. The Australian Standard section or clause is not applicable in these instances.

  - **Additional Information:** all information not identified as a departure provides further guidance to the Australian Standard section or clause.

Where a section or clause does not appear in the body of this supplement, the Australian Standard requirements are followed.

2 Classification of Supplement Information

The classification of each clause as a Departure, Additional Information or both is shown in the table below.

Clause	Classification
2.3.2	Additional Information
2.4 (d)	Additional Information
3.2	Departure
4.1.4	Additional Information
4.2.1	Additional Information
5.6	Additional Information
6.1	Additional Information
6.1.2	Additional Information
6.1.2 (c)	Additional Information
6.1.2 (d)	Additional Information
6.1.2 (e)	Additional Information
6.2.1	Departure
6.2.2	Additional Information
6.2.3	Additional Information
6.2.4	Additional Information
7.1	Departure and Additional Information
7.2	Additional Information
7.4	Additional Information
7.5	Departure

Australian Standard requirements are followed in their entirety for sections and clauses not shown in this table.

3 Details of Changes

Clause 2.3.2 – Flashing yellow arrow

Flashing yellow arrows are not used in Victoria. The use of the flashing GIVE WAY TO PEDESTRIAN sign, which can be located adjacent to the traffic signal lantern, is considered to be sufficient in warning drivers of the presence of pedestrians during a green pedestrian phase.

Clause 2.4 (d) – Pedestrian countdown timer

The use of a yellow countdown timer display to replace the flashing red pedestrian symbol shall only be considered for use in:

- a Pedestrian Priority Area under the Movement & Place framework
- an area of significant pedestrian activity, at locations in regional Victoria where the Road Use Hierarchy is yet to have been developed.

Clause 3.2 – SIGNAL FACE LAYOUTS AT INTERSECTIONS

Departure

Single-aspect right turn green arrows are permitted in the special case of a Dual (Far Right) Secondary lantern where the approach is controlled as part of a split phase arrangement. This is described in DTP Supplement to Austroads Guide to Traffic Management (AGTM) Part 10.

Clause 4.1.4 – Overhead Signal Faces

Mast arms

Mast arms are provided where it is necessary to ensure the visibility of sufficient lanterns for approaching vehicles.

Mast arms should be installed for an approach to signals in order to ensure that for each approach lane, there is at least one near-side lantern (i.e. primary, dual primary or overhead primary) located with no more than one intervening lane. For example, a mast arm should be installed for the following cases:

- an undivided approach with 3 or more lanes at the stopline
- a divided approach with 3 or more lanes at the stopline and no median suitable to place a dual primary lantern
- two mast arms should be installed for a divided approach with 6 or more lanes at the stopline.

For a curved approach, the visibility of the lanterns may be assessed using the appropriate visibility template given in Section 10.4.4 of AGTM Part 10 (2020), using a stopping distance calculated in accordance with AS 1742.14.

A mast arm may be installed where the visibility of any of the pole-mounted lanterns is impeded by awnings, poles, trees or similar sight obstructions along the approach from the stopping distance to the stop line. Mast arms may be justified with fewer lanes than indicated above where road speeds are above 60 km/h, if the lane widths are very wide, such as in some rural towns.

There may be greater justification for mast arms where there is a high proportion of trucks, such as near a port, freight interchange or heavy industrial area.

Size of mast arms

Mast arms are available with four outreach lengths as shown in Table 1.

The lantern on the outreach of a mast arm must be at a sufficient height so that vehicles do not collide with it. Therefore, the mast has been designed to provide a 5.5 m clearance from the road surface.

Due to the need to provide electrical clearance between the mast arm and any overhead electricity cable (refer Figure 1), mast arms should be installed in the median on a divided road. This location also ensures that:

- The overhead lantern is nearest to the fastest moving vehicles.
- If an indented right turn lane exists, there is a lantern clearly visible above the through lane.

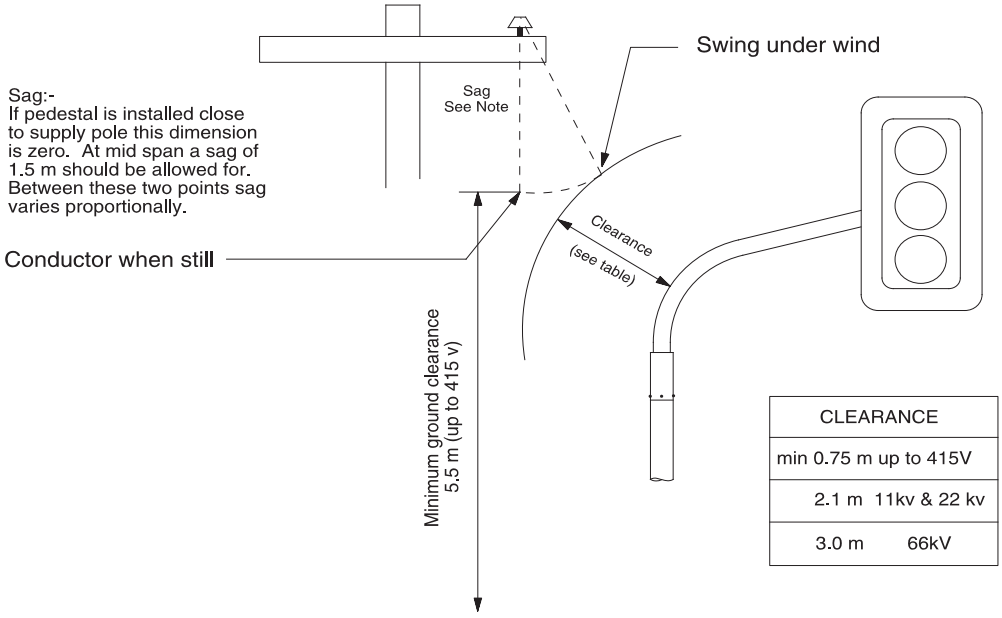


Figure 1: Signal hardware clearance required under electricity and tram operator lines

Mini mast arm (1.4 m outreach)

The DTP/VicRoads ITS Standard Drawing TC 1103 shows the mini mast arm to be of one size only - one which provides a 5.5 m vertical clearance to the 1.4 m outreach. At this height, it cannot be used under 240 V power lines, which are generally hung 7.0 m above ground level, as the electrical safety clearance would be encroached. The clearance to power lines for all hardware is shown in Figure 1.

However, the mini mast arm can have its height reduced by 400 mm where it is to be installed under 240 V power lines. Clearance of 4.9 m for all non over dimensional vehicles will still be maintained.

Therefore, where necessary, design plans may specify the mini mast arm as 4.9 m x 1.4 m MA, although 5.5 m x 1.4 m MA should be specified whenever possible.

Table 1: Pole and mast arm specifications including vertical clearance and outreach requirements

	Vertical Clearance (m)	Outreach (m)	Pole Height (m)
Joint Use Pole (JUP)	-	-	8.5, 11, 13.5
Mini Mast Arm (Mini MA)	4.9 to 5.5	1.4	-
Mast Arm (MA)	5.5	2.5, 3.7, 5.5	-
Joint Use Mast Arm (JUMA)	5.5	2.5, 3.7, 5.5	8.5, 11, 13.5

Note: Mounting height of a street lighting lantern is 1.5 m above pole height.

The various pedestal types used by DTP are shown in Figure 2.

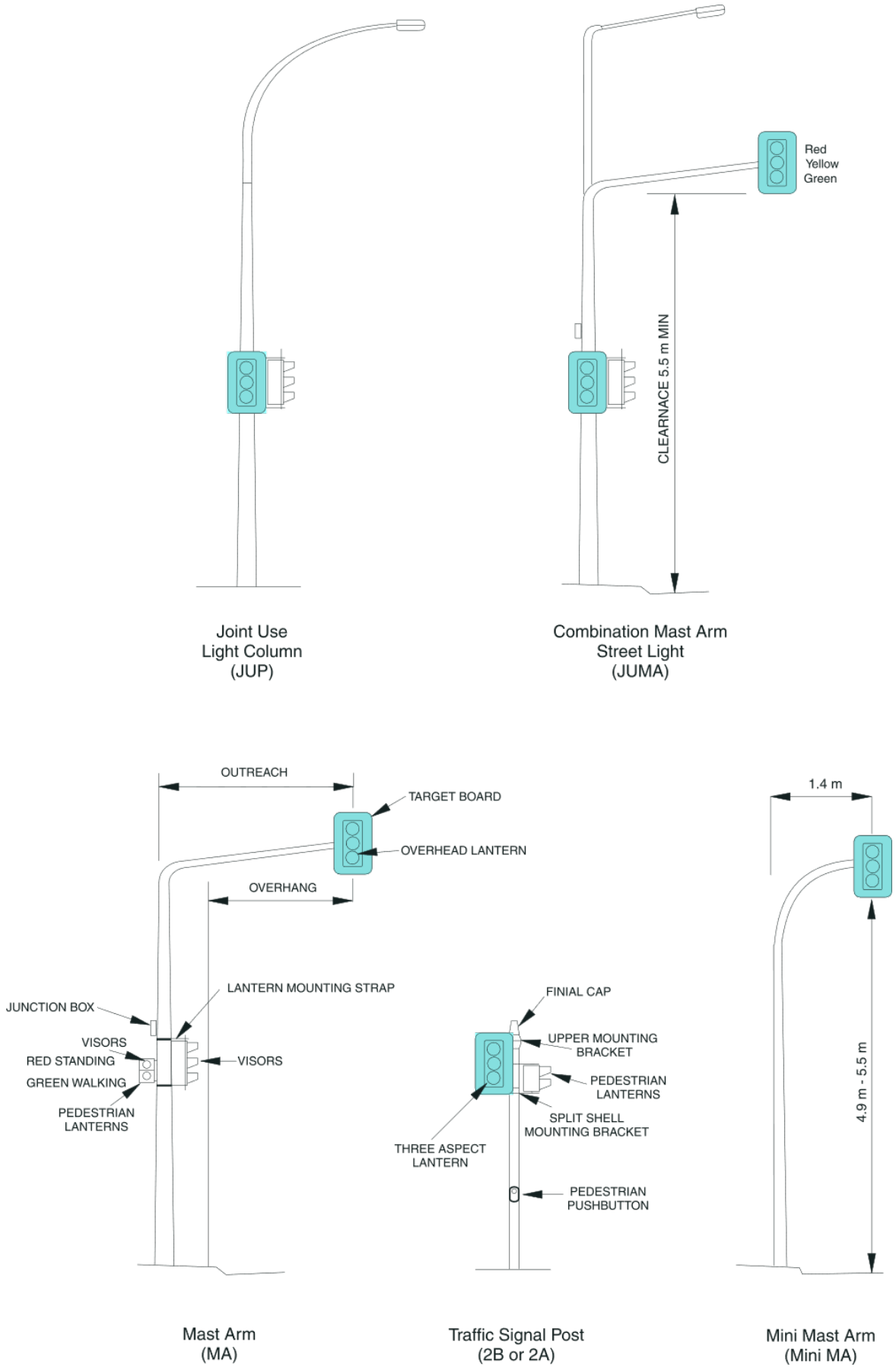


Figure 2: Various pedestal types and signal components

Clause 4.2.1 – Signal Face Locations - General

Additional guidance on the placement of signal faces at intersections is shown in Figure 3 and Figure 4.

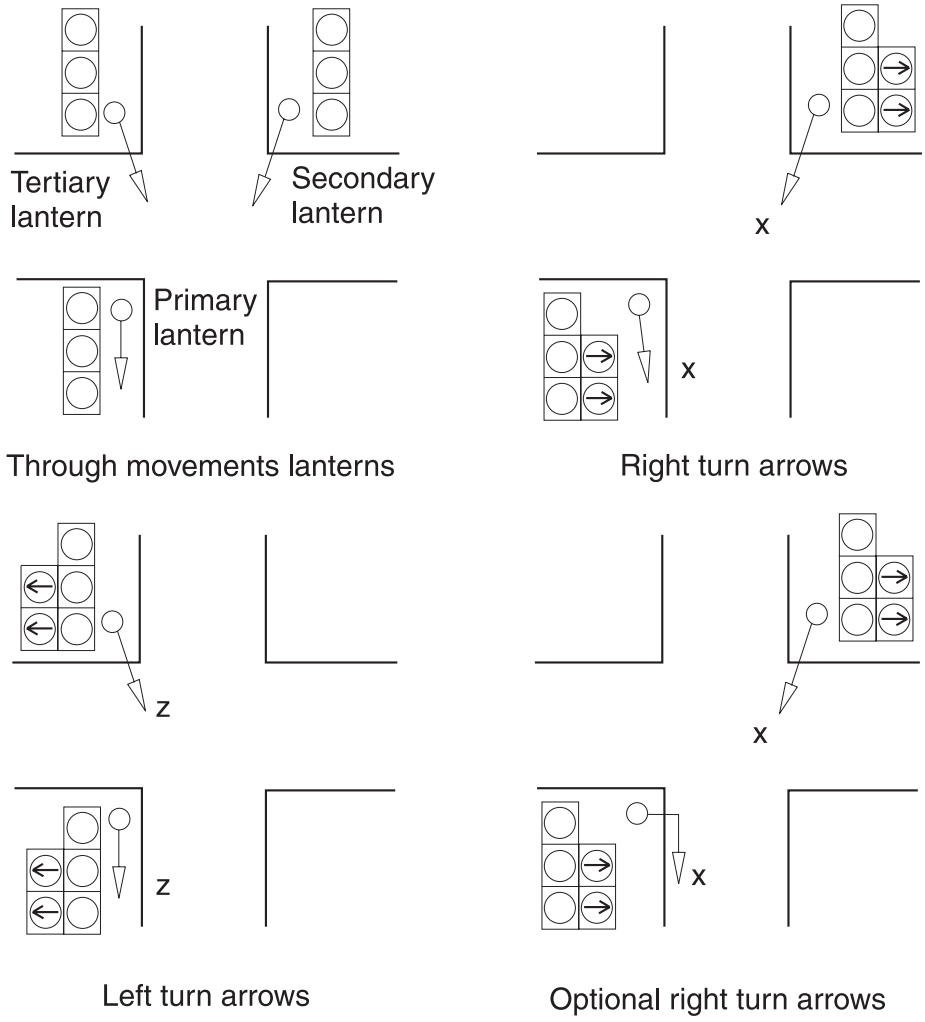


Figure 3: Location of signal displays – undivided roads

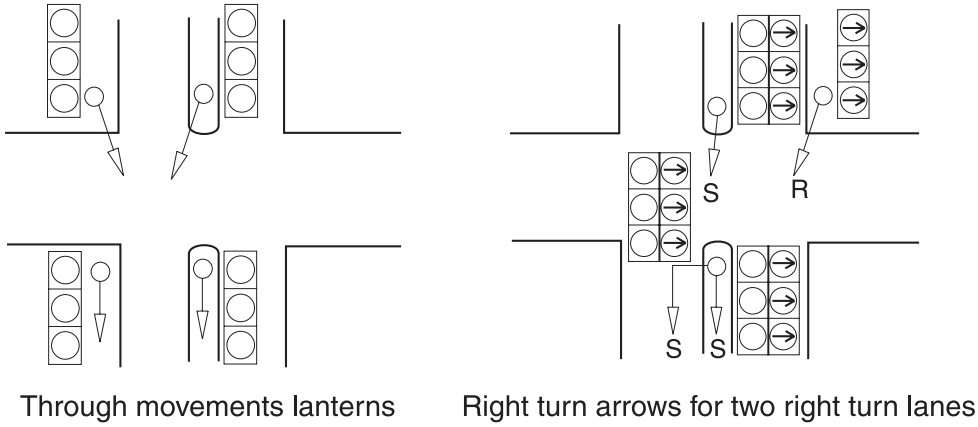


Figure 4: Location of signal displays – divided roads

Further guidance is given in the DTP Supplement to AGTM Part 10, including for approaches that are serviced as part of a split phase arrangement.

Clause 5.6 – PEDESTRIAN PUSH BUTTONS

Pedestrian push buttons are generally provided on the same pedestals as the pedestrian lanterns at each end of the crosswalk. If this location is not within easy reach, then a type 3 pedestal (a 1 m high pedestal) is used. The most frequent use of a type 3 pedestal is on safety zones.

If the crosswalk passes over a median less than 2.5 m wide, then the pedestrian movement should be treated as a full crossing, not a staged crossing. A pedestrian push button is not necessary to be provided in these situations, but existing push buttons should not be removed for existing sites.

Audio-tactile push buttons should be specified for all new signal installations. Detectors with constant and variable sound output are available. Variable detectors adjust output according to ambient noise levels and should be used adjacent to residential properties. There is an increasing practice of turning the audible signals off at night where residential properties are close to the pedestrian crossing and the audible signal causes disturbance. Consultation with any local associations for the vision impaired should be considered. The signal controller will need to be reprogrammed for the new operating times.

The pedestal and pedestrian push button shall be positioned within the zone of common reach for people either standing or in a standard wheelchair (refer to AS 1428).

The push button assembly should be placed on the side of the pole with the face parallel to the crossing and the arrow pointing horizontally towards the crossing. In Victoria, it is also acceptable to place the push-button on the approach side of the pole with the face perpendicular to the crossing and the arrow pointing upwards. Further guidance on the placement is given in AGTM Part 9, DTP Supplement to AGTM Part 9 and DTP Accessibility (DDA) Guidelines for Road Infrastructure.

Clause 6.1 – SIGNS

Table 2 lists additional signs for use in Victoria. For the detailed design of these signs, refer to DTP Supplement to AS 1743.

Table 2: List of additional signs

Sign	Sign number	Size, mm
U TURN MUST GIVE WAY	R2-V115	450 x 750
RIGHT TURN MAY OPERATE EVERY 2ND CYCLE (Wide Format)	G9-V200-1	900 x 580
RIGHT TURN MAY OPERATE EVERY 2ND CYCLE (Narrow Format)	G9-V200-2	620 x 750
Reversible Lane	R2-V120	1500 x 3000

U TURN MUST GIVE WAY

Under rule 38 of the Road Safety Road Rules 2017, drivers performing a U-turn at an intersection must give way to all other turning vehicles. The sign reinforces this rule.

Sign R2-V115 (U TURN MUST GIVE WAY) should not be used at intersections simply to support the road rule.

The sign is used at signalised intersections that have a green right turn arrow on the major road operating concurrently with a green left turn arrow on the side road. Under these circumstances, both drivers have a green light, which may lead a driver performing a U-turn into a conflict with a driver concurrently undertaking a left turn.

The sign is placed on the signal pedestal or a short distance in front of it facing a driver performing a U-turn movement on the major road, thus alerting the driver to a potential conflict.

R2-V115

Right turn every second cycle

Capacity constraints on the road network have resulted in the need to assess which vehicle movement can be delayed or queued in order to meet the demands of the critical vehicle movements and intersection capacity. In some situations where the volume of a right turn movement is minor, it may be considered suitable to operate the minor right turn in every second traffic signal cycle (or every third cycle, etc.). A description and the warrants for operating a fully controlled right turn every second cycle is discussed in the DTP Supplement to AGTM Part 9.

At intersections where this method of control is implemented, a G9-V200 series sign with the message 'RIGHT TURN MAY OPERATE EVERY 2ND CYCLE' should be installed on the signal pedestal or a short distance in front, facing drivers in the affected right turn lane. The narrow format sign (G9-V200-2) can be used where space is limited (e.g. in a narrow median).

At intersections with road safety cameras, a supplementary plate shall be installed, which also identifies the days and time periods of operation (refer to AS 1742.2).

G9-V200-1

G9-V200-2

Reversible Lanes

Reversible lane signs (R2-V120) shall be used on roads where a reversible lane arrangement has been implemented to improve road capacity.

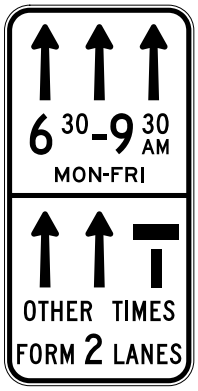
The lane information shown on the sign shall depict the reversible lane as well as the permanent lane(s).

The times displayed on signs at both ends of the reversible lane must differ to take into account the clearance time required to safely change the direction of flow.

The signs must be placed at intervals not exceeding 500 m and in a conspicuous location, not only for traffic using the road that has the reversible flow, but also for traffic entering from significant side roads.

The sign shall also be used in advance of the reversible lane, with a 'xxx m AHEAD' supplementary sign (R7-12) added underneath.

Variable message signs may also be used to inform drivers of important changes to lane operation as indicated by overhead lane signals.



R2-V120

Signs for special movements at B lights

DTP Supplement to AS 1742.12 provides details regarding the use of signs for special movements at B lights.

Clause 6.1.2 – Application

At a left turn slip-lane which requires entering traffic to give way to the intersecting traffic stream, a GIVE WAY sign shall be provided (refer to AS 1742.2 for further details).

Clause 6.1.2 (c) – U-turn permitted (R2-15)

This sign is not required at signalised intersections in Victoria as U-turns are allowed without the need for the sign to be displayed as per the Road Safety Road Rules 2017.

However, this sign may be provided where there is a form of right turn prohibition, but a U-turn is still permitted. In this case, the R2-15 sign is installed underneath the no right turn sign.

Clause 6.1.2 (d) – Hook Turn Only (R2-21)

Right turn from the left (hook turn) signs are used extensively in the Melbourne Central Activities District, on streets where trams operate, to assist the movement of traffic and provide for safe right turns.

Where traffic flow is heavy, road widths are restricted and right turn phases are not practical, provision is made in the intersection layout to allow right turn vehicles to store on the left of the intersection clear of the through traffic lanes, allowing better traffic movement through the intersection. Its purpose is also to maintain a clear passage for trams.

In city areas with high pedestrian volumes, conventional right turn operation may lead to the situation where both traffic lanes are held up, blocked respectively by a right turn vehicle in the right lane and a left turn vehicle in the kerb lane waiting for pedestrians to clear the pedestrian crosswalk. It may only need one turning vehicle in each lane to hold up all the through vehicles.

Hook turns can be used on a road and conventional right turns on the other (intersecting / perpendicular) road but hook turns and conventional turns should not be used together on the same road at an intersection.

Hook turns are safer for pedestrians, as the right turning traffic can only move off in the next part of the traffic signal cycle in conjunction with the adjacent (or side road) traffic, rather than turning through pedestrians on the pedestrian crossing.

Right turn from left signs are restricted to signalised intersections.

The sign shall be installed within the intersection and, if possible, mounted overhead. The sign shall operate at all times (i.e. no time of operation supplementary sign is permitted).

In addition, an advance version of R2-21 sign shall be installed prior to the intersection either overhead or side mounted on the right side where a median or tram safety zone exists. The word ‘ONLY’ on the bottom of this sign shall be replaced by the word ‘AHEAD’.

Clause 6.1.2 (e) – Pedestrian may cross diagonally (scramble crossing) (R3-5)

Diagonal pedestrian crossings may be provided in central business districts where there are high pedestrian volumes, which affect the capacity of the intersection due to geometric restraints.

This facility should only be installed when it would lead to a more efficient signal phasing operation. Vehicular traffic is required to stop on all approaches to the intersection and pedestrians are permitted to also cross the intersection diagonally.

Figure 5 provides a typical diagonal pedestrian crossing arrangement.

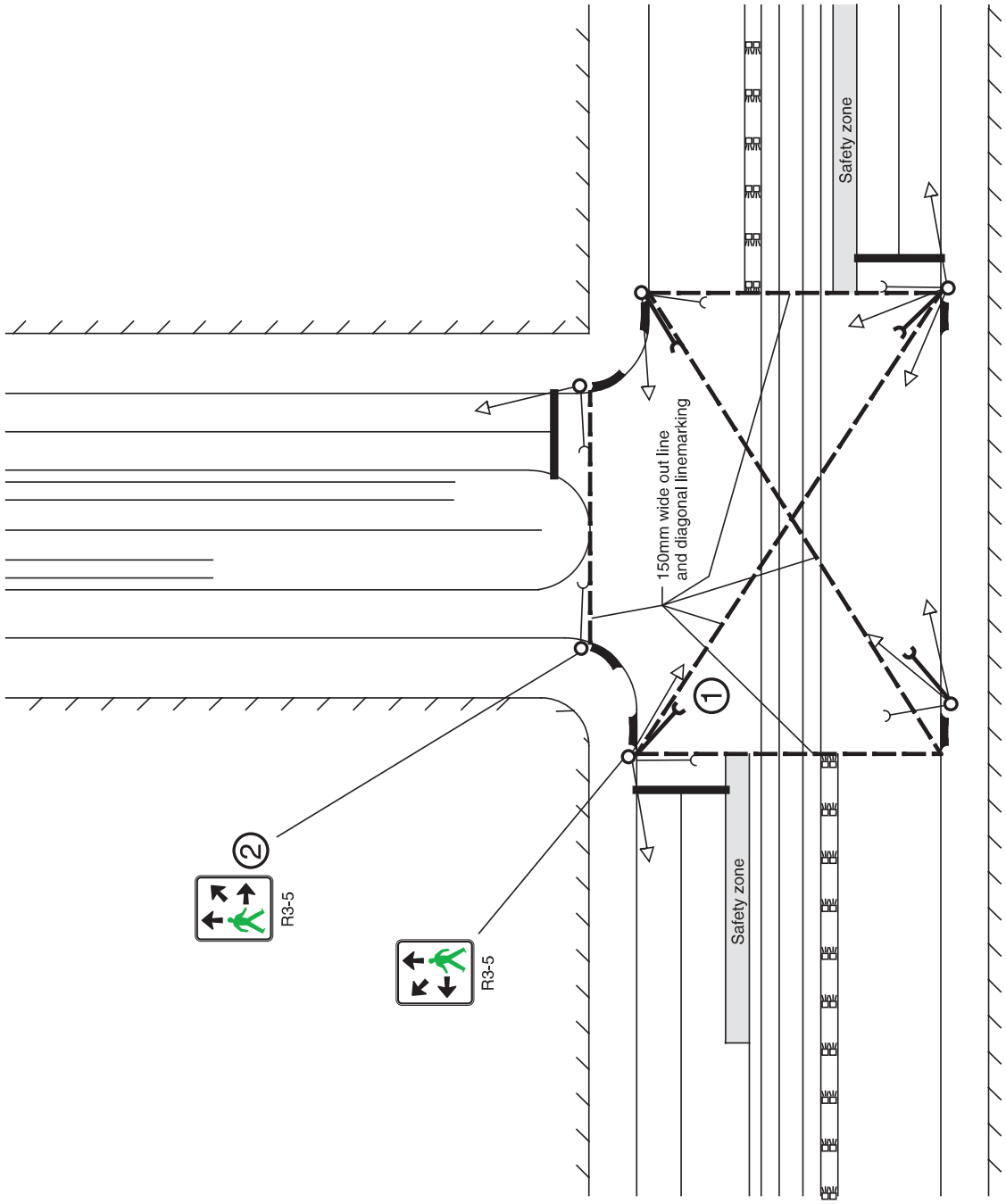


Figure 5: Typical diagonal pedestrian crossing arrangement

Notes to Figure 5:

1. *Additional pedestrian lanterns facing diagonally across the intersection are required.*
2. *Pedestrian May Cross Diagonally sign (R3-5) should be installed on all legs of the intersection.*

Clause 6.2.1 – Stop Lines

Departure

The width of all stop lines at signalised intersections shall be 600 mm. This line thickness provides enhanced conspicuity in adverse viewing conditions (e.g. wet weather) and distinguishes the stop line from other lines at signalised and unsignalised intersections.

Clause 6.2.2 – Pedestrian Crosswalks

Pedestrian cross walk lines should be as near as possible to the corners of the intersection to:

- ensure maximum visibility of pedestrians by turning motorists
- minimise the distance from the stop line to the point where left turns conflict with the parallel pedestrian movement so that the speed of left turning vehicles at the conflict point is minimised
- minimise the distance from the stop line to the cross walk on the far side of the intersection so that the time for through vehicles to clear the intersection is minimised.

The relationship between the stop and pedestrian cross walk lines is shown in Figure 6.

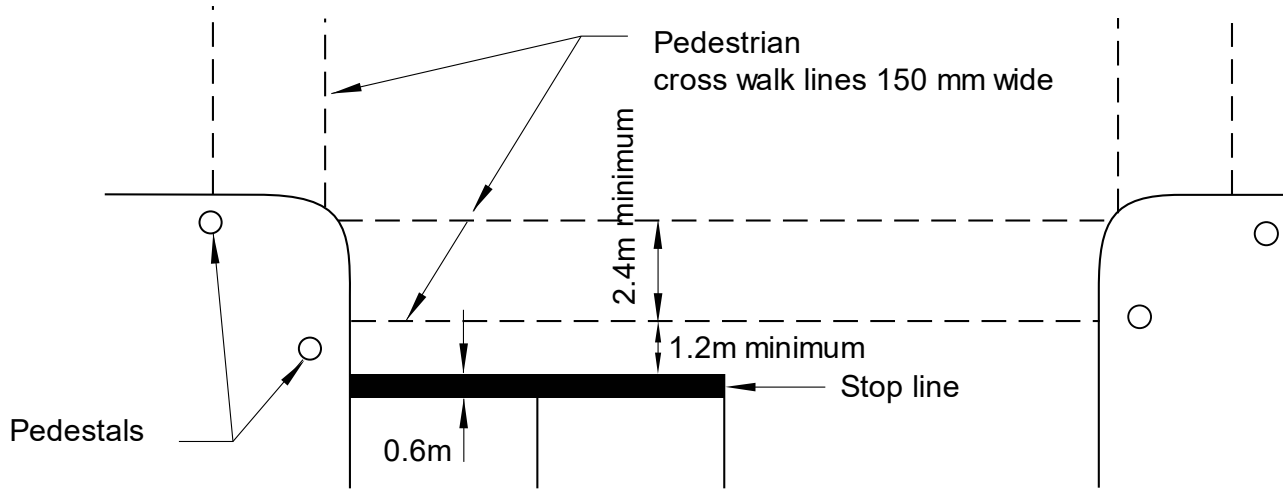


Figure 6: Typical pedestal and linemarking arrangement

Pedestrian crosswalk lines are only used at:

- signalised crossings
- unsignalised school or children's crossings
- priority path crossings.

Pedestrian crosswalk lines are not used at unsignalised crossings (except above) such as at unsignalised left turn slip lanes, or pedestrian refuges to define pedestrian walking paths.

Pedestrian crosswalk lines shall be a minimum of 2.4m wide. A wider crosswalk should be provided at intersections that experience higher pedestrian volumes.

At intersections, the crosswalk line nearer to the middle of the intersection should be a minimum of 1.2 m clear of the prolongation of the edge of the cross traffic lane.

Diagonal Pedestrian Crossing

See Clause 6.1.2 (e) for details on diagonal pedestrian crossing linemarking.

Clause 6.2.3 – Intersection Arrows

Figure 7 and Figure 8 provide additional information regarding the placement of intersection arrows at typical signalised intersections.

DTP Supplement to AS 1742.12 provides details regarding the use of intersection arrows in bus lanes and bus only lanes.

Clause 6.2.4 – Turn Lines

Turn lines shall also be provided in the following situations:

- Where there are multiple turning lanes at a signalised intersection (including on a slip lane).
- For a single turning lane into a multi-lane road where turning vehicles are guided into a lane other than the right-most lane of the departure road.
- The intersection is on a vertical curve such that right turning drivers could be unsure of their direction of travel.
- One or more of the approaches is sharply angled.
- The divided road carriageway width on two or more approaches exceeds 10.5 m.
- The dividing line on opposing undivided approaches of an intersection are offset by more than 3 m.
- In other situations where there may be confusion regarding the turning movement path(s) (for both single and multiple turning lanes).

When a driver of a right turning vehicle filtering through an intersection has difficulty in determining where to stop, which may be due to the curvature of the road and/or vehicles making a right turn from the opposite direction, a 300 mm wide hold line may be marked to indicate where to wait prior to completing their turn (refer to Figure 7). The exact location of the hold line is subject to a swept path assessment using the Design Vehicle to ensure the location is compatible with the road geometry.

Examples of the use of turn lines are shown in Figure 7 and Figure 8.

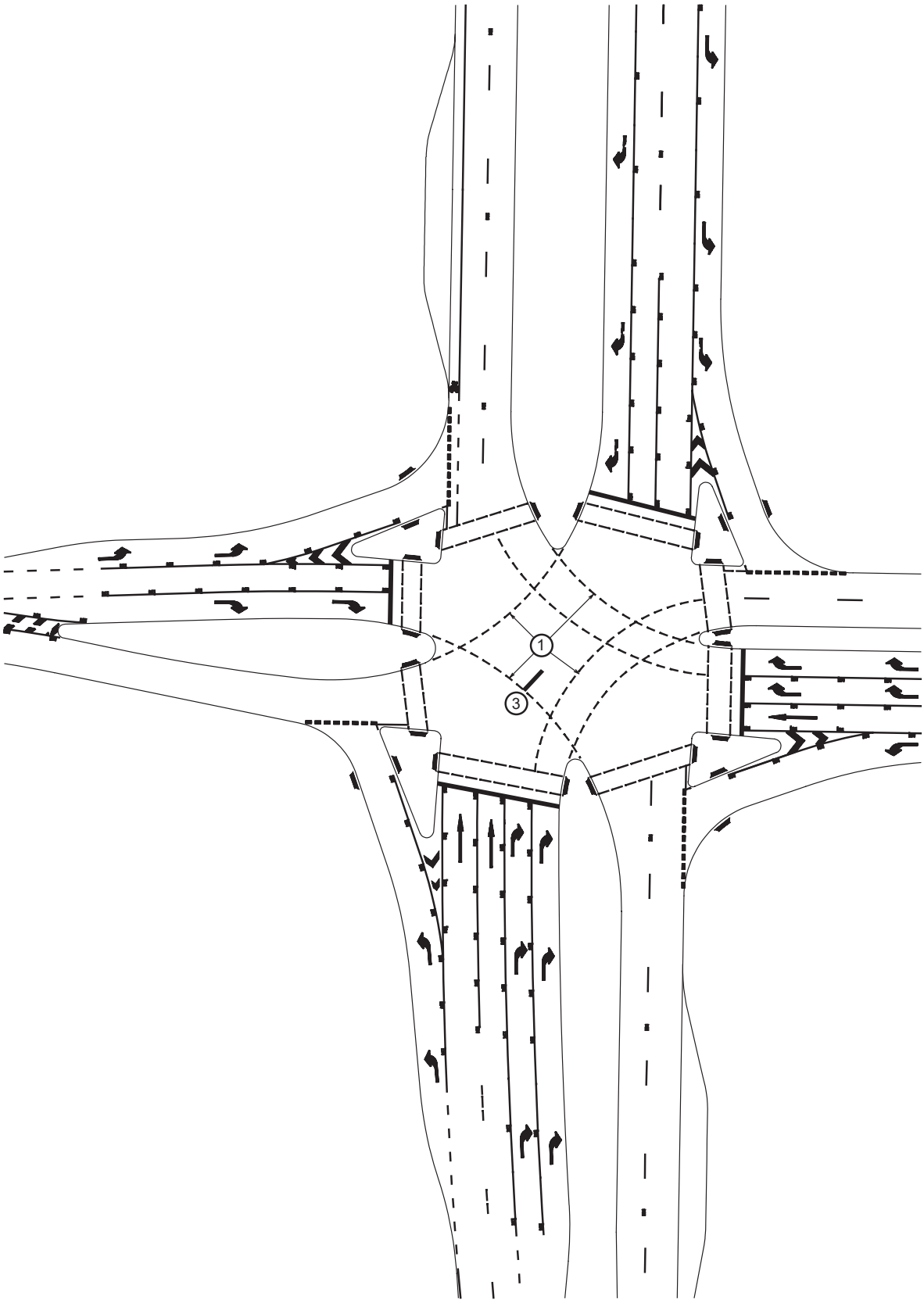


Figure 7: Typical use of turn lines at a signalised intersection

Notes to Figure 7 shown after Figure 8.

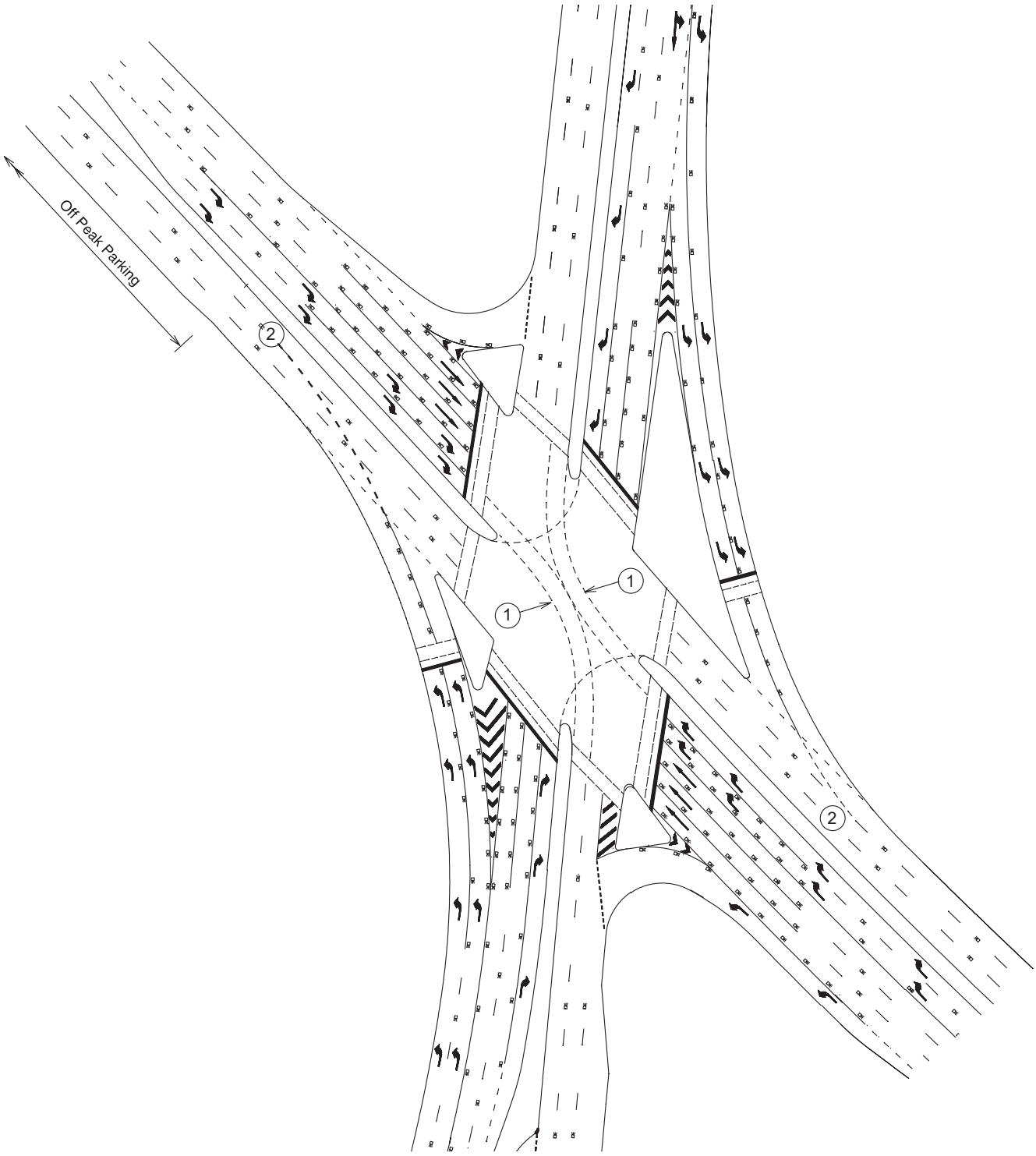


Figure 8: Special use of turning lines at the intersection of major arterial roads

Notes to Figure 7 and Figure 8:

1. *Adequate separation of turn lines should be provided to meet the swept path requirements of opposing right turning vehicles, turning concurrently. In special cases where split right turn phases are used, a lesser width may be used as shown in Figure 8.*
2. *Turn line guides left turn traffic into the appropriate lanes; turn line continues to meet lane line.*
3. *A 300 mm wide hold line may be installed to indicate the location where turning traffic may stop when filtering, so as not to conflict with the opposing through movement.*

Clause 7.1 – SIGNALS FOR EMERGENCY SERVICE FACILITIES

Departure

Victoria does not use flashing red signals (double flashing red lights) as there is a risk that drivers may not be familiar with this signal operation and may not stop when the signals are operating.

Three-aspect signal faces should be used instead of two-aspect signal faces. The sudden activation of the two-aspect signals, where previously no signal was displayed, could cause confusion, especially for drivers not familiar with the site.

For additional information regarding the operation of signals at emergency service facilities, refer to DTP Supplement to AGTM Part 10.

Clause 7.2 – ADVANCE WARNING TRAFFIC SIGNAL SIGN ASSEMBLIES

Standard drawing W3-V101 in the DTP Supplement to AS 1743 provides a template for the design of this assembly.

Where active advance warning signals are being provided for signals installed in isolated rural locations, or in other situations where signals may not be expected (rather than because of restricted sight distance), the advance warning signals should be positioned at the Stopping Sight Distance away from the stop line. Refer to Austroads Guide to Road Design Part 3 for further information on Stopping Sight Distances.

Clause 7.4 – ROUNDABOUT METERING SIGNALS

An additional signal face beyond the location of the stop line (but not adjacent to the roundabout holding line) should be provided to ensure the signals are readily visible to traffic stopped at the stop line.

Clause 7.5 – LEFT TURN ON RED AFTER STOPPING

Departure

The use of left turn on red (LTOR) is not permitted. Refer to DTP Supplement to AGTM Part 10 for further information.

This document is also available in an accessible format at transport.vic.gov.au

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