Operational Instruction

Traffic Signal Faces
Traffic Signal Faces - 14.2

AMENDMENT RECORD

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Manager, Traffic Services
18 / 02 / 2020

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Traffic Services, Road and Marine Services Division, DPTI
Email: dpti.tassadminsupport@sa.gov.au

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1. **Scope**

The aim of this Operational Instruction is to ensure that the signal faces are aimed in the correct direction so as to maximise the response from drivers and reduce confusion. It will enable designers to specify the correct visors and louvres to be attached to traffic signal lanterns associated with traffic signal faces and to provide, where necessary, screening of signal faces from adjacent approach roads.

This guide is intended to avoid the unnecessary provision of louvres and 300 mm lanterns whilst providing for all the functional requirements of the signal faces according to nationally approved standards. It also provides guidance for installing traffic signals co-located with railway crossings.


The guidance provided in this Operational Instruction is intended to provide consistent application of the traffic signal lanterns on roads under the care, control and management of Department of Planning, Transport and Infrastructure.

2. **Definitions**

A list of definitions referenced from the Australian Road Rules, Austroads Glossary of Terms, AS 2144 Traffic signal lanterns, AS 1742.7 Railway crossings and AS 1742.14 Traffic signals are repeated here where pertinent.

**Approach**
That section of road, consisting of one or more lanes, used by vehicles approaching an intersection or mid-block site.

**Aspect** (or Traffic Signal Aspect)
A single optical system (circular, arrow, or symbolic) on a signal face capable of being illuminated at a given time. Red, yellow, green and white aspects are used for vehicle movements.

**Controlled Area**
A portion of a roadway or intersection, the entry to which is controlled by traffic signals, delineated at entry either by a marked stop line or in its absence, the primary signal position, and at exit by the point beyond which there is no further conflict with intersecting vehicular and pedestrian traffic.

**Display** (or Signal Display)
A signal aspect that is illuminated such as circle, arrow or pedestrian displays.

**Dual Primary Signal Face**
The signal face mounted on a post either on the median at or near the right of the stop line, or if there is no median or the median is too narrow, to the right and near the projection of the stop line.
Extended Range Lantern
A vehicular lantern with a light output and distribution which is suitable for traffic signalling applications that require recognition by vehicle drivers from distances of up to 240 m.

Flashing Signal (or Twin Red Lights)
A device showing, in a horizontal or diagonal arrangement, 2 illuminated red discs that flash alternately.

General Purpose Lantern
A vehicular lantern with a light output and distribution which is suitable for traffic signalling applications that require recognition by vehicle drivers from distances of up to 100 m.

Louvres
An assembly of mechanical baffles mounted within the visor to reduce sun phantom (horizontal louvres) or to restrict angular coverage of a signal (vertical louvres).

Overhead Signal Face
The signal face mounted above the roadway.

Primary Signal Face
The signal face mounted on a post at or near the left of the stop line of the approach.

Railway Crossing
Any crossing of a railway at grade, providing for vehicular traffic and/or other road users, including pedestrians.

Secondary Signal Face
The signal face mounted on a post on the downstream side to the right of the approach.

Signal Face (or Traffic Signal Face)
A set of signal aspects in a common assembly generally in one or two columns placed together with a target board to improve signal visibility, facing traffic from one direction.

Tertiary Signal Face
The signal face mounted on a post on the downstream side to the left of the approach.

Traffic Signal Lantern
An assembly comprising one or more aspects, together with means of connecting them to the power supply and facilities for mounting the complete assembly.

Visor
An attachment to the signal face to minimise sun-phantom or veiling reflection effects or to reduce the possibility of a signal being seen by traffic for which it is not intended.
3. **Vehicle Displays - Face Functions**

Table 3.1 defines the main functions of the primary signal faces as providing warning and stopping information to drivers; and the main function of the secondary and tertiary faces as providing starting and manoeuvring information to drivers.

<table>
<thead>
<tr>
<th>Location of Signal Face</th>
<th>Main Functions Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Warning</td>
</tr>
<tr>
<td>Primary</td>
<td>Yes</td>
</tr>
<tr>
<td>Secondary</td>
<td>‡</td>
</tr>
<tr>
<td>Tertiary</td>
<td>‡</td>
</tr>
<tr>
<td>Dual Primary</td>
<td>Yes</td>
</tr>
<tr>
<td>Overhead Primary</td>
<td>Yes</td>
</tr>
<tr>
<td>Overhead Secondary</td>
<td>‡</td>
</tr>
<tr>
<td>Overhead Tertiary</td>
<td>‡</td>
</tr>
</tbody>
</table>

‡ These functions may also be provided depending on site geometry, topography and other conditions.

Extracted from Table 8.1 Austroads Guide to Traffic Management (GTM) Part 10 (2019) page 136

4. **Vehicle Displays - Aiming Distance Requirements**

<table>
<thead>
<tr>
<th>Approach speed (km/h)</th>
<th>Stopping (metres from stop line)</th>
<th>Warning (metres from stop line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>50</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>80</td>
<td>130</td>
</tr>
<tr>
<td>70</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>80</td>
<td>120</td>
<td>170</td>
</tr>
</tbody>
</table>

Extracted from Table 8.3 Austroads GTM Part 10 (2019) page 143

Warning sight distance is to be achieved by the alignment of all primary signal faces.

Stopping sight distance is to be used as the initial alignment of all secondary and tertiary signals.

Starting sight distance is to be achieved by turning the secondary or tertiary signal face towards the centre of the approach so that the display is clearly discernible to a driver stopped 3 metres from the stop line on the approach to which the signal face applies. However, it is not necessary for the driver at the stop line to be able to view the full face of the display.

Starting sight distance, where a secondary or tertiary signal face applies to a single traffic movement only, is to be achieved by turning the lantern towards the centre of the approach lanes used for that traffic movement so that it is clearly visible to a driver stopped 3 metres from the stop line on the lanes to which it applies.

It is desirable to achieve warning sight distance with tertiary and secondary lanterns where this is achievable without compromising the stopping or starting functions.
5. Vehicle Displays - Sizes and Numbers of Signal Faces

Typical standard signal face sizes are shown in Table 5.1 below.

<table>
<thead>
<tr>
<th>Speed Zone (km/h)</th>
<th>Aspect Type</th>
<th>Primary</th>
<th>Duplicate Primary</th>
<th>Secondary/Tertiary</th>
<th>Obscured Primary/Secondary</th>
<th>Extended Range Overhead</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 70</td>
<td>Circular</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Arrow Symbols</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>80 – 110</td>
<td>Circular</td>
<td>300</td>
<td>300</td>
<td>200/300²</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Arrow Symbols</td>
<td>300¹</td>
<td>300¹</td>
<td>300¹</td>
<td>300¹</td>
<td>300</td>
</tr>
</tbody>
</table>

NOTES:
1. May be 200 mm where turning speed < 75 km/h
2. Where there is no duplicate primary signal at an extended range approach, the secondary or tertiary signal will need to be 300 mm

Where an intersection is in a speed zone less than 80 km/h, all signal faces will be 200 mm. The design sight distance for 200 mm aspects is 100 m, and for 300 mm aspects is 240 m.

Rules for the allocation of lanterns to an approach:

- A minimum of 3 circle aspects shall be provided for any through movement.
- A minimum of 2 arrow aspects shall be for any turning movement.
- Extended range lanterns (300 mm) are required at speeds of 80 km/h and over.
- Where a 300 mm overhead primary signal aspect has been provided for the extended range functionality the size of the lower mounted primary lantern signal faces may be reduced to 200 mm (subject to the minimum number of 300 mm lanterns being provided).
- All signal aspects, including combinations of circle and/or symbolic arrows, on the same signal face shall be the same size.
- Where a 300 mm aspect is required this shall take precedence over the provision of the 200 mm aspect size.
- The primary signal face shall be provided on all approaches except where it is obscured by an obstruction, e.g. by trees or verandas at close range (say less than 2 m). Where a primary signal face would be obscured by an obstruction as described above and therefore cannot be provided, an overhead primary signal face shall be provided to replace it. Where overhead signal faces are provided, not for extended range but merely as an alternative location to otherwise obscured signal faces, the overhead will be 200 mm.
• For circular aspects, where 300 mm signal faces are provided for the extended range function, at least two 300 mm signal faces are to be provided. These will normally be provided at the primary (or overhead primary if added) and dual primary locations. Where there is no dual primary, the second 300 mm signal face shall normally be provided at the secondary location. However, where a 300 mm left turn arrow is required with the tertiary circular signal face and if no right turn arrow is provided, the secondary circular aspects may be 200 mm.

• For arrow aspects where a speed zone is 80 km/h or over, two extended range 300 mm signal faces shall be provided to facilitate the “warning” and “stopping” function of the primary signal face on the turn approach. However, where the turning speed of the vehicles is below 75 km/h, the size of the lanterns should be reduced to 200 mm, providing the circular display, as part of the combined signal face, is also permitted to be provided at the 200 mm size.

6. Vehicle Displays - Devices to Screen Signal faces (Visors and Louvres)

6.1 Types of visors

There are 3 types of visors. Their use and cut off angles are tabulated in Table 6.1.

Type A OPEN – Recommended for use in most locations, can be visible up to 180°.

Type B CLOSED – Recommended for use where the lantern is to be hidden from the view of drivers on other approaches. In terms of the normal shielding of secondary and tertiary lanterns from the view of drivers on adjacent approaches, the Type B should be all that is necessary for effective and safe control.

Type C CUTAWAY – These are cut away on one side only and are visible on the cutaway side as if they are Type A. Type C is only used with the long visor and is not normally used by DPTI. Its use may however be considered if both the stopping and starting aiming distances are not achievable in the same lantern by use of the Type B visor. Where a Type C is used, it should be specified as left and right and the cutaway should be on the side nearest to the driver on the approach to which the lantern applies.

Refer to AS 2144 Traffic Signal Lanterns (2014) Figure 7.10 for details.
### Table 6.1 Cut Off Angles for Visors

<table>
<thead>
<tr>
<th>Lantern size (mm)</th>
<th>Visor Type as AS 2144</th>
<th>Length (mm)</th>
<th>(^1)Angle for total cut off of signal indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>Open Type A</td>
<td>200</td>
<td>No restriction</td>
</tr>
<tr>
<td>200</td>
<td>Closed Type B</td>
<td>200</td>
<td>90º</td>
</tr>
<tr>
<td>200</td>
<td>Closed Type B</td>
<td>300</td>
<td>67º</td>
</tr>
<tr>
<td>200</td>
<td>Cutaway Type C</td>
<td>300</td>
<td>Open side no restriction, 34º on closed side</td>
</tr>
<tr>
<td>300</td>
<td>Open Type A</td>
<td>300</td>
<td>No restriction</td>
</tr>
<tr>
<td>300</td>
<td>Closed Type B</td>
<td>300</td>
<td>90º</td>
</tr>
<tr>
<td>300</td>
<td>Closed Type B</td>
<td>400</td>
<td>74º</td>
</tr>
<tr>
<td>300</td>
<td>Cutaway Type C</td>
<td>400</td>
<td>Open side no restriction, 37º on closed side</td>
</tr>
</tbody>
</table>

NOTES:
1. The angle for total cut off of signal indication is essentially the maximum viewing angle.
2. Drafting templates S-4538 Sheet 1 and Sheet 2 showing the visibility angles can be used to assess the risk of sighting signal faces on adjacent approach roads and provide guidance on the devices to be used to minimise the risk.

Table derived from Table 8.4 Austroads GTM Part 10 (2019) page 147

### 6.2 Application of standard visors and louvres

Primary lanterns shall be fitted with open visors. Secondary and tertiary lanterns shall be fitted with closed visors.

No louvres shall be fitted to symbolic displays such as “arrows” and “B” aspects. Symbols with louvres will appear distorted to drivers and may be confused with circular displays.

Long visors, and where necessary, vertical louvres shall be fitted to signal faces that may be sighted by a driver on an adjacent approach road where the display could be misconstrued to apply to the driver. This requirement does not apply to signal faces displaying overlapping traffic movements on the same approach road, e.g. turning arrows in the same signal face with circular displays.

### 6.3 Types of special visors used at closely associated stop lines

There are two types of angled visor and louvre configurations for use at closely associated stop lines – tilted visor using a special visor with horizontal louvres and a conventional closed visor using vertical louvres.

#### 6.3.1 Tilted visor

The tilted visor for use with 200 mm lanterns comprises a visor, 300 mm long with five 120 mm louvres at 25 mm spacing, fixed at an angle of 10º to the normal of the signal face as shown in Figure 6.1.
6.3.2 Vertical louvred visor

The visor with vertical louvres may be used with 200 mm or 300 mm aspects, and may be used in all aspects of a standard 3-aspect circular signal face.

Vertical louvres can be angled more acutely than tilted visors and may therefore be more effective where extreme obscuration is required.

The type of visor (200mm is shown in the example) to be used with vertical louvres is shown in Figure 6.2.
6.4 Application of special visors with louvres

Special visors are normally used where adjacent traffic signals are less than 200m apart and should not be used where the distance, measured between adjacent controlled stop lines is greater than 200m.

Visors with louvres are positioned at an angle to the view of drivers and are intended to remove any confusion for the driver where closely associated stop lines have different displays. This situation is typically found where a driver may misread the green display from a downstream adjacent signal site to indicate that it is safe to proceed across the stop line at the near site, which may be showing a contrary display (red or yellow).

Where there is a problem with stopped vehicles proceeding during the red display, the use of vertical louvres might be a more effective treatment than the tilted visor. Drivers will often start to move based on the extinguishing of the red signal and where it is considered necessary to address this issue, the vertical louvre arrangement can be applied to the yellow and red displays as well as the green.

An example of where to locate visors and louvres at staggered “T” intersections is shown in Figure 6.3.

The principle objective of using angled visors with louvres is to avoid drivers approaching the first approach (1), which is displaying yellow or red being confused by the second approach (2), which is displaying green.

Peripheral vision decreases as speed increases and drivers focus their attention farther ahead. The driver can therefore be unaware of any changes to interposing signals. There is also the possibility that a driver, waiting at a stop line, who is only able to see the secondary lanterns, may inadvertently proceed on seeing a green signal at the adjacent signal site.

Where closely associated intersections are controlled for example at a staggered T-configuration, the use of visors and louvres needs careful design. The use of
vertical louvres in preference to tilted visors can be very effective in screening closely associated lanterns from through movements but continue to provide side road drivers with clear indication of the green signal at the second approach (2) on the major road. This is particularly the case for the tertiary side (and left primary) lanterns for a right-left stagger and the secondary side (and right primary) lanterns for a left–right stagger as shown in Figure 6.3 where the signal faces suitable for vertical louvres are shown with are circled in red.

When the tilted visor is used this will normally be applied to the green circular aspects on all signal faces on an approach (2). However, where vertical louvres are used but are not considered a suitable treatment for some signal faces, the remaining signal faces on the same approach may have the tilted visor applied to the circular green aspects.

A mixture of both vertical louvres and tilted visors should provide adequate obscuration without restricting a driver’s view of the significant lanterns.

![Figure 6.3 Staggered T Intersection Showing the Locations of Louvres](image)

Legend
- Tilted Lantern
- Standard Lantern
- Approach No.
- Signal face with vertical louvres
7. **Vehicle Displays - Target Boards**

All traffic signal faces except pedestrian displays shall be provided with target boards. Lanterns **shall** be configured with the front of the aspects in the same plane.

Where signal faces control the same approach road, the signal aspects shall be configured as a single lantern within the single target board. Examples of typical signal faces are shown below in **Figure 7.1**.

![Figure 7.1 Permitted Signal Face Layouts](image)

Extracted from Figure 8.15 Austroads *GTM Part 10* (2019) page 122
8. **Pedestrian Displays – Application of Visors and Louvres**

Pedestrian lanterns are usually to be orientated in the direction of the middle of the crosswalk on the far side of the crossing. All pedestrian lanterns are required to be fitted with standard visors as shown in AS 2144 (2014) Figure 7.12 page 43. Where split approach pedestrian phasing is used, vertical louvres are required to be fitted to both the red and green pedestrian aspects at the kerb side.

Split approach pedestrian phasing is normally used where there is a median and the road is exceptionally wide. At these locations, the long crossing time necessary for a single pedestrian approach would create excessive and unnecessary delays to all users of the intersection.

The median where split approach phasing is used should be 2.4 m or wider in order to accommodate waiting pedestrians.

Where split approach pedestrian movements are provided, it is essential that a pedestrian standing on the side of the road, waiting to cross, is unable to see the pedestrian lantern on the furthest side of the road as this may be providing a conflicting signal. This correct view of the pedestrian display is achieved by providing an unobscured pedestrian face mounted on the pole in the median and an obscured face on the pole on the far kerb.

To obscure the potentially conflicting signal face, the marked crosswalks on each approach are aligned at a different angle to the kerb and visors with vertical louvres are fitted to the pedestrian displays on the opposite kerbside to mask the pedestrians’ view of the signal face.

The visors and louvres to be fitted on the pedestrian signal faces for split approaches are shown in Figure 8.1.
9. **Vehicle Displays - Traffic Signals at Railway Crossings**

All new installations and changes to a railway crossing assembly located in the vicinity of a railway crossing on public roads require consultation and approval from the Rail Infrastructure Manager.

Where a traffic signal shares the same pole as a railway crossing flashing signal assembly (RX-5), the following equipment shall be installed in the following order starting from the top:

- Audible warning device, if required.
- Railway crossing sign (R6-25). For new installation and replacement, this sign supersedes the R6-24 ‘crossbuck’ sign.
- The (Number)…TRACKS sign (W7-2-2), when more than 1 track is present at the crossing. This sign shall be located directly below the R6-25 sign.
- Traffic signal face.
- The railway crossing flashing signal shall be located immediately below the traffic signal face.
- The STOP ON RED SIGNAL sign (R6-9). This sign may be omitted if there is insufficient space to locate it.

Examples of a traffic signals and flashing signal assembly are shown in **Figure 9.1** and **Figure 9.2**.

![Figure 9.1](image-url) Traffic Signals Incorporated into an RX-5 Assembly
Figure 9.2 Traffic Signals Incorporated into an Overhead Flashing Signal Assembly