

11.1 Introduction (AS 3.12.2)

This section provides the basic information to effectively use illuminated flashing arrow signs. These signs comprise a matrix of lamps or LED aspects in the form of an arrow that is flashed in a cyclic manner to either the left or right, indicating the direction in which approaching vehicles are to pass.

The equipment is to be operated in accordance with this section and with the manufacturer's instructions. As part of the daily routine tasks and record keeping, a log must be kept of the location and the period of display of the signs. This documentation may be required in Court in case of an accident or other incident such as a traffic infringement. Other bodies working on public roads are encouraged to follow these practices where they are applicable. Refer to Section 6, *Record keeping and reporting*, for more information.

Flashing arrow signs are intended to be applied primarily where a lane is closed or a diversion of traffic is required, typically on a multilane carriageway. They may also be adapted for mobile plant operation where only part of the road is blocked by the road plant but a clear direction to traffic is required as to which side of the plant traffic should pass through the mobile work site. An example of this is longitudinal linemarking.

Note that this section does not replace the field service manual and operating instructions for each set of equipment. It is important that operators make themselves fully acquainted with the manufacturer's instructions and recommendations before attempting to operate the equipment.

11.2 Approvals and specifications

Illuminated flashing arrow signs shall comply with the relevant Australian Standards, where they exist, and RTA specifications FAS/5 or FAS/4 Part A. The relevant Australian Standards are listed in FAS/5 and FAS/4. General operating instructions are given in this section.

In addition to the above, only equipment that has been type approved by the RTA is to be used. Testing of equipment is to be undertaken by the

RTA's Manager, Traffic Equipment and Standards. After type approval has been issued the Manufacturer or Selling Agent shall affix, to the equipment, a durable marking plate in the following format:-

This equipment conforms to
RTA – NSW TYPE APPROVAL
No.

The number shown on the marking plate shall be that shown on the Type Approval Certificate issued by the RTA Manager, Traffic Equipment and Standards.

Requests for copies of Specification No. FAS/5, FAS/4 Part A or a list of type approved equipment, and arrangements for type approval of equipment should be directed to:-

Manager, Traffic Equipment and Standards
Roads and Traffic Authority NSW
Level 5 Pod D
99 Phillip Street PARRAMATTA NSW 2150
Telephone (02) 8837 0116
Facsimile (02) 8837 0025

11.3 Definitions

These definitions are specific to this section, see also, Section 2.3, *Definitions*.

Aiming distance – the distance between the flashing arrow sign and the eye of an approaching driver.

Cycle length – the time interval between the start of the lamps being switched on and off and then on again to give a complete sequence of displays.

Flashing arrow signs – flashing electronic traffic control signs and associated equipment used at work sites and operated in one of the following modes:-

Arrow right mode (AR) – the lamps are energised to display an arrow which directs traffic to move or merge to the right.

Arrow left mode (AL) – the lamps are energised to display an arrow which directs traffic to move or merge to the left.



Double headed arrow mode (DA) – the lamps are energised to display an arrow which directs traffic to move or merge both to the left and to the right. It is usually used where the centre lane of a three lane carriageway is closed to traffic and generally in an emergency situation

Warning mode (W) – a pair of opposite diagonal lamps flash to give a strong warning or caution to approaching traffic.

Lamp matrix – an arrangement of lamps that display a message or symbol when a set or pattern of lamps is turned on or flashed.

Monitoring lamps – a set of two lamps at the rear of the sign which displays the mode of operation to the workers. Monitoring lamps are only provided on the Type C sign.

Off-time – the period of cycle time all the lamps are off. This is usually 50 to 40 percent of the cycle time.

On-time – the period of cycle time specific lamps are on. This is usually 50 to 60 percent of the cycle time.

Visibility distance – the maximum unobstructed distance the flashing displays are clearly seen under bright, daylight conditions with the specified lamps fully energised.

Visors – cylindrical matt black sleeves that are fitted around each lamp to shield them from incident light and reduce sun phantom effects.

11.4 General description of system

11.4.1 Illuminated flashing arrow sign equipment

The following three size designations are used.

Type A and Type B signs are suitable for mounting permanently on the rear of a road construction vehicle (fixed sign arrangement) or on the cab of a truck or utility vehicle (adjustable sign arrangement). Cab-mounted signs can be rotated to face either the front or the rear of the vehicle. The sign can also be rotated and locked in the face-down position for transport when the sign is not in use. They may be powered from the vehicle's electrical system or from a separate power source.

Type C signs are trailer mounted with integral generator, back-up battery supply and control equipment. Provision is made for the sign to be lowered, rotated and locked for transport or when the sign is not in use.

All signs can operate in one of four modes as detailed in Table 11.1.

Mode	Rear monitoring for Type C	Flashing lamps
Arrow right (AR)	-----■	Shaft and the right side arrow head.
Arrow left (AL)	■-----	Shaft and the left side arrow head.
Double arrow (DA)	■-----■ synchronised flash	Shaft and both the left and the right side arrow heads.
Warning (W)	■-----■ alternating flash	Pairs of diagonally opposite lamps. Gives a general message of caution or draws attention to an important traffic control sign.
Note: Lamp off ■ Lamp on		
Table 11.1 – Modes of operation		

11.4.2 Vehicle-mounted signs

Type A signs are suitable for attachment to light vehicles such as cars, panel vans or utilities or small plant items. Type B signs are suitable for attachment to heavy vehicles such as trucks and large plant items.

They are generally used on mobile works such as longitudinal linemarking, mobile survey vehicles, patrol vehicles and on shadow trucks protecting groups of workers.

11.4.3 Trailer-mounted signs

Type C signs are self contained trailer mounted units particularly designed for use on high speed roads such as rural divided roads where driver expectations are high.

They are generally used at short term or long term lane closures for work requiring one or more lanes to be closed for one or more shifts. Where

the flashing arrow signs are to operate overnight or over weekends the associated signs and devices need to be either reflectorised or lit.

11.4.4 Associated signposting and traffic arrangements

Any additional or associated signposting or traffic arrangements that may be required to be used with flashing arrow signs is to conform to the requirements of this manual.

Using flashing arrow signs tends to downgrade the effectiveness of other devices at the work site so it is essential that the associated signs and devices be in very good condition and special care be taken in their erection. The visibility distance for Type A, B and C flashing arrow signs is 500, 1000 and 1500 metres respectively. Associated signs should be located in clear view of approaching drivers, generally on the left side of the road. However, on winding alignment it may also be necessary to erect a sign or signs on the right hand side for clear viewing. Duplicate signs, on the right hand side of the road, may be considered when a driver's view may be obscured by alignment, buildings or heavy traffic. The use of larger signs may be considered for high approach speeds.

11.5 Equipment installation

11.5.1 Lamps

The brightness of the lamps is adjusted by an automatic dimming control which dims the light output for night conditions. A photocell detects the ambient light conditions that triggers the dimming facilities.

The flash rate for flashing arrow displays (AL, AR, DA) can vary from 50 to 60 percent on-time and 50 to 40 percent off-time. For diagonal flashing displays (W) the on-time and off-time is the same. The repetition rate for all modes is between 35 and 40 cycles per minute.

Two monitoring lamps are provided at the rear of the Type C sign to allow workers to monitor the mode of operation. These lamps flash as shown in Table 11.1.

11.5.2 Sign boards

Generally, the flashing arrow sign unit should be positioned so as to be as near as possible in the driver's line of sight. It is important to always locate signs to give the driver maximum visibility and hence time to understand

and react to the sign message. The visibility distance of the sign (ie. the distance at which the motorist can first become aware of the flashing arrow) varies as shown in Table 11.2. The minimum sight distance that should be provided to the flashing arrow sign depends both on the vehicle type and vehicle speed in the approach to the work area.

Table 11.2 provides a guide to the sight distances appropriate for the three types of sign. On high speed roads, every effort should be made to position the sign to achieve the desirable minimum sight distance.

Sign type	Visibility distance (m)	Sight distance	
		Desirable minimum	Absolute minimum
A	500	250	150
B	1000	500	300
C	1500	750	450
Note: Increase the sight distance by 2% for each 1% of downgrade. Decrease the sight distance by 2% for each 1% of upgrade.			
Table 11.2 – Typical sight distances for placement of flashing arrow signs			

The signs must be securely erected and anchored to prevent wind movement or interference by vandals. This is especially true for Type C signs as these are intended to be operated unattended.

The signs must also be aimed carefully to direct their display to the approaching vehicles. It is important that the sign be aimed to vehicles within the “critical zone” which covers the distances where drivers have time to react to the message and change lanes or stop if necessary. This is particularly important if the approach alignment of the road is not straight.

Sighting is usually done by means of a “sighting” device which facilitates aiming of the sign display. Such an aiming device must be substantially free of parallax error and must make allowance for the inherent downcast in the sealed-beam lamps. In the absence of a “sighting” device fitted to the sign, aiming needs to be undertaken by “trial and error”.

Table 11.3 lists the recommended aiming distances from the sign near the start of the taper defining the lane closure.

Approach speed (km/h)	Aiming distance (m)		
	Sign type		
	A	B	C
< 60	60	120	180
60	100	200	300
80	140	280	420
100	200	400	600
> 100	260	520	780
<p>Notes:</p> <p>The aiming distance should not exceed the sight distance.</p> <p>The recommended aiming distances for the Type A sign is based on the stopping distance PLUS the reaction distance for 2.5 seconds of travel PLUS an allowance of 30 metres for siting the sign past the start of the taper.</p> <p>The aiming distances for Type B and C signs are two and three times those for the Type A sign to take advantage of their greater size and visibility.</p> <p>Type C signs not usually used on low speed roads.</p>			
Table 11.3 – Aiming distances for various approach speeds			

Figure 11.1, *Illustration of aiming and sight distance*, shows the relationship between these two distances used when setting up flashing arrow signs.

11.5.3 Controls

The controls available are:-

- Power: On/Off
- Mode selection
- Mode monitoring (Type C signs only).

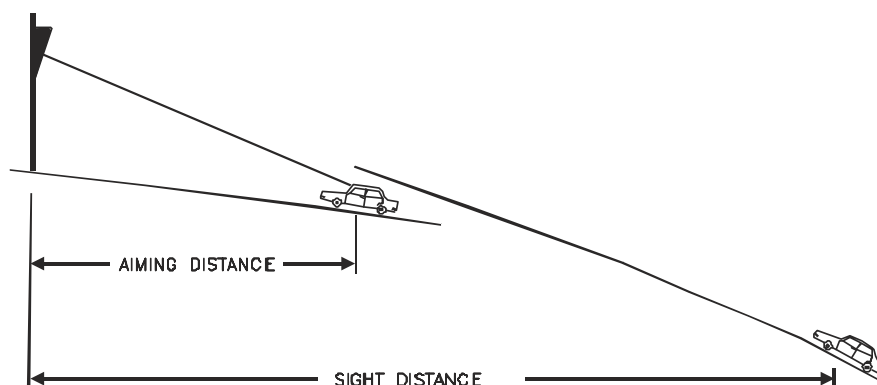


Figure 11.1 – Illustration of aiming and sight distance

11.6 Operation

11.6.1 Control modes

Although the layout and switch configuration may differ, all controls have basically the same functions, namely:-

- Arrow Right (AR)
- Arrow Left (AL)
- Double Arrow (DA)
- Warning (W).

11.6.2 Flash rate

The flash rate is fixed to the levels given in the Specifications and cannot be varied. It is important to check that all lamps are functioning to give the correct display selected by the controls.

11.6.3 Dimming

The dimming facilities are automatic but care should be taken that any incident light (from street lighting and/or vehicle headlights) falling on the photocell does not adversely interfere with the operation of the dimming feature. The photocell should be occasionally cleaned, since if it is dirty or obstructed, the lamps will not be as bright as they should be.



11.6.4 Setting up

The equipment should be set up to the Manufacturer's Instructions with particular care to the siting and aiming of the signs to suit the layout arrangement being used and the geometry of the road approach to the sign.

11.6.5 Trouble shooting

The monitoring lamps should be regularly observed to confirm that the sign is operating in the appropriate mode for the work site. It is also necessary to regularly inspect the front panel of the sign to ensure that all lamps are clean and alive.

If one lamp is not operating then check it and if it is blown replace with a new lamp. If all lamps are out or all lamps are too dim for the conditions then check the battery or generator for charge. If the charge is satisfactory but the lamps are still too dim for the conditions then check that the photocell is not being blocked from reading the true ambient light level.

11.7 Maintenance

11.7.1 Field service

Operators should familiarise themselves with the manufacturer's instructions. A high level of field service is essential to maintain the sign in good condition to provide an effective warning to motorists at all times.

Field service usually covers:-

- simple fault diagnosis and associated replacement of the faulty modules;
- routine maintenance and servicing, including replacement of lamps and other consumable components;
- keeping the equipment clean and tidy.

These requirements are detailed in the manufacturer's instructions.

11.7.2 Major repairs

If care is taken with the field service, the equipment should remain in good working condition between major service inspections and overhauls. If major faults develop the sign should be taken out of service and alternative



traffic control arrangements made. The sign should not be returned to service until the faults have been rectified.

11.7.3 Administration procedures

Refer to local office procedures in respect of administration, costing and maintenance of flashing arrow signs as an item of small plant.