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# **Policy, Application, and Technical Guidelines for Warning Flashing Signals**

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## Policy, Application, and Technical Guidelines for Warning Flashing Signals

This document is owned by Manager Traffic Management Services and authorised by Executive Director Network Operations. Please submit all comments and requests to the Network Operations Planning Manager.

### Authorisation

As Executive Director Network Operations, I authorise the issue and use of Policy, Application, and Technical Guidelines for Warning Flashing Signals.



Approved by Executive Director Network Operations

Date: 06/06/2025

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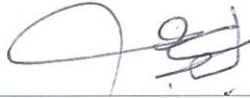

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# Document control

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# Amendments

Revision number	Revision date	Description of key changes	Section / page no.
3B	02/06/2016	Drawings 200431-0100, 200431-0104 AND 200431-0105 amended. Drawings 201431-0015 AND 201531-0060 added.	4 Header
4	13/06/2025	Combines and supersedes the following guidelines: <ul style="list-style-type: none"> <li>• Advance Warning Flashing Signals Guidelines</li> <li>• Wig Wags Policy, Application and Technical Guidelines</li> </ul>	All

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## 1 Policy statement

Main Roads will install and maintain Warning Flashing Signals (Advance Warning Flashing Signals and Wig Wags) for the safety of the network and all road users in accordance with the guidelines in this policy.

Main Roads *Road Safety Policy* targets reduction of road trauma by 50 per cent by 2030 as we work to achieve zero fatalities and serious injury by 2050.

Warning Flashing Signals have a significant potential to help Main Roads, Local Governments, and Western Australia meet these targets by alerting drivers to an identified hazard (that is, an unexpected event or situation of higher-than-normal potential risk) and advising them of an appropriate response. This supports a reduction in crashes and crash severity at critical locations.

## 2 Principles

According to the principle of the hierarchy of road safety controls (refer Austroads *Safe System Roads for Local Government*, Table 4.1) the most effective way of managing a hazard is to eliminate it. Warning Flashing Signals (Advance Warning Flashing Signals and Wig Wags) are used in locations where the hazard cannot be eliminated but can be reduced by influencing driver behaviour. Warning Flashing Signals should therefore be used only where there is an **identified hazard** that cannot be addressed with treatments that would eliminate the hazard, or where there are constraints that restrict the use of other suitable treatments.

Warning Flashing Signals should only be used where traffic engineering studies – considering such aspects as traffic speeds, traffic volumes, high truck use, visibility and crash patterns – indicate that the inclusion of these signs may be of benefit. All other reasonable engineering, signing and pavement marking solutions should be considered before installation of Warning Flashing Signals.

Main Roads will consider the installation of Warning Flashing Signals in line with the three key principles outlined in Sections 2.1 to 2.3.

### 2.1 Credible

Warning Flashing Signals must be effective in addressing identified safety issues that cannot be readily treated in any other way. They should not be installed in locations where a permanent change to the speed limit or reasonable geometric improvements could suitably address the identified hazard. Warning Flashing Signals must not be installed where they interfere with or potentially contradict other traffic control devices (TCD).

In all cases, Warning Flashing Signals are used to complement, not replace, static signage.

### 2.2 Reliable

Warning Flashing Signals must perform their intended role of influencing driver behaviour or slowing traffic, thereby reducing crash risk during typical conditions encountered at the installation location (including weather, access to power and other external factors).

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## 2.3 Relevant

The use of Warning Flashing Signals must be targeted to alert drivers to the presence of the identified hazard, under clear and consistent application guidelines.

Improper use of Warning Flashing Signals will reduce their impact and effectiveness. As such, they may only be used with Main Roads prior approval and in accordance with this guideline.

## 3 Purpose

This guideline document sets out the circumstances and process under which Main Roads will consider approval of Warning Flashing Signals.

Any proposals for the installation, modification, or removal of Warning Flashing Signals are subject to the requirements contained in this document.

## 4 Scope

### 4.1 Application and exclusions

This guideline applies to all public roads in Western Australia.

Installation, alteration or removal of Warning Flashing Signals at railway level crossings sits outside of this guideline. Refer to the [\*Railway Crossing Control in Western Australia Policy and Guidelines\*](#) for details.

This guideline does not apply to metered roundabouts or ramp metering locations.

### 4.2 Background

Warning Flashing Signals (AWFS and Wig Wags) are used in various situations to increase awareness of a specific identified hazard. That can be an unexpected event or a situation of higher-than-normal potential risk. This allows drivers to reduce speed or stop as necessary to adjust to the hazard.

Warning Flashing Signals fall into two categories:

- Advanced Warning Flashing Signals
- Wig Wags

The selection of Warning Flashing Signals is controlled by a series of warrants, as defined in the Application Guidelines (Section 7).

#### 4.2.1 Advance Warning Flashing Signals (AWFS)

AWFS take the form of twin, horizontal alternating flashing yellow displays installed as an integral part of a warning sign (the AWFS assembly). They may be flashing permanently, for certain periods of the day, or only when triggered by an event. Examples of AWFS are shown in Figure 4-1.

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The activation of AWFS warns drivers that it is probable they will need to stop, reduce speed or deviate. They are particularly beneficial where the identified hazard is not yet visible, and for heavy vehicles which require a greater stopping distance.

AWFS are installed in advance of a signalised intersection allowing drivers, upon seeing the signs activate, to safely come to a stop at the holding line or position.

AWFS may also be installed on the approach to a general hazard as part of (or in conjunction with) standard or custom warning signs to increase their prominence.



Figure 4-1: Examples of AWFS applications

Any project where AWFS are proposed should go through the road safety management (ROSMA) process as early as possible to maximise road safety outcomes, including the potential to reduce fatal and serious injuries (FSIs).

**4.2.2 Wig Wags**

Wig Wags take the form of twin two-way, diagonally opposed, alternate flashing yellow displays. They are typically one of the two types shown below, in Figure 4-2.

Wig Wags are used to highlight the location of a pedestrian crossing. The activation of Wig Wags does not in itself require action by the driver; their purpose is to alert drivers in situations where increased awareness of is required.



Figure 4-2: Typical types of Wig Wags

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## 5 Roles and responsibilities

Under the *Road Traffic Code 2000*, Regulation 297 (1), the Commissioner of Main Roads is the sole authority with power to “erect, establish or display, and [...] alter or take down any road sign, road marking or traffic-control signal”.

Under Regulation 297 (2) “the Commissioner of Main Roads may allow an authorised body to erect, establish, display, alter or take down any particular road sign, road marking or traffic-control signal, or road signs or traffic-control signals of a class or type of classes or types, and in the circumstances (if any), specified in the instrument of authorisation”.

For **AWFS at railway crossings**: The process of approval for installation, modification or removal of AWFS at railway crossings is defined by the *Railway Crossing Control in Western Australia Policy and Guidelines*, Section 12.

For **all other Warning Flashing Signals**: Under delegated authority, the Main Roads roles responsible for the recommendation, review and approval of all other Warning Flashing Signals are defined in accordance with the following:

	State roads (metro)	All other roads
Responsibility	Role	Role
Approval of installation, modification or removal of Warning Flashing Signals	Manager Traffic Management Services	Manager Traffic Management Services
Review of installation, modification or removal of Warning Flashing Signals	Traffic Services Manager / Network Area Performance Manager	Traffic Services Manager or Regional Manager
Recommendation for installation, modification or removal of Warning Flashing Signals	Network Operations Route Manager	Traffic Services Coordinator

The custodian of each section of this document is defined as follows:

Section(s)	Custodian
Section 1: Policy statement	Main Roads WA Network Operations Directorate
Section 2: Principles	Main Roads WA Network Operations Directorate
Section 3: Purpose	Main Roads WA Network Operations Directorate
Section 4: Scope	Main Roads WA Network Operations Directorate
Section 5: Roles and responsibilities	Main Roads WA Network Operations Directorate
Section 6: Definitions	Main Roads WA Network Operations Directorate
Section 7: Application guidelines	Main Roads WA Network Operations Directorate
Section 8: Technical guidelines for geometric placement	Main Roads WA Road Traffic Engineering

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Section(s)	Custodian
Section 9: Civil infrastructure guidelines	Main Roads WA Road Traffic Engineering
Section 10: Electrical infrastructure guidelines	Main Roads WA Electrical Asset Management
Section 11: Monitoring	Main Roads WA Network Operations Directorate
Section 12: References	Main Roads WA Network Operations Directorate

All enquiries regarding this guideline should be directed to the Network Operations Planning Manager.

## 6 Definitions

Refer to Main Roads *Glossary of Terms Guidelines* which provide the most commonly used terminology used by Main Roads.

Table 6-1: Definitions

Term	Definition
<b>85<sup>th</sup> percentile vehicle speed</b>	The speed at or below which 85 per cent of cars are observed to travel, under free-flowing conditions at the hazard location.
<b>Advance Warning Flashing Signals (AWFS)</b>	Twin, horizontal alternating flashing yellow displays installed as an integral part of a warning sign. The activation of AWFS warns drivers that it is probable that they will be required to stop, reduce speed or deviate.
<b>Advance Wig Wags</b>	Wig Wags installed on the approach to a pedestrian crossing, to provide advance warning of an upcoming pedestrian crossing.
<b>Heavy vehicle</b>	As defined in Austroads <i>Vehicle Classification System</i> ; vehicles from classes 3 to 12.
<b>Identified hazard</b>	An unexpected event, or situation of higher-than-normal potential risk.
<b>Main Roads</b>	Main Roads Western Australia
<b>Mid-block</b>	Located outside of the functional area of an intersection.
<b>Position Wig Wags</b>	Wig Wags installed near a pedestrian crossing, to alert drivers to the presence of the pedestrian crossing.
<b>Mid-block signalised pedestrian crossing</b>	A pedestrian crossing controlled by traffic lights, not at an intersection.
<b>ROSMA</b>	Main Roads WA Road Safety Management System
<b>Road safety audit (RSA)</b>	A formal, systematic assessment of the potential road safety risks associated with a new road project or road improvement project, conducted by an independent qualified audit team. The assessment considers all road users and suggests measures to eliminate or mitigate those risks.

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Term	Definition
<b>Traffic sign</b>	Sign as recognised in the Australian Standards or Main Roads signs index
<b>Traffic control device (TCD)</b>	Markers, signs and signal devices used to inform, guide and control traffic, including motor vehicle drivers. Pedestrians and all types of micro-mobility (bicycles, skateboards, e-scooters, etc).
<b>Traffic warden controlled children's crossing</b>	Otherwise known as a children's crossing; a pedestrian crossing defined by parallel lines across the carriageway where drivers must stop when a "children crossing – stop" flag is displayed.
<b>Wig Wags</b>	Twin two-way, diagonally opposed, alternate flashing yellow lights. The activation of Wig Wags is used to increase the conspicuousness of a pedestrian crossing.
<b>Warning Flashing Signals</b>	Includes all types of advance Warning Flashing Signals (AWFS) and Wig Wags.
<b>Wombat crossing</b>	A zebra crossing on a raised platform.
<b>Zebra crossing</b>	The colloquial term for a pedestrian crossing delineated by white stripes approximately parallel to the centre line of the roadway, where pedestrians have precedence over vehicular traffic under the road rules.

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## 7 Application guidelines

### 7.1 Introduction

Guidelines for the application of Warning Flashing Signals are provided for the following types of installation:

1. Signalised intersections (AWFS) - See Section 7.5
2. Pedestrian crossings (AWFS or Wig Wags) – See Section 7.6
3. General hazards (AWFS) – See Section 7.7

### 7.2 General considerations

Warning Flashing Signals should be used only where the identified hazard cannot be eliminated, or where there are constraints that restrict the use of other suitable treatments.

AWFS are beneficial along heavy vehicle routes, particularly in locations with obscured sightlines, or where drivers may not otherwise anticipate a specific hazard. Because the onset of the flashing signal indicates to drivers that they will need to stop, the placement and timing of the AWFS installation is critical to achieve the intended safety outcomes.

Wig Wags increase the conspicuity of pedestrian crossings and increase driver awareness of the potential for pedestrians to be in the carriageway. They are particularly beneficial where pedestrians must cross roads with a high proportion of heavy vehicles, or where crossing distances are longer.

### 7.3 New and existing sites

AWFS and Wig Wags should only be used where required by the warrants detailed in Section 7.5 to Section 7.7 of these guidelines, or where a detailed road safety audit or [ROSMA](#) analysis indicates that this treatment is the preferred solution. This process should consider such factors as traffic speeds, traffic volumes, high heavy vehicle volumes, visibility, and crash patterns.

Proposals for AWFS and Wig Wags need to also consider site constraints, including geometric, environmental and financial factors.

Any changes to signalised intersections or any other road related infrastructure that affects existing signs of this type would warrant the re-assessment of the site against this document and the upgrade of AWFS and Wig Wags to new standards and guidelines if and where required.

### 7.4 Costs and maintenance

Where a hazard has been identified that warrants Warning Flashing Signals, the asset owner of the road is responsible for funding the installation and assessment of the devices (or by agreement otherwise). Main Roads is responsible for the installation, maintenance, and operation of the Warning Flashing Signals.

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## 7.5 Signalised intersections

### 7.5.1 General

The purpose for installation of AWFS in advance of signalised intersections (the identified hazard) is to provide visual advance warning that it is probable that drivers will need to stop.

An example of AWFS on approach to a signalised intersection is shown below, Figure 7-1:

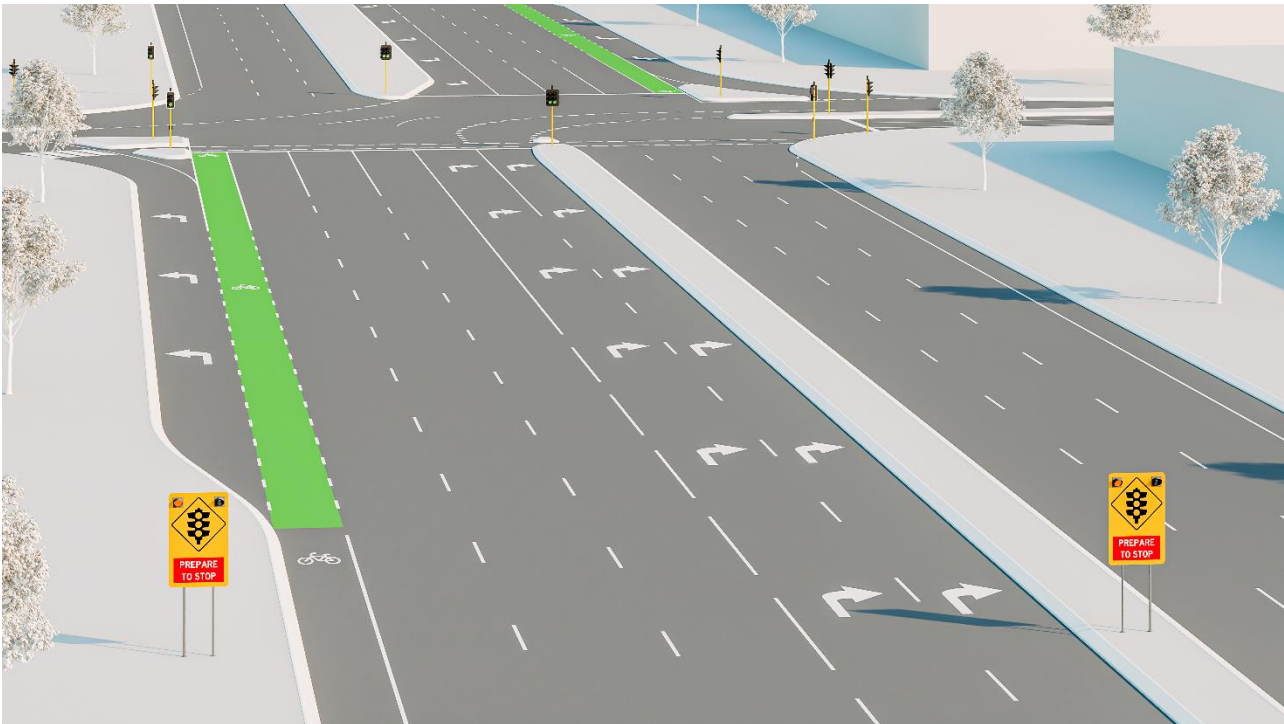


Figure 7-1: Example of AWFS on the approach to a signalised intersection

### 7.5.2 Warrants and criteria

To support the needs of heavy vehicles, AWFS **must be installed** on the approach to signalised intersections where mid-block posted speed limit is:

- **80 km/h or above** and
  - the approach lies along a heavy vehicle (HV) route approved for restricted access vehicle (RAV) Category 4 and higher, **and**
  - the traffic signal is more than 500m from the preceding signal.

In accordance with Main Roads *Speed Zoning Policy and Application Guidelines*, the maximum speed limit through traffic signals in Western Australia is 70 km/h.

Advanced Warning Flashing Signals **may** be considered on the approach to signalised intersections on roads where mid-block posted speed is:

- **60 km/h or above** and
  - the approach lies along a heavy vehicle (HV) route approved for restricted access vehicles (RAV) Category 2 and higher, **and**

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- the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) on the approach is greater than 10 per cent, **and**
- **at least one** of the following conditions apply:
  - » the minimum approach sight distance on the approach to the traffic signals cannot be achieved (refer to *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 3.2.1)
  - » the intersection approach comprises an average downgrade of 3 per cent or greater for at least the last 30 metres from the intersection (as per *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 2.2.2)
  - » where the signalised intersection is the first encountered by a driver after 20 minutes or more of uninterrupted high-speed driving ( $\geq 70$  km/h)<sup>1</sup>.

Sites meeting one or more of the above criteria will be recommended, reviewed and approved in accordance with the roles and responsibilities defined in Section 5.

AWFS **must not** be used at sites where only the turning movements are signal controlled, to avoid confusion for through traffic.

AWFS **must not** be used on new or upgraded roads to overcome geometric design issues, unless:

- the proposed design would improve road safety outcomes at the site, as determined by a road safety audit; and
- there is strong justification on why the geometric design issues cannot be overcome; and
- the geometric design issues and the proposed inclusion of AWFS to reduce the risks are appropriately reviewed and approved by Main Roads Road Traffic Engineering and Main Roads Manager Traffic Management Services.

## 7.6 Pedestrian crossings

### 7.6.1 General – AWFS

AWFS **must not** be used for pedestrian crossings.

### 7.6.2 General – Wig Wags

The purpose of installation of Wig Wags at or in advance of a pedestrian crossing is to alert drivers to the presence of a pedestrian crossing and the potential for pedestrians on or crossing a carriageway.

The four types of pedestrian crossing where Wig Wags may be installed are:

1. mid-block signalised pedestrian crossing (refer to [200431-0116](#) for details)
2. zebra or wombat crossings (refer to [200331-0164](#) and [200631-0001](#) for details)
3. traffic warden controlled children's crossings (refer to [9531-2169](#) for details)
4. non-priority pedestrian crossings.

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<sup>1</sup> This is a travelling distance shown to induce hypovigilance (see [Monotony & Hypovigilance](#), CARRS-Q).

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For selection criteria to determine the appropriate pedestrian crossing type, refer to *Main Roads Pedestrian Crossing Facilities Guidelines*.

There are two types of Wig Wags:

1. position Wig Wags, installed at the crossing location
2. advance Wig Wags, installed in advance of the crossing location.

If Wig Wags are to be installed, then the location (advance Wig Wags or position Wig Wags) will differ depending on the type of crossing and the local conditions.

All desirable design criteria for pedestrian crossings should be met; Wig Wags must not be used to compensate for poor design.

### 7.6.3 Warrants and criteria

#### 7.6.3.1 Mid-block signalised pedestrian crossing

Wig Wags used in advance of a mid-block signalised pedestrian crossing alert drivers to the likely presence of pedestrians in the carriageway and provide a visual advance warning that they may be required to stop.

Position Wig Wags **must not** be installed at mid-block signalised pedestrian crossings.

Advance Wig Wags **may** be considered where:

- mid-block posted speed is **60 km/h or above** and
- **at least one** of the following conditions apply:
  - the crossing is on a 4-lane (or more) single or 2-lane (or more) dual carriageway **and** pedestrian demand is infrequent (demand *outside* of the peak hours is fewer than 20 per day)
  - the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) on the approach is greater than 10 per cent
  - the minimum approach sight distance on the approach to the crossing cannot be achieved (refer to *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 3.2.1)
  - the approach comprises an average downgrade of 3 per cent or greater for at least the last 30 metres before the crossing (as per *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 2.2.2)
  - there is a history of driver non-compliance at the existing crossing, as evidenced by video survey
  - where the signalised intersection is the first encountered by a driver after 20 minutes or more of uninterrupted high-speed driving ( $\geq 70$  km/h).

An example of Wig Wags on approach to a mid-block signalised pedestrian crossing is shown in Figure 7-2:

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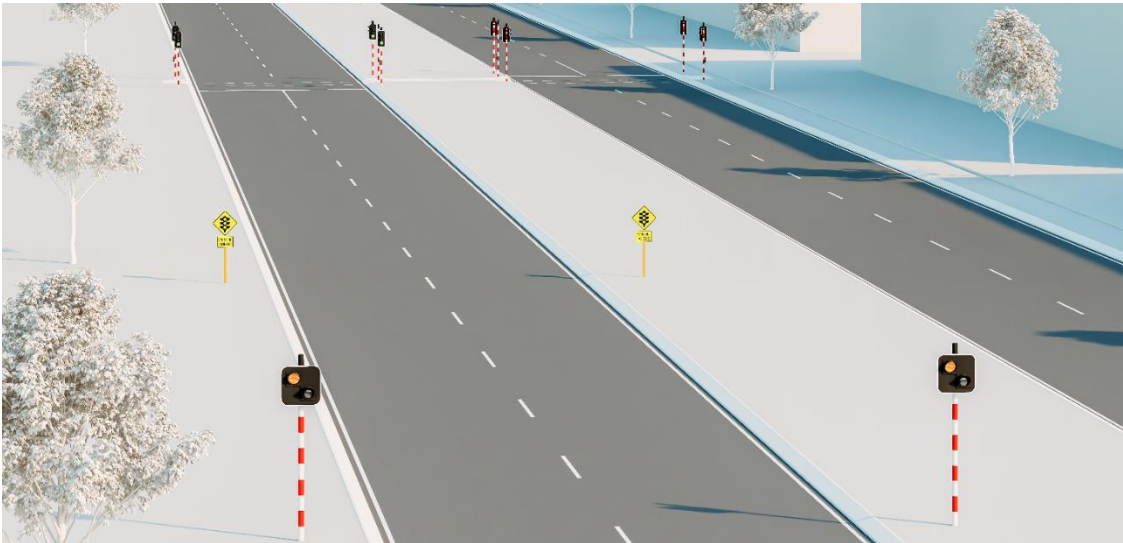


Figure 7-2: Example of advance Wig Wags on approach to a signalised pedestrian crossing

### 7.6.3.2 Zebra or wombat crossings

As per *Road Traffic Code* Regulation 62, “a driver must give way to a pedestrian or relevant rider who is on a pedestrian crossing”. Safe operation of a zebra or wombat crossing is dependent upon the driver being able to identify the crossing, observe a pedestrian or cyclist on or near the crossing, then stop or slow down to give way to the pedestrians or cyclists using the crossing.

Wig Wags used at a zebra or wombat crossing alert drivers to the presence of a pedestrian crossing facility where there may be a need to give way to a pedestrian. An example application is shown below, Figure 7-3.



Figure 7-3: Example of position Wig Wags installed at an existing wombat crossing

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Position Wig Wags **may** be considered for existing locations **only**, where:

- the crossing is on a 4-lane (or more) single or 2-lane (or more) dual carriageway road, **and**
- **at least one** of the following conditions applies:
  - it is necessary to increase the conspicuousness of the crossing due to environmental factors such as:
    - » within a shopping strip with continuous parked vehicles
    - » street furniture that may reduce the prominence of the zebra or wombat crossing
  - the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) is greater than 10 per cent
  - the minimum approach sight distance on the approach to the crossing cannot be achieved (refer to *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 3.2.1)
  - there is a history of driver non-compliance at the existing crossing, as evidenced by video survey.

If position Wig Wags are provided, then advance Wig Wags **may** be considered where:

- mid-block posted speed is **60km/h or above**, and
- **at least one** of the following conditions apply:
  - the approach lies along a heavy vehicle (HV) route approved for restricted access vehicles (RAV) Category 4 and higher **and** the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) on the approach is greater than 10 per cent
  - the minimum approach sight distance on the approach to the crossing cannot be achieved (refer to *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 3.2.1)
  - the approach comprises an average downgrade of 3 per cent or greater for at least the last 30 metres before the crossing (as per *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 2.2.2)
  - where the signalised intersection is the first encountered by a driver after 20 minutes or more of uninterrupted high-speed driving ( $\geq 70$  km/h).

Advance Wig Wags for zebra or wombat crossings **must not** be installed without also providing position Wig Wags at the crossing.

In accordance with Main Roads *Pedestrian Crossing Facilities Guidelines*, zebra and wombat crossings are not permitted to be installed on a 4-lane (or more) single or 2-lane (or more) dual carriageway road. As such, Wig Wags **must not** be installed at new zebra or wombat crossings.

### 7.6.3.3 Traffic warden controlled children's crossing

Traffic warden controlled children's crossings are part-time facilities catering primarily for school children. Crossings are only in operation when children crossing flags (R3-3 in AS 1742.10) are displayed. As per *Road Traffic Code* Regulation 61(3), "a driver must stop the vehicle before it reaches a children's crossing, if a 'children crossing - stop' sign is displayed to face approaching drivers; and must not permit any portion of the vehicle to enter upon the children's crossing, while any pedestrian or relevant rider is on it or while the sign is displayed".

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Wig Wags used in advance of a traffic warden controlled children's crossing alert drivers to the likely presence of pedestrians on the carriageway and provide a visual advance warning that drivers may be required to stop. An example application is shown below, Figure 7-4.

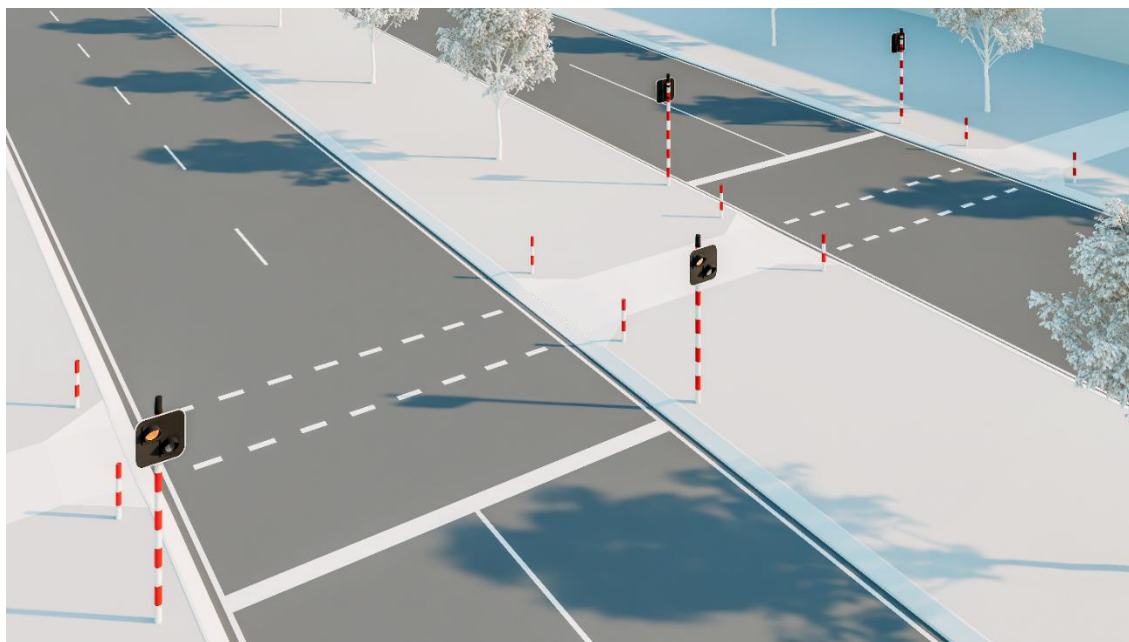


Figure 7-4: Example of Wig Wags installed at a warden-controlled children's crossing

Position Wig Wags **may** be considered where:

- the crossing is on a 4-lane (or more) single or 2-lane (or more) dual carriageway road **and**
- **at least one** of the following conditions apply:
  - a minimum of 1000 vehicle movements (total in both directions) occur in one hour during the school crossings period
  - the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) is greater than 10 per cent
  - there is a history of driver non-compliance at the existing crossing, as evidenced by video survey.

If position Wig Wags are provided, then advance Wig Wags **may** be considered where:

- mid-block posted speed is **60 km/h or above** and
- **at least one** of the following conditions apply:
  - the approach lies along a heavy vehicle (HV) route approved for restricted access vehicles (RAV) Category 4 and higher **and** the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) on the approach is greater than 10 per cent
  - the minimum approach sight distance on the approach to the crossing cannot be achieved (refer to *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 3.2.1)
  - the approach comprises an average downgrade of 3 per cent or greater for at least the last 30 metres before the crossing (as per *Main Roads Supplement to AGRD: Part 4A- Unsignalised and Signalised Intersections* Section 2.2.2)

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- where the signalised intersection is the first encountered by a driver after 20 minutes or more of uninterrupted high-speed driving ( $\geq 70$  km/h).

Advance Wig Wags for warden-controlled children's crossings **must not** be installed without also providing position Wig Wags at the crossing.

#### 7.6.3.4 Non-priority pedestrian crossings

The 'Pedestrians' (W6-1) sign or 'Children' (W6-3) sign (see Figure 7-5) may be used to warn drivers of the potential presence of pedestrians on or crossing the road at a non-priority crossing. That is, in locations where there is not a zebra or wombat crossing, operated signal (mid-block) pedestrian crossing, or warden controlled children's crossing.



Figure 7-5: Example of pedestrian crossing (W6-1) [left] and children crossing (W6-3) [right]

Where these signs do not provide sufficient warning (due to poor visibility of the warning signs) or when pedestrians are mostly present at certain time of the day, Wig Wags may be appropriate to supplement the W6-1 or W6-3 warning sign according to the following criteria.

Advance Wig Wags **may** be considered where:

- Mid-block posted speed is **60 km/h or above** and
- the crossing is on a 4-lane (or more) single or 2-lane (or more) dual carriageway road, **and**
- **at least one** of the following conditions apply:
  - the minimum approach sight distance on the approach to the crossing cannot be achieved (refer to Main Roads *Supplement to AGRD*: Part 4A - Unsignalised and Signalised Intersections Section 3.2.1)
  - the daily percentage of heavy vehicles (Austroads Level 3 classification 3-12) on the approach is greater than 10 per cent
  - the approach comprises an average downgrade of 3 per cent or greater for at least the last 30 metres from the crossing (as per Main Roads *Supplement to AGRD*: Part 4A - Unsignalised and Signalised Intersections Section 2.2.2).

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## 7.7 General hazards

### 7.7.1 General

AWFS on the approach to a general identified hazard are installed as part of (or in conjunction with) standard or custom warning signs to increase their prominence.

Main Roads *Vehicle Activated Signs Policy and Guidelines* define the parameters for selection of AWFS on the approach to general hazards.

Typical applications include:

- hidden or obscured vehicle queues
- low clearance sites (with over-height detection)
- entry or crossing locations for emergency vehicles
- entry or crossing locations for heavy vehicles
- steep descents
- heavy vehicle check bays (compulsory stops)
- reduced visibility
- stock crossings.

These installations fall into two basic categories:

- permanently flashing
- flashing only when required (triggered by an event or vehicle-actuated).

Where possible, signs should be selected in accordance with Main Roads Signs Index *Advance Warning Series MR-WAW*. Customisation of these signs to warn of a specific identified hazard may be considered by Main Roads.

### 7.7.2 Warrants and criteria

Application for and approval of AWFS for general hazards shall be undertaken in accordance with the process identified in the Main Roads *Vehicle Activated Signs Policy and Guidelines* (Section 7).

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## 8 Technical guidelines for geometric placement

### 8.1 Background

#### 8.1.1 Advance Warning Flashing Signals (AWFS)

AWFS are installed in advance of a signalised intersection so that drivers, upon seeing the signs activate, can safely come to a stop at the holding line or position. The minimum distance from the stop line is therefore the sum of the distances travelled during reaction time and braking distance (for the design vehicle).

AWFS may also be installed on the approach to a general hazard as part of (or in conjunction with) standard or custom warning signs to increase their prominence. Where the signals provide for alternative routes or actions (for example over height vehicle to exit), they must be placed sufficiently in advance to allow the vehicles to carry out the required manoeuvres.

#### 8.1.2 Wig Wags

Wig Wags are used to highlight the location of a pedestrian crossing. They are located either at the crossing point (position Wig Wags), or on the approach to the crossing (advance Wig Wags).

### 8.2 AWFS at signalised intersections

#### 8.2.1 Longitudinal distance

The longitudinal distance from the stop line to the AWFS assembly should be assessed for the individual installation, reflecting the available sightlines and hazard condition, and confirmed through Main Roads [design processes](#). Any potential conflicts should be resolved through a formal technical query.

The minimum distance (S) from the traffic signal stop line is given in Equation 1 below.

*Equation 1: Minimum distance to AWFS assembly for signalised intersections*

$$S = v \times R_T + \frac{v^2}{2g(f + G)}$$

where	v	=	posted speed limit, (m/s)
	R <sub>T</sub>	=	reaction time, (s).
	g	=	9.8m/s <sup>2</sup>
	f	=	coefficient of deceleration
	G	=	grade (%)
	S	=	traffic signal distance (m)

This is the sum of the distance travelled during reaction time and deceleration (the safe stopping distance).

- **Reaction time**

A desirable minimum reaction time of 2.5s **must** be used in all calculations (refer to Main Roads [Supplement to Austroads Guide to Road Design Part 3](#), Section 8.6.3 Table 8.7).

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- **Coefficient of deceleration**

A coefficient of deceleration of 0.29 **must** be used in all calculations, consistent with the “maximum value for calculating truck stopping sight distance for most urban and rural road types, and level crossings” as defined in *Austroads Guide to Road Design: Part 3 – Geometric Design* Table 5.3.

- **Grade**

Defined to be the average gradient over the safe stopping distance (m).

Distance from traffic signal to the AWFS assembly may be increased as required to accommodate site constraints such as driveways, drainage, or other existing infrastructure.

### 8.2.2 Lateral position

AWFS **must** be installed:

- On the left verge of the carriageway only:
  - if there is a single lane in the direction of travel at the location of the sign, and the road alignment on the approach does not obscure the sign assembly.
- On both sides of the carriageway (divided or undivided):
  - if there are multiple lanes in the direction of travel at the location of the sign
  - where the road alignment on the approach obscures the left side assembly.

### 8.2.3 Signal timing

The timing of the AWFS onset (when the signal begins to flash) is calculated so that a driver who is travelling at the posted speed limit and passes the signals before they begin to flash, has sufficient time to clear the identified hazard. That is, the vehicle would cross the traffic signal hold line before the signals change from green to yellow.

The AWFS offset timing is determined by the AWFS assembly distance (sign location from stop / hold line) and given by the formula:

*Equation 2: AWFS offset timing for signalised intersections*

$$t = \frac{S + 22}{v}$$

where S = traffic signal distance (m)  
(as measured on site)  
v = posted speed limit, (m/s)  
t = AWFS offset timing (s)

- **Signal perception distance**

A signal perception distance of 22 metres is included in the above equation. This acknowledges that drivers within 22 metres of the AWFS may not perceive the onset of the flashing signal.

The signals, once activated, must remain flashing for the duration of the red control signal. The signals shall flash alternately at a frequency of 1 Hz.

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## 8.2.4 Typical AWFS distance and offset timing

The following tables provide typical AWFS assembly distance (S) and timing offsets (t). Timings must be adjusted according to the actual sign distance, as per **Equation 2** above.

For intersections with a mid-block posted speed limit of 70 km/h, typical values are given in Table 8-1:

*Table 8-1: AWFS assembly distance and associated signal offset (70km/h)*

G	-8%	-6%	-4%	-2%	0%	2%	4%	6%	8%
<b>S</b>	140	132	126	120	115	111	107	104	101
<b>t</b>	8.5	8.0	7.5	7.5	7.0	7.0	6.5	6.5	6.5

\* Distance rounded to nearest metre; time rounded to nearest 0.5 seconds

For intersections with a mid-block posted speed limit of 60 km/h, typical values are given in Table 8-2:

*Table 8-2: AWFS assembly distance and associated signal offset (60km/h)*

G	-8%	-6%	-4%	-2%	0%	2%	4%	6%	8%
<b>S</b>	109	103	98	94	91	87	85	82	80
<b>t</b>	8.0	7.5	7.0	7.0	7.0	6.5	6.5	6.0	6.0

\* Distance rounded to nearest metre; time rounded to nearest 0.5 seconds

G = approach gradient (%)

S = distance to sign location from stop line (m)

t = signal offset time, related to sign position (S)

## 8.2.5 Red light and speed safety cameras

All applications for red light and speed safety cameras should be referred to the WA Police.

## 8.3 AWFS for general hazards

### 8.3.1 Longitudinal distance

The longitudinal distance from the identified hazard depends on whether the sign is permanently flashing or only flashing when required. Where signals only flash when required for temporary hazards (for example stock crossing, vehicles entering), the minimum AWFS sign distance from the identified hazard is given by **Equation 1** above.

Where the signals provide alternative routes or actions (for example over height vehicle to exit), they must be placed sufficiently in advance to allow the vehicles to carry out the required manoeuvres.

### 8.3.2 Operating time

Where signals only flash when required for temporary hazards (such as stock crossing, vehicles entering), the principles described in Main Roads [Vehicle Activated Signs Policy and Guidelines](#) should be applied to determine the operating time.

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### 8.3.3 Signal timing

Where vehicles are required to take action (for example over height vehicles to exit), the detectors and times must be set such that the signal starts flashing at a time not less than the sum of the reaction time and that which is required to read and comprehend the sign (see formula below), and not less than 5 seconds. The lights shall continue flashing until a vehicle travelling at the posted (or advisory) speed is beyond the sign.

*Equation 3: AWFS offset timing for general hazards*

Time =  $R_t + N + 1$  seconds (value to be rounded up to the nearest whole second) or  
5 seconds, whichever is greater.

where            N        =        number of words on the sign  
                       $R_t$       =        reaction time (assumed to be 2.5 seconds, see Section 8.2.1)

## 8.4 Wig Wags at pedestrian crossings

### 8.4.1 Mid-block signalised pedestrian crossings

#### 8.4.1.1 Time of operation

Wig Wags in advance of mid-block signalised pedestrian crossings shall be activated when the pedestrian pushes the button and continue to flash until the signals for vehicles turn green.

#### 8.4.1.2 Longitudinal distance

Refer to Main Roads standard drawing 200431-0116 for details.

### 8.4.2 Zebra or wombat crossings

#### 8.4.2.1 Time of operation

Wig Wags at zebra or wombat crossings must operate in a continuous, 24/7 operation.

#### 8.4.2.2 Longitudinal distance

Position Wig Wags for zebra or wombat crossings must be installed at or near the pedestrian crossing.

Advance Wig Wags for zebra or wombat crossings must be installed 0.6 V in advance of the W6-2B signs.

Refer to Main Roads standard drawings 200631-0001 / 200331-0164 for details.

### 8.4.3 Traffic warden controlled children's crossings

#### 8.4.3.1 Time of operation

Wig Wags at traffic warden-controlled children's crossings must operate continuously during the standard school zone times for the region in which the crossing is located.

#### 8.4.3.2 Longitudinal distance

Position Wig Wags at traffic warden-controlled children's crossings must be installed in accordance with [9531-2169](#).

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Advance Wig Wags for traffic warden-controlled children's crossings must be installed 0.6 V in advance of the W6-3B sign.

### 8.4.4 Non-priority pedestrian crossings

#### 8.4.4.1 Time of operation

As there is no requirement for drivers to give way to pedestrians for this use of Wig Wags, their use may be time of day dependent.

The time of operation will be specific to each site based on appropriate investigation, where applicable.

It may be beneficial for the signals to only operate when the risk is higher to avoid:

- reducing the effectiveness of the Wig Wags through overuse
- disruption of adjacent residents
- unnecessary energy consumption.

#### Longitudinal distance

Advance Wig Wags should be positioned in advance of the 'Pedestrian' W6-1 or 'Children' W6-3 warning signs according to Table 8-3:

*Table 8-3: Distance in advance of warning signs*

$V_{85}$ (km/h)	S
<75	80-120m
75-90	120-180m
>90	180-250m

where  $V_{85}$  = Observed 85<sup>th</sup> percentile vehicle speed on the approach to the crossing  
 S = Upstream distance from the pedestrian warning sign

### 8.5 Lateral clearance

Lateral clearance from AWFS to the road should be in accordance with Main Roads standard drawing [8720-0762](#).

Lateral clearance from Wig Wags to the road should be in accordance with Main Roads standard drawing [9548-106](#).

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## 9 Civil infrastructure guidelines

### 9.1 AWFS at traffic signals

#### 9.1.1 Sign selection

Alternative warning sign options should be selected in accordance with Main Roads *Advance Warning Series Drawings* 200431-0087 through 200431-0088.

#### 9.1.2 Sign size

Where possible, AWFS at signalised intersections should be size C on both sides of the carriageway or road. Alternative sizes **may** be considered in accordance with Table 9-1:

*Table 9-1: AWFS signage size*

Size	Condition of use
<b>D</b>	Posted speed of 70 km/h (or greater), <b>and</b> where increased visibility is required
<b>C</b>	Posted speed of 70 km/h (or greater)
<b>B</b>	Posted speed of 70 km/h or less, <b>and</b> must only be used where it is impractical to provide sufficient space for size C or D size on one or both sides
<b>A</b>	Only to be used on roads with a speed limit of 70 km/h or less, <b>and</b> must only be used: <ul style="list-style-type: none"> <li>• where it is impractical to provide sufficient space for size B, C or D sign</li> <li>• in conjunction with a size B, C or D sign.</li> </ul>

**Note:** *On sloping ground, or where different post types are used, adjust the post lengths and mounting heights to ensure that the levels of the lanterns are level.*

### 9.2 AWFS for general hazards

#### 9.2.1 Sign selection

Signs should be selected in accordance with Main Roads *Advance Warning Series Drawings* [201631-008](#) through [201631-0012](#). Sign footings should be consistent with Main Roads drawing [201431-0016](#).

#### 9.2.2 Sign size and position

Where possible, AWFS at traffic signals should be size C on both sides of the carriageway or road. Alternative sizes may be considered in accordance with Table 9-1 (Section 9.1.1 above).

Lateral position of signs are given in Main Roads standard drawing [8720-0762](#).

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### 9.3 Applicable drawings

Type	Description	Drawing number
Standard drawing	Signs & Line Marking for Pedestrian Zebra Crossing	<u>200331-0164</u>
Standard drawing	Road Hump - Wombat Crossing	<u>200631-0001</u>
Standard drawing	Traffic Control Signals Mid-Block Pedestrian Crossings - Signs and Pavement Marking	<u>200431-0116</u>
Standard drawing	Sign Footing Details for Advance Warning Flashing Signs	<u>201431-0116</u>
Warning sign	Advance Warning Flashing Signs School Crossing Signal Layout - Signs and Pavement Marking	<u>9531-2169</u>
General drawing	Location Details for One Post Signs	<u>9548-106</u>
General drawing	Location Details for Two and Three Post Signs	<u>8720-0762</u>
Warning sign	Advance Warning Flashing Signs Warning Sign (size C)	<u>200431-0087</u>
Warning sign	Advance Warning Flashing Signs Warning Sign (size D)	<u>200431-0088</u>

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## 10 Electrical infrastructure guidelines

### 10.1 AWFS at traffic signals

#### 10.1.1 Conduits and pits

Conduits and pits should be in accordance with Main Roads *Vehicular Signals Guidelines* (Section 2.5.11.4) and Main Roads guideline drawing 200431-0136.

#### 10.1.2 Cables

Cables must be in accordance with Main Roads *Vehicular Signals Guidelines* (Section 2.5.13) and Main Roads *Specification 712 – Traffic Signals*.

#### 10.1.3 Connection

Each sign is to be wired separately back to its connection point.

AWFS must be connected to the traffic signal equipment as follows:

- at the nearest terminating box (or the controller) for pit system installations, or
- at the controller for post-top system installations.

#### 10.1.4 Display

AWFS must use LED display lanterns for all new sites, in accordance with Main Roads standard drawing 201531-0060.

#### 10.1.5 Power connection

A backup power source (UPS) must be provided for the traffic signal installation.

### 10.2 AWFS for general hazards

#### 10.2.1 Signal components

Detectors must be designed in accordance with Austroads *Revision of Guide to Traffic Engineering Practice: Part 8 - Traffic Control Devices* AP-T47-06.

#### 10.2.2 Conduits and pits

Conduits and pits should be located in accordance with Main Roads *Vehicular Guidelines* (Section 2.5.11.4) and Main Roads guideline drawings 200431-0134 to 200431-0138 and 200431-0128 to 200431-0131.

#### 10.2.3 Cables

Cables must be specified and installed in accordance with Main Roads *Vehicular Guidelines* (Section 2.5.13), Main Roads *Specification 712* and Main Roads guideline drawing 200431-104.

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## 10.3 Wig Wags

### 10.3.1 Conduits and pits

Conduits and pits should be located in accordance with Main Roads guideline drawings [200431-0111](#) and [200431-0113](#) and [200431-0128](#) to [200431-0131](#).

### 10.3.2 Cables

Cables must be specified and installed in accordance with Main Roads [Specification 712](#).

## 10.4 Applicable drawings

Type	Description	Drawing number
Standard drawing	Advance Warning Flashing Signs Typical Electrical Construction	<a href="#">200431-0100</a>
Standard drawing	Advance Warning Flashing Signs Typical Electrical Construction Using Aluminium Frangible Posts	<a href="#">201431-0015</a>
Standard drawing	Advance Warning Flashing Signs ELV Lamp Signal Lanterns – Wiring Details	<a href="#">200431-0101</a>
Standard drawing	Advance Warning Flashing Signs LED Signal Lanterns – Wiring Details	<a href="#">200431-0102</a>
Standard drawing	Advance Warning Flashing Signs - Region LED Signal Lanterns – Wiring Details	<a href="#">201531-0060</a>
Guideline drawing	Advance Warning Flashing Signs At General Hazards	<a href="#">200431-0104</a>
Standard drawing	Traffic Control Signals Traffic Signals Faults - Controller Label	<a href="#">200431-0125</a>
Standard drawing	Traffic Control Signals Double Lid Cable Pit & Termination Pit	<a href="#">200431-0128</a>
Standard drawing	Traffic Control Signals Controller Base Moulding	<a href="#">200431-0129</a>
Standard drawing	Traffic Control Signals 29 Core Termination Box	<a href="#">200431-0130</a>
Standard drawing	Traffic Control Signals 51 Core Termination Box	<a href="#">200431-0131</a>
Guideline drawing	Traffic Control Signals Typical Conduit Layout – for Future Signal Installation	<a href="#">200431-0134</a>
Guideline drawing	Traffic Control Signals Conduit, Pit, Post & Loop Layout – Typical 4-Way Intersection	<a href="#">200431-0135</a>
guideline drawing	Traffic Control Signals Conduit Layout	<a href="#">200431-0136</a>
Guideline drawing	Traffic Control Signals Conduit Layout – Typical T Intersection	<a href="#">200431-0137</a>

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Type	Description	Drawing number
Standard drawing	Advance Warning Flashing Signs Signals at School Crossing and Signs at Isolated Hazards – Switchboard Details	<u>200431-0111</u>
Guideline drawing	Advance Warning Flashing Signs Typical Conduit Layout & Lantern Mounting Details – School Crossings	<u>200431-0113</u>

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## 11 Monitoring and review

Every AWFS shall be subject to monitoring and review for at least 12 months following installation. This review should cover:

- video surveys before installation and 12 months after installation, for direct comparison against pre-implementation and before-and-after performance study.  
Surveys to include:
  - stop line compliance, including proportion of yellow and red-light running
  - speed profile (85<sup>th</sup> percentile and mean vehicle speed, variability by vehicle class) by approach and lane, in advance of the AWFS assembly and after the stop line
- comparison of crash incidence and patterns at the intersection before and after implementation
- comments on the effectiveness of the installation and the costs and benefits associated with the application of AWFS at the location
- recommendation on the retention, modification, or removal of AWFS at the location
- recommendation on changes to the *Warning Flashing Sign Guideline* (this document).

Where Wig Wags have been specified due to a history of driver non-compliance at the existing crossing, monitoring and review is recommended for at least 12 months following installation. This review should cover:

- video surveys before installation and 12 months after installation, for direct comparison against pre-implementation and before-and-after performance study  
Surveys to include:
  - stop line compliance
  - speed profile (85<sup>th</sup> percentile and mean vehicle speed, variability by vehicle class) by approach and lane
- recommendation on the retention, modification, or removal of Wig Wags at the location.

The asset owner of the road is responsible for monitoring and assessment of the devices (or by agreement otherwise).

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## 12 References and related documents

Document number	Description
<b>AS 1742.1</b>	Manual of Uniform Traffic Control Devices - Part 1: General Introduction and Index of Signs
<b>AS 1742.2</b>	Manual of Uniform Traffic Control Devices - Part 2: Traffic Control Devices for General Use
<b>AS 1742.10</b>	Manual of Uniform Traffic Control Devices - Part 10: Pedestrian Control and Protection
<b>AP-R518-16</b>	Austrroads <u>Safe System Roads for Local Government</u>
<b>N/A</b>	Main Roads <u>Vehicle Signals Guidelines</u>
<b>D22#526875</b>	Main Roads <u>Vehicle Activated Signs Policy and Guidelines</u>
<b>D23#613706</b>	Main Roads <u>Wig Wags Policy and Application Guidelines</u>
<b>D23#1350906</b>	Main Roads <u>Supplement to Austrroads Guide to Road Design Part 4 – Intersections and Crossings: General</u>
<b>D23#1315195</b>	<u>MRWA Supplement to Austrroads Guide to Road Design Part 4A – Signalised and Unsignalised Intersections</u>
<b>D19#846517</b>	Main Roads <u>Speed Zoning Policy and Application Guidelines</u>
<b>04/10127</b>	<u>Main Roads Specification 712 – Traffic Signals</u>
<b>RTC2000</b>	<u>Road Traffic Code 2000</u>

