

GUIDANCE ON THE USE OF PORTABLE TRAFFIC SIGNALS



This document is a collation of existing information conveniently brought together for Local Authorities, road and street works operators, industry manufacturers and Traffic Management Companies.

The information has been taken from a wide range of documents noted in the Reference Section.

The signal timing guidance for vehicular only schemes has been significantly updated. Additionally, with a stronger focus on Active Travel, guidance for pedestrian signalling timing and clearance times for cyclists has also been included.

It has been represented in a format that will hopefully lend itself to creating a better understanding and therefore improve quality in application.

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Disclaimer

ARTSM does not accept any responsibility or liability for any errors or omissions in the content of this document.

This document has been created drawing on existing guidance, however devolved Administrations should check for local variances.

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I. Safety Information

I.1 General

It should be noted that this document is guidance for the implementation of Temporary Traffic Management Schemes which include Portable (or Temporary) Traffic Signals. This advice is for use by site operatives and all those involved in designing and specifying temporary traffic management systems.

The requirements of Safety at Street Works & Road Works 'A Code of Practice' (the Red Book) and Traffic Signs Manual Chapter 8 for Temporary Traffic Management specify many of the conditional and operational requirements. Signs, tapers, barriers etc are only used for indicative purposes in this document for simplifying the communication of the signalling. Only those signs that specifically relate to the signals are referenced and the ones on the approaches beyond the stop-line are omitted for simplicity. Signs, signals, barriers and marking must comply with the Traffic Signs Regulations & General Directions (as amended) 2016 (TSRGD). Where used, Diagram Numbers referenced are TSRGD references.

I.2 Must/shall/should/may

In this document the word **“must”** is used to indicate a legal requirement which must be complied with. The word **“shall”** indicates essential best practice which a Traffic Authority may require to demonstrate that advice in this document has been followed. The word **“should”** indicates a course of action that is strongly recommended. The word **“may”** is used to indicate an option, which requires consideration depending on the circumstances.

I.3 Legal Considerations

Anyone intending to use traffic signalling systems for temporary traffic management must first obtain written approval from the Traffic Authority or in the case of urgency, given verbally and confirmed in writing as soon as is reasonably practicable (TSRGD Schedule 14 Part 6). This document is guidance only and users are reminded that there are other Statutory obligations not exhaustively listed. The Traffic Management (TM) designer is a Designer under CDM Regulations - 2015.

2. Portable Signalling Systems



- 2.1 Most portable signalling systems comprise of vehicle signalling components and pedestrian signalling components that are brought together to form a traffic signalling system. In this document different signalling schemes are depicted in the form of template plans.
- 2.2 Portable signals are usually battery powered and the system linked via radio control. However, under certain circumstances the signals may be linked by cables.
- 2.3 Different portable signals have different signalling functions available. You should ensure that the signals available for the Traffic Management (TM) scheme that needs delivering have the required function(s) available (TOPAS specifications are designed to help with this selection).
- 2.4 By design, portable signals are easily moved and usually configured at the roadside. For associated safety reasons, this means that complex signalling schemes may not be possible.
- 2.5 Complex signalling schemes are more efficient at moving vehicles and pedestrians and can be better delivered with a Temporary Signalling system. Temporary Signalling systems should be considered where delays are to be minimised and the safety and/or performance required for the scheme may not be possible with Portable Signals.
- 2.6 You should check with the manufacturer if in any doubt about the functions that are available on the signalling system you are planning to use.



3. Portable and Temporary Signals

- 3.1 This guidance covers much of the scope of Portable Signals within works. However, in some circumstances, a Temporary Signal facility may be more suitable.
- 3.2 The decision on what type of signal facility to permit is for the Traffic Authority which may be delegated to the TM Designer.

PORTABLE

- A traffic light signal to Diagram 3000.1 of TSRGD is used.
- Supported by an integral wheeled base (or tripod) which is easy to move.
- The system is run from a portable controller which is usually configured at the side of the road.
- They provide simple phased based signalling.



TSRGD prohibits arrows in portables



Min 1.5m*
Typically
1.6 - 1.7m

TEMPORARY

- A traffic light signal to Diagram 3000 of TSRGD deployed at a higher regulated height is used.
- Usually mounted in bases that cannot be readily be moved without specialist equipment.
- The system is run from a permanent controller (or a temporary controller which has many of the functions of a permanent controller).
- They can provide more complex and more efficient signalling functions.
- Temporary systems can be wired or wireless.



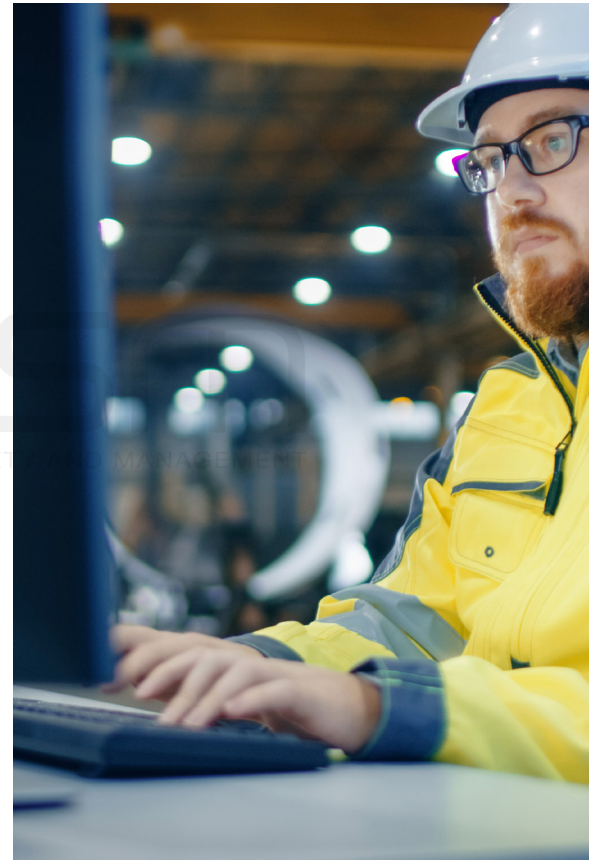
Min
2.1m*

Note: A specific portable vehicular signal is provided for in TSRGD (Diagram 3000.1) however there are no specific portable alternatives for pedestrian signals.

*Both signals depicted in their relative sizes

4. Before Deployment

- 4.1 The street works qualifications or National Highways Sector Scheme 12D sets the recognised competency levels for deploying temporary traffic management schemes. You must never set out a scheme for which you have not been specifically trained and are competent to deploy.
- 4.2 For Street or Road works requiring traffic signals a specific Traffic Management (TM) plan shall be used.
- 4.3 For some of the simple TM schemes such as 2-way signalling or where emergency works require signalling, a generic TM plan may be used but must be updated on deployment with a risk assessment.
- 4.4 When deploying portable signals, you shall validate or update your TM plan complete with dimensions to the respective signal locations in metric. These dimensions are very important as they are the basis of signal safety timings (clearance times).
- 4.5 You shall only use equipment you have been specifically trained on as all manufacturers' systems vary in operation.
- 4.6 You should check that permission has been granted before leaving the depot and going to site.
- 4.7 You should check you have the right portable signalling equipment and documentation for the scheme to be deployed and the equipment has been checked for correct operation.



5. Transporting Signals

- 5.1 You should take care in loading and transporting traffic signals to and from site. Traffic Management vehicles and trailers used for this purpose all have maximum weight limits that need to be conformed to for safety.
- 5.2 Portable signals can be deceptively heavy as they contain batteries and/or ballast which makes them withstand high levels of wind so they continue to be operational in adverse weather conditions.
- 5.3 You shall check the weight of your vehicle or trailer as signals coupled with the required quantity of TM signs and the associated sign ballast can quickly take you over the safe prescribed limit of the vehicle or trailer if not carefully checked. (Road Traffic Act 1988)
- 5.4 You should note that TM Vehicles fitted with hydraulic or electric tail-lifts will significantly reduce the vehicle's payload. Some vehicles have been specially adapted for transporting signals safely.
- 5.5 You should follow the required guidance for securing the signals for safe transport and avoid securing by a single point of failure.
- 5.6 You must correctly set the vehicle height indicator as this is a legal requirement of all open back vehicles if the overall travelling height exceeds 3m.
- 5.7 If you are transporting batteries for portable signals you shall comply with the ADR guidance for the safe transportation of batteries. (see reference in Section 22)



6. Deployment

Vehicle Signals

- 6.1 You shall ensure all aspects of the traffic signal are clearly visible to motorists when approaching the signal AND at the WAIT HERE sign.
- 6.2 The WAIT HERE sign shall not obscure the signals or be too close to the signal. The WAIT HERE sign shall be at least 15m from the lead-in taper.
- 6.3 You shall never move the signals when in operation. To move a signal, the system should be taken out of service (or transitioned to All-Red) where the system safety clearance times can be re-set for the revised scheme layout. The system can then be safely re-started.



Detector (MVD or Radar)

- 6.4 For efficient signal operation the detector which is normally mounted on the top of the traffic signal should be aligned so it is pointing directly down the road and have a clear line of sight (LOS) of approaching vehicles.
- 6.5 For efficient operation this LOS should be a minimum of 40m. The detector detects vehicles and optimises the signal timings. Position the signal away from moving clutter, such as overhanging vegetation and branches, which may lead to inefficient detector operation.



6. Deployment (Cont.)

Pedestrian Signals & Push Buttons

- 6.6 For schemes which include pedestrian facilities, the pedestrian push button shall be easily accessible from the footway where the crossing starts.
- 6.7 The push button should be on the right of the pedestrian waiting to cross. This is the location that visually impaired pedestrians are guided to and expect the push button to be.
- 6.8 If the pedestrian facility is a stand-alone crossing, the crossing point shall be less than 10m from the WAIT HERE sign.
- 6.9 If the pedestrian facility is within signal controlled works, the crossing point shall be less than 15m from the WAIT HERE sign of the vehicle phase that is before the crossing phase.
- 6.10 When positioning a pedestrian signal be mindful that most systems are usually 'handed'. You shall ensure that when it is deployed, the push button is accessible to pedestrians AND the pedestrian signals are orientated so they face the crossing.
- 6.11 A pedestrian push button for a far side signal can be to either Diagram 4003 or 4003.8. For crossings that include cyclists Diagram 4003.6 or 4003.7 may be used.



7. Existing Signal-Controlled Junctions and Crossings

- 7.1 If the scheme you are deploying requires a permanent signal installation to be taken out of service arrangements should be made to switch off the permanent equipment. The traffic authority's permission must be sought to switch off permanent signals.
- 7.2 Where portable signals are used near permanent signals that have been taken out of service then the permanent signalling equipment shall be covered (bagged). This is especially important if the permanent signals are out of service for more than one week.



**Diagram
7019**

(Shall **not**
be used near
portable signals.)

- 7.3 Where permanent signals are out of service and portable signals are operating you should not attach TSRGD Diagram 7019 to the permanent signals as this can be confusing for motorists.
- 7.4 You should note that some authorities have their own guidance on covering (bagging) of signals and you should check first.
- 7.5 You should also note that for some TM schemes permanent signals may require covering (bagging) but with their lit regulatory signs still visible to traffic.
- 7.6 Where portable pedestrian facilities are to be used to make a safe crossing for pedestrians where a Zebra Crossing is taken out of service, the portable signal pedestrian crossing should not be deployed on or close to the site of the Zebra crossing.

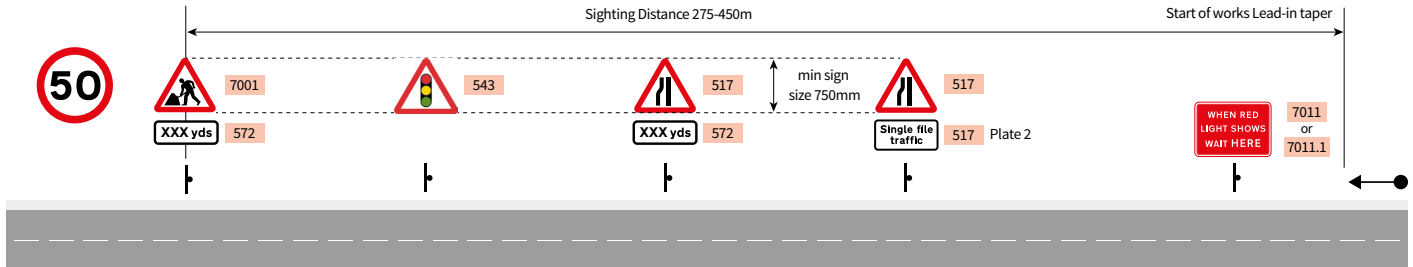
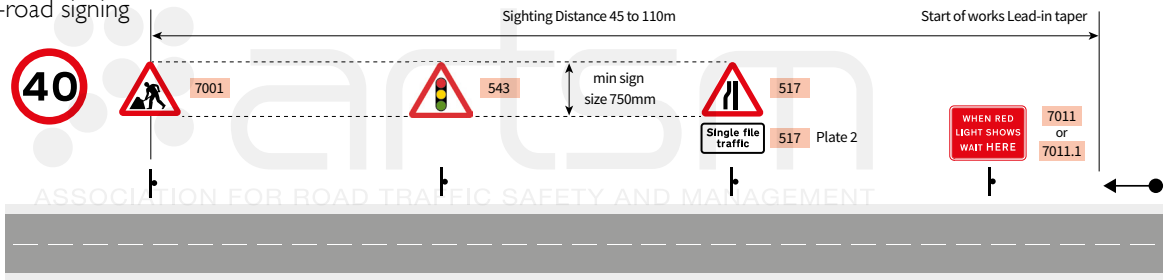
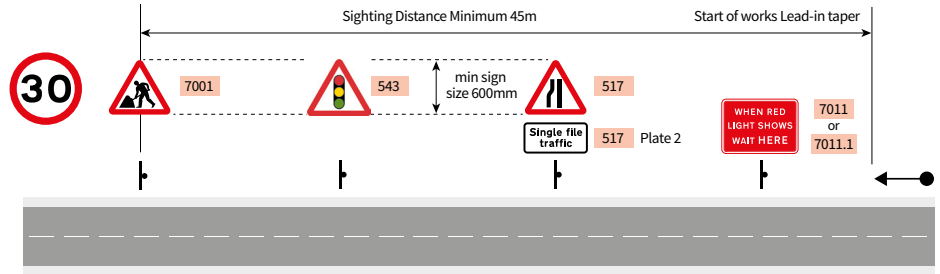


Covered (bagged) signals may require the regulatory sign to still be visible.

8. Approaches to Signals

8.1 Deploying correct signing on the approach to signals is an important safety aspect of the traffic management. You must follow the guidance in Safety at Street Works and Road Works 'A Code of Practice' and TSM Chapter 8.

8.2 You should note the special approach and side-road signing requirements for a non-signalled side road (Section 11).



Note: Stand-alone pedestrian & haul route crossings have different sign requirements

9. General Signalling Principles

9. General Principles

- 9.1 As portable vehicle signals are smaller than temporary or permanent signals, careful consideration shall be given to providing two vehicle signals on each approach.
- 9.2 You must use two vehicle signals for each approach at a stand-alone pedestrian crossing (as a minimum). (TSRGD Schedule 14, Part 6, General Direction 43)
- 9.3 Whether one or two vehicle signals are used, for safe operation, the approaching driver shall be able to see at least one signal on the approach and one whilst waiting at the WAIT HERE sign.
- 9.4 Where there are pedestrian crossing facilities within a TM scheme, (not a stand-alone pedestrian crossing), you shall use two vehicle signals per approach to a crossing unless your risk assessment can specifically address the safety issues resulting from only using one vehicle signal.
- 9.5 Portable vehicle signals can be placed in or out of the carriageway with the correct signs and protection.
- 9.6 Portable vehicle signals are preferably placed in the carriageway if placing them out of the carriageway impedes the pedestrian footway.
- 9.7 Portable vehicle signals are lower than normal signals and you shall ensure the signal is not wholly or partly obscured from traffic with any part of the WAIT HERE sign or its frame.
- 9.8 Intervisibility is a very important safety aspect of the TM design for a site and the positioning portable traffic signals. Intervisibility is the environment where waiting vehicles or pedestrians can view others that are also waiting for the next signalled movement. Wherever possible, there should always be good visibility from each WAIT HERE sign or pedestrian waiting area to those of conflicting movements.
- 9.9 Pedestrians shall have clear sight of stopped vehicles on red following a green before the invitation to cross is displayed as the next stage. Clear sight is typically less than 10m for a stand-alone pedestrian crossing and less than 15m for a pedestrian facility within a TM scheme.
- 9.10 The distance between WAIT HERE signs is important for both the safety and the efficiency of traffic movements and should be minimised wherever possible. This distance sets the all-red clearance time for the signals (Section 19.1). The all-red time must not be set too short to compromise safety. However, excessively long red times can have a negative impact on signal compliance which can also compromise the safety and efficiency of the site.

9. General Signalling Principles (Cont.)

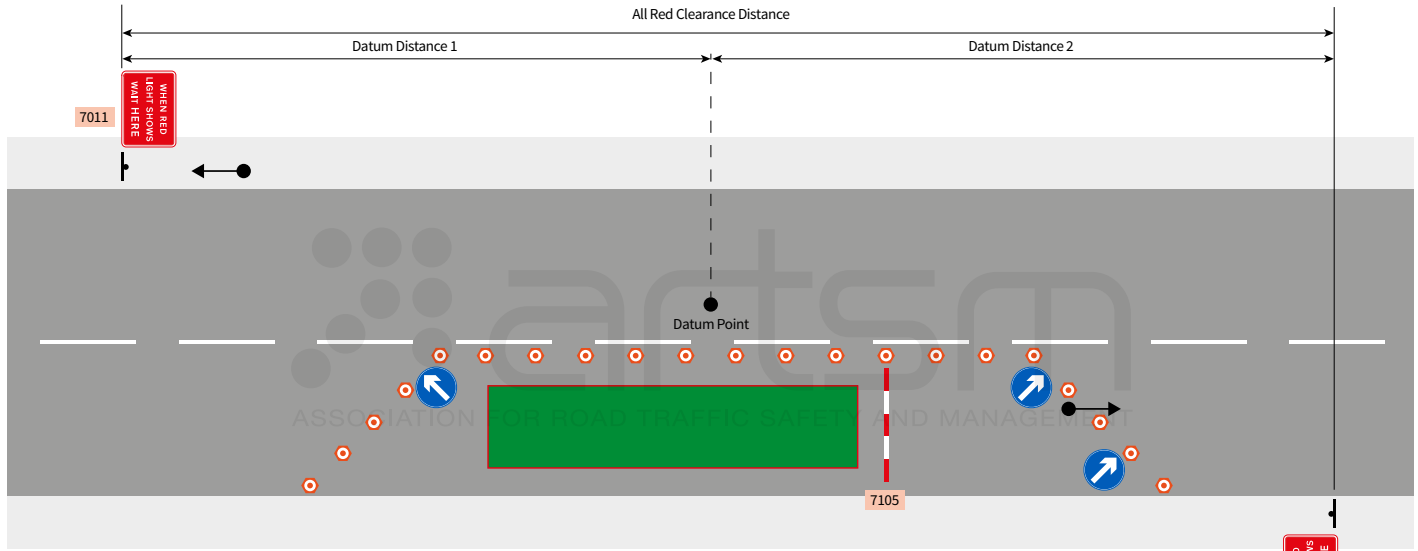
- 9.11 Portable vehicle signals and their respective WAIT HERE signs should be positioned in order to maximise their visibility to approaching traffic. Increasing the distance between the WAIT HERE signs may be required to provide adequate visibility to approaching traffic. You shall avoid locating them in an obscured location behind a bend or other obstruction.
- 9.12 You should make reasonable endeavours to keep the length of works short and relocate the signals and the TM if works progress along a carriageway.
- 9.13 Do not lay out a long set of signalled works with excessive distance between WAIT HERE signs in order to avoid moving the signals and associated TM measures as the works change.
- 9.14 The duration of the clearance all-red time for some phase transitions shall be increased if there is a gradient or a required vehicle turning movement within the works. Gradients and/or turning movements slow traffic speeds and necessitate longer all-red clearance times.
- 9.15 Setting portable traffic systems to long vehicle maximum green settings is not usually the most efficient way of signalling traffic. Setting excessively long maximum green times can form large platoons of vehicles exiting the works that can cause problems at a downstream set of permanent signals.
- 9.16 Where there is opportunity, you should link non-conflicting vehicle phases on multi-phase signals where the carriageway is clear of works and it is safe to do so as this will reduce delays to traffic.
- 9.17 You should site the Master controlling signal (the signal at which Manual Control may be used) in accordance with your risk assessment to give the best view of the other signals and their respective approaches. This is beneficial for the safest and best operation of the Manual Control mode.
- 9.18 You should always site the Master controlling signal where you can observe all the pedestrian facilities within the works.
- 9.19 Your risk assessment must take specific account of the potential failure of the signals. This shall include site intervisibility and may include the provision of STOP/GO signs where mandated or required on site permit conditions.

SECTION 10

2-Way Shuttle-Works Traffic Scheme



10. 2-Way Shuttle-Works Traffic Scheme Plan Layout



- Key**
- Vehicle Signal 3000/3000.1
 - Traffic Sign
 - Traffic Cone 7101.1
 - Carriageway Works
 - Traffic Direction Sign 610
 - Road Closed Barrier 7105

7011
WHEN RED LIGHT SHOWS WAIT HERE

10. Points to Consider for 2-Way Shuttle-Works

- 10.1 You should be trained on the specific type of signal controller you are using and whether it uses All Red clearance timing (sometimes called 'Longest Journey') or Datum Point clearance timing.
- 10.2 All Red clearance timing uses the distance measured between the two WAIT HERE signs.
- 10.3 Datum Point timing uses the distances between the WAIT HERE signs and the Datum point.
- 10.4 The Datum Point should be taken from approximately the centre of the works and distances to the Datum Point do not have to be equal.
- 10.5 Signalling systems registered to the following TOPAS specifications meet the requirements for a 2-Way Shuttle-Works scheme.
 - TOPAS 2502 or 2537
 - TOPAS 2540 appendix B or D

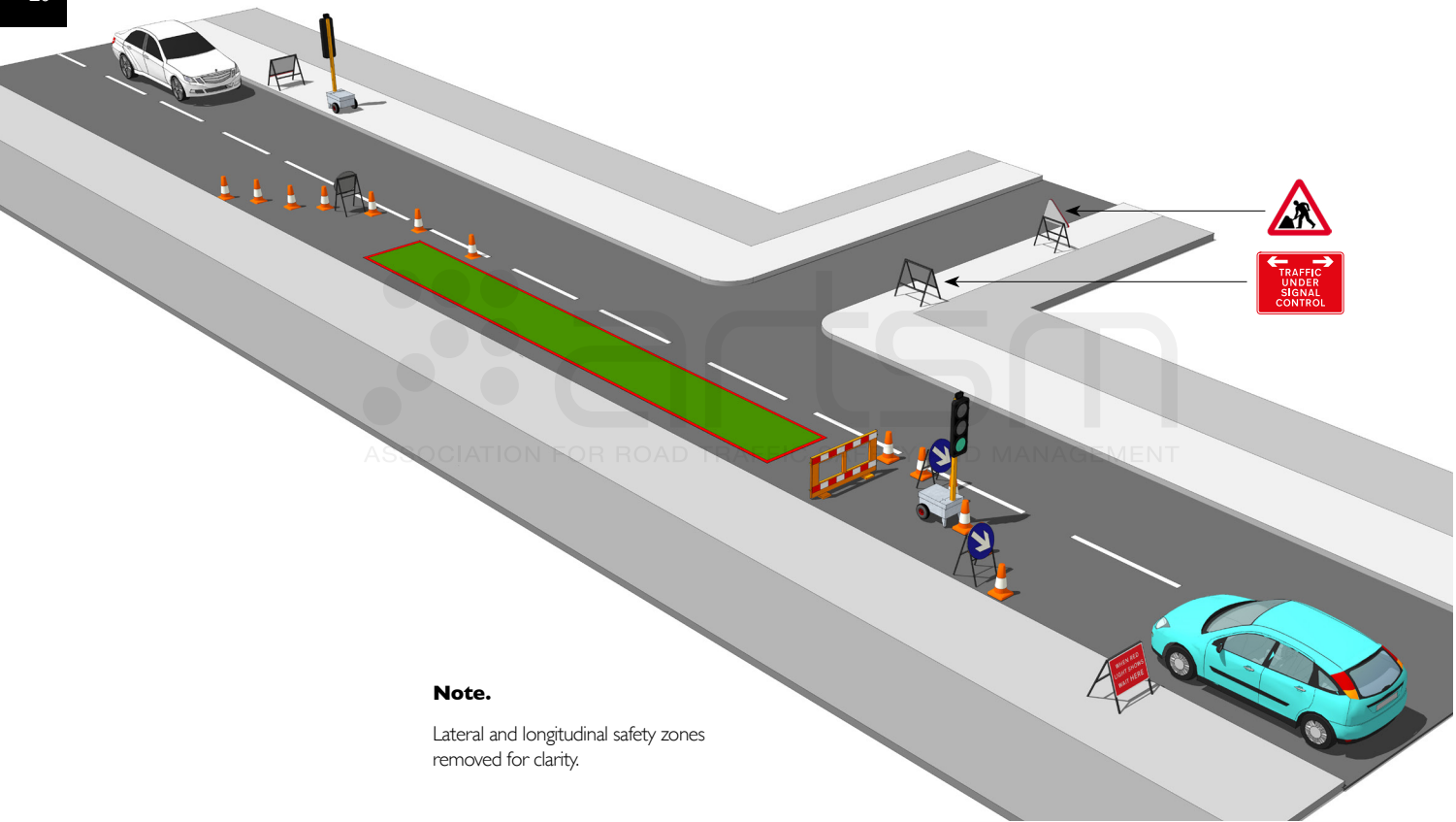


SECTION II

2-Way Shuttle-Works Traffic Scheme with Side Road



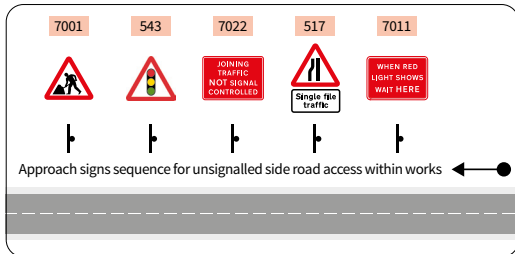
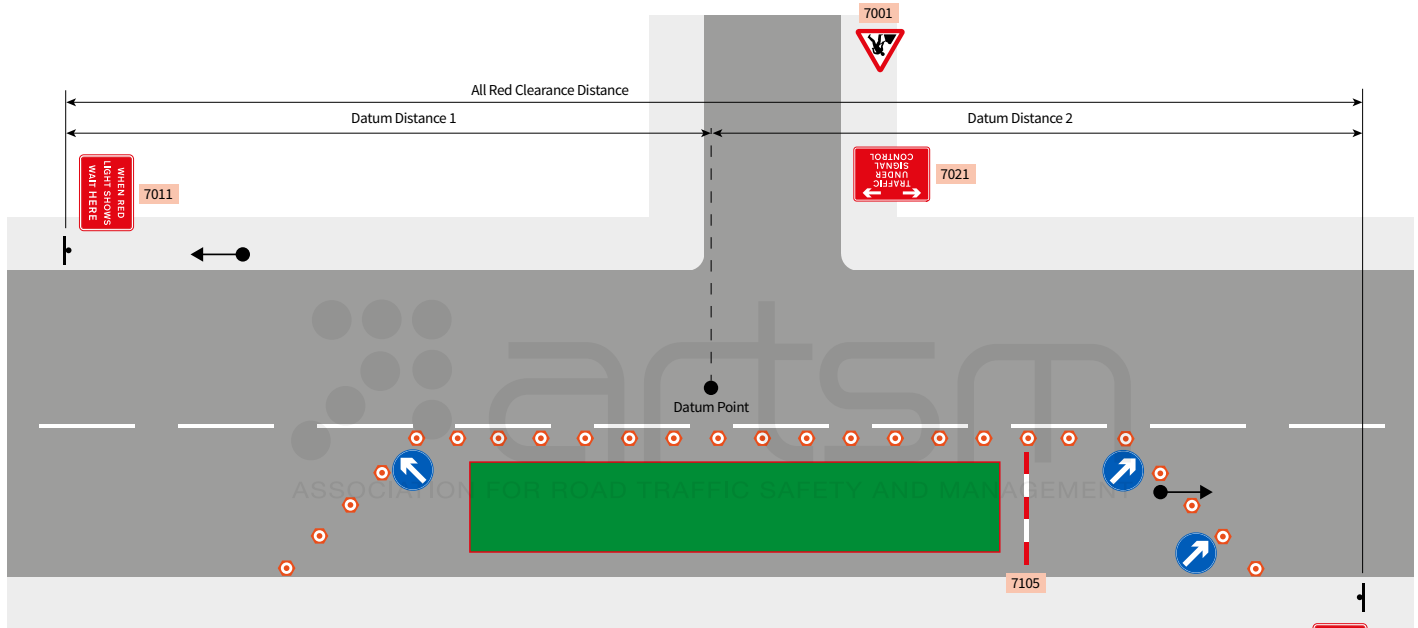
II. 2-Way Shuttle-Works Traffic Scheme with Side Road



Note.

Lateral and longitudinal safety zones removed for clarity.

II. 2-Way Shuttle-Works Traffic Scheme with Side Road Plan Layout



- Key
- Vehicle Signal 3000/3000.1
 - Traffic Sign
 - Traffic Cone 7101.1
 - Carriageway Works
 - Traffic Direction Sign 610
 - Road Closed Barrier 7105



II. Points to Consider for 2-Way Shuttle-Works with Side Road Access

- I 1.1 You should be trained on the specific type of signal controller you are using and whether it uses All Red clearance timing (sometimes called 'Longest Journey') or Datum Point clearance timing.
- I 1.2 For works which cover a side road access within the works, you may be able to deploy signals without the requirement for signalling the side road access.
- I 1.3 If the access has low levels of traffic, this has the advantage of simplifying the signalling requirement and potentially reducing the delays to vehicles.
- I 1.4 The use of 2-way vehicular signals should be avoided when the shuttle section includes a road junction.
- I 1.5 The visibility of the side road access into the works is a key factor in the assessment. If visibility is poor then signal control of the access is likely to be needed. Those waiting at the un-signalled side road access must be able to see the front vehicle at both of the vehicular signals.
- I 1.6 You must never deploy this option where pedestrian signal facilities are within the scheme.
- I 1.7 Your scheme risk assessment will determine whether deploying this format of traffic control is possible without reducing overall safety.
- I 1.8 The duration of the works is an important factor in the risk assessment.
- I 1.9 A scheme may include more than one un-signalled access.
- I 1.10 You shall additionally deploy Diagram 7022 on both signalled approaches between Diagram 543 and 517.
 - I 1.11 You shall deploy Diagrams 7001 and 7021 on the side road access.
 - I 1.12 Signalling systems registered to the following TOPAS specifications meet the requirements for a 2-Way Shuttle-Works scheme.
 - TOPAS 2502 or 2537
 - TOPAS 2540 appendix B or D



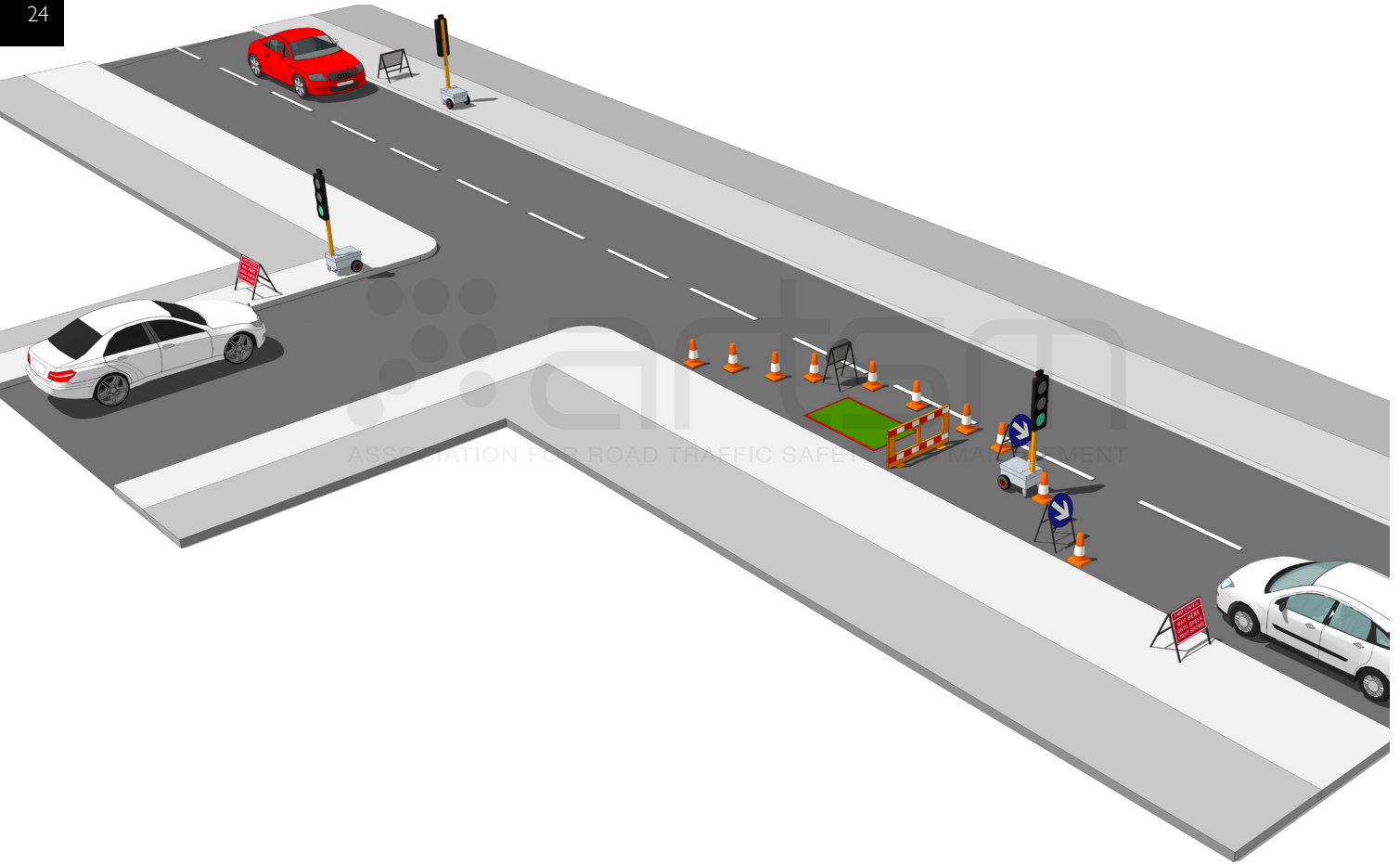
SECTION 12

Multi-Phase Traffic Scheme

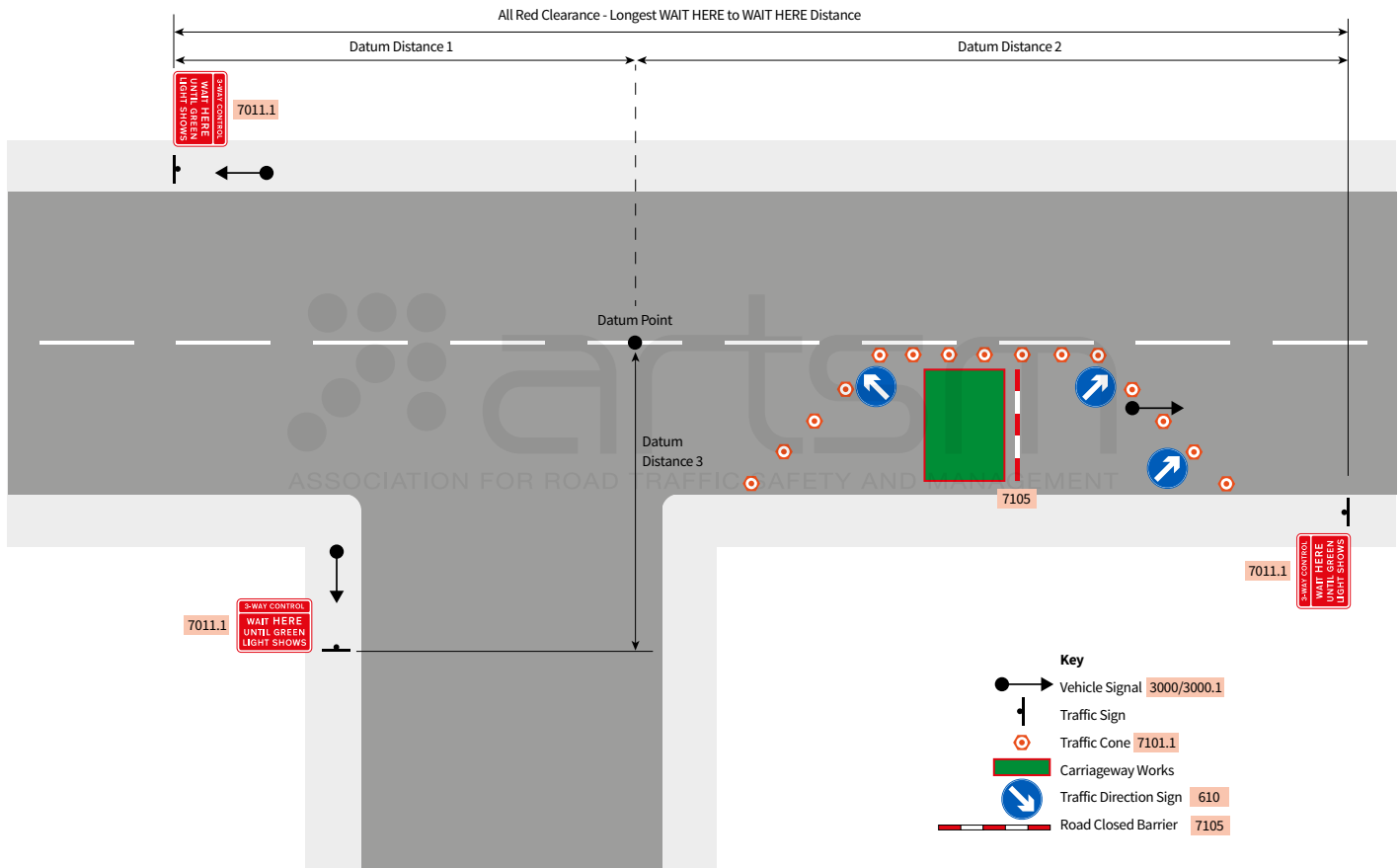


I2. Multi-Phase Traffic Scheme

24



I2. Multi-Phase Traffic Scheme Plan Layout



I2. Points to Consider for Multi-Phase Traffic Schemes

- 12.1 Controllers capable of Multi-Phase schemes operate either on All-Red clearance time setting (sometimes called 'Longest Journey') or Datum based Clearance time settings. You should be trained on the type of controller you are deploying.
- 12.2 All-Red clearance time setting is taken from the longest WAIT HERE to WAIT HERE distance for the whole scheme. You should be careful to make sure you have measured the longest on the site as the longest may be between two WAIT HERE signs which are not in a straight line.
- 12.3 Datum based distances are taken from each WAIT HERE sign to a common datum point. You should be careful to associate the right datum distance to the correct signal when assigning the timings to the scheme.
- 12.4 For 4 phase multi-phase signals you should use the variant Diagram 701 I.1 which specifies 4-Way Control.
- 12.5 Owing to their operation, and usually a loss of carriageway, multi-phase signals can lead to significant congestion in busy locations. The location of the signals to minimise clearance times is important.



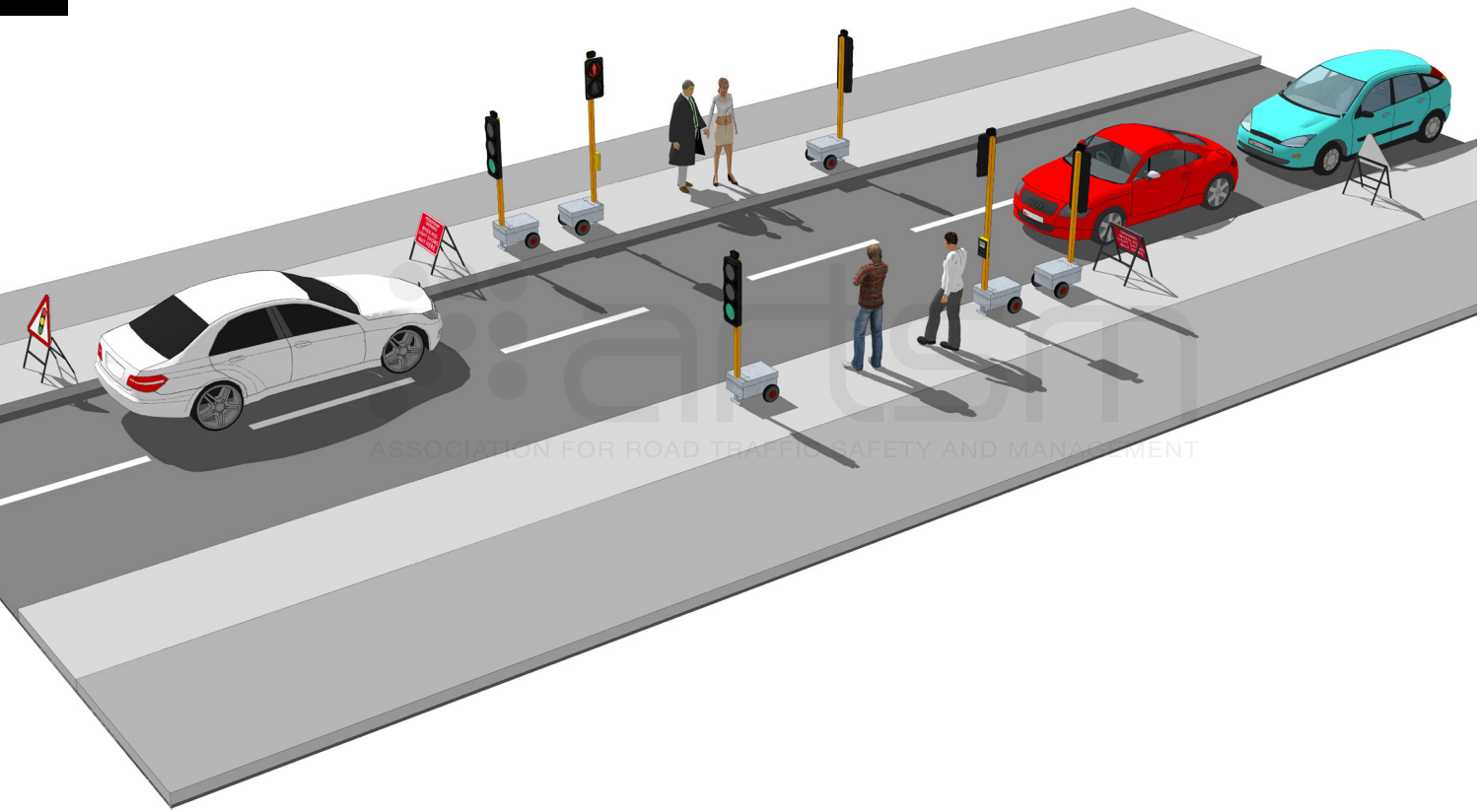
- 12.6 You should always use linked phases in multi-phase schemes where the width of the carriageway is sufficient for two-way traffic to operate and it is safe to do so.
- 12.7 Signalling systems registered to the following TOPAS specifications meet the requirements for a Multi-Phase traffic scheme.
 - TOPAS 2502 or 2537
 - TOPAS 2540 appendix B or D

SECTION 13

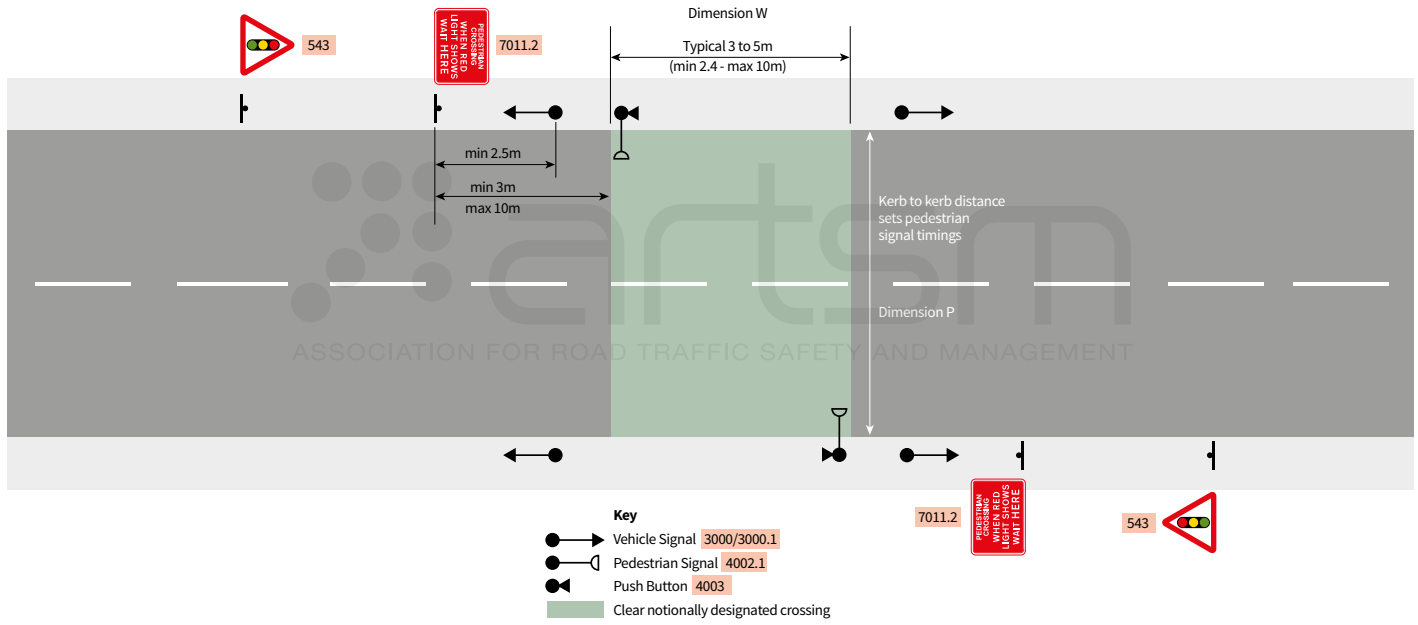
Stand-Alone Pedestrian Crossing



13. Stand-Alone Pedestrian Crossing



I3. Stand-Alone Pedestrian Crossing Plan Layout



13. Points to Consider for Stand-Alone Pedestrian Crossings

- 13.1 Stand-alone pedestrian facilities may be provided:
 - Where an existing permanent crossing has had to be closed for upgrade works
 - Near road works sites where it is impractical to incorporate a pedestrian facility into the portable signals
 - At large public events, where there is a need for a crossing for a relatively short time
- 13.2 When considering the layout of portable pedestrian facilities, the safety of road users, particularly pedestrians, should be the foremost consideration.
- 13.3 A risk assessment must always be carried out when deciding what type of facility to provide. Particular care shall be taken on approaches that have more than one lane. On multi-lane approaches, the risk of drivers in the outside lane being unable to see the vehicular signals shall be considered.
- 13.4 For a stand-alone pedestrian crossing two vehicular signals must be used for each approach (TSRGD Schedule 14, Part 6, General Direction 43).
- 13.3 It is strongly recommended that portable pedestrian facilities of any type shall only be used on roads with a 30mph speed limit.
- 13.4 Where the speed limit is greater than 30 mph and pedestrian facilities are considered necessary then a Temporary Traffic Regulation Order (TTRO) shall be considered to reduce the speed limit to 30mph.
- 13.5 Under all circumstances the speed of the vehicles on the relative approaches to a pedestrian facility shall be assessed. If the 85th percentile for approaching vehicles is above 35mph then speed reduction measures shall be considered.
- 13.6 Dimension W is the width of the crossing and should be typically 3 to 4 m. It must not be less than 2.4m and should not be greater than 10m.
- 13.7 Dimension P is the length of the crossing measured kerb to kerb. This dimension is required for setting the pedestrian signal timings (See Section 19.2).
- 13.8 The provision of a stop line, studs and zig-zags is optional (but if zig-zags are to be used, a stop line and studs must also be used). This may be appropriate where a facility will be in place for some time, or if it is considered that a more formal crossing place is necessary. Decisions on what road markings to use at the individual sites are for the traffic authority and/or the TM Designer.
- 13.9 For a stand-alone pedestrian crossing, the points in Section 20 'Signalled Pedestrian Facilities' should also be taken into consideration in the scheme.
- 13.10 Signalling systems registered to the following TOPAS specifications meet the minimum requirements for standalone pedestrian crossings;

Portable Systems - TOPAS 2538 or TOPAS 2540 Appendix E
Temporary Systems - TOPAS 2503 or TOPAS 2540 Appendix C

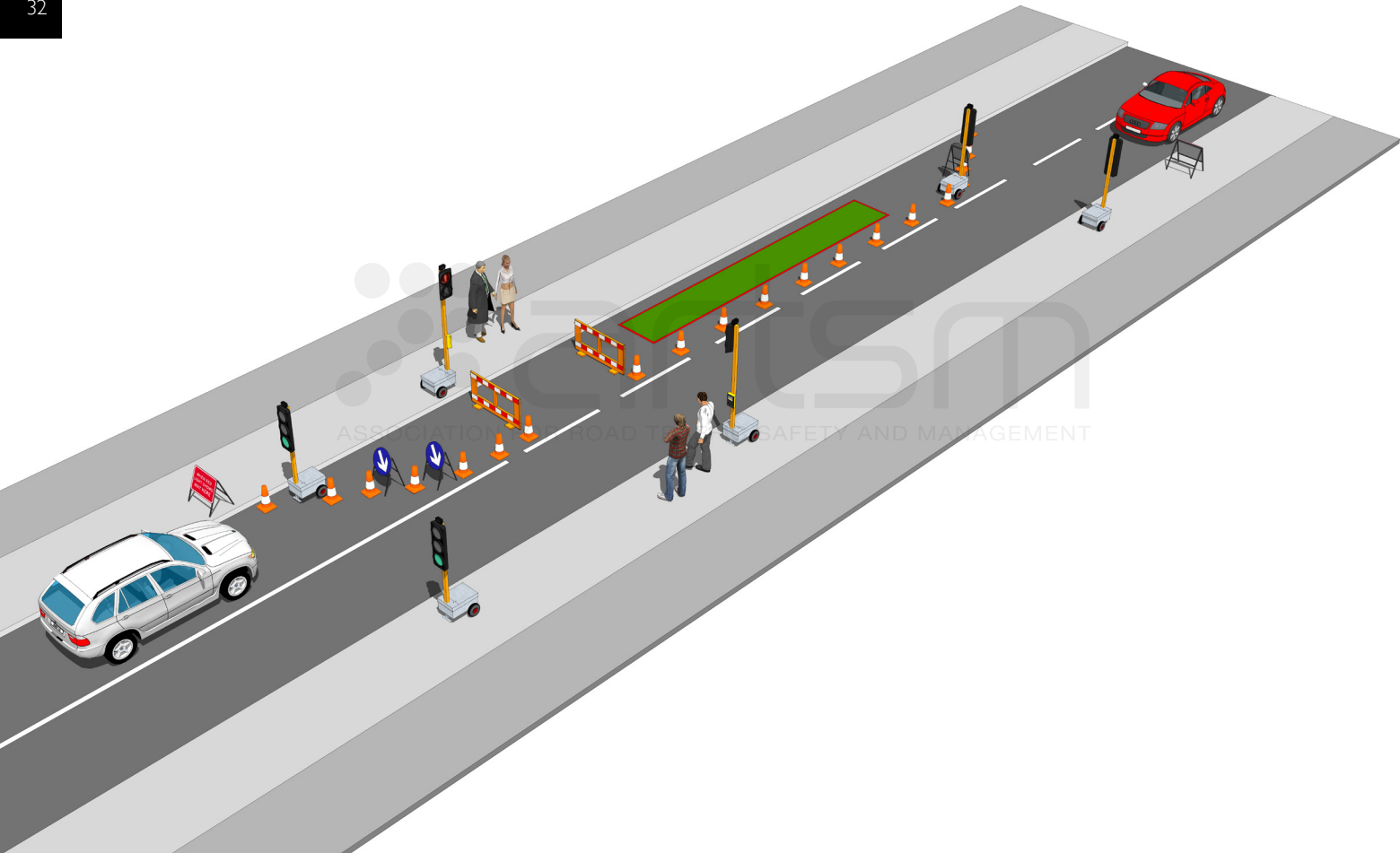
SECTION 14

2-Way Shuttle-Works Traffic Scheme
with Pedestrian Crossing

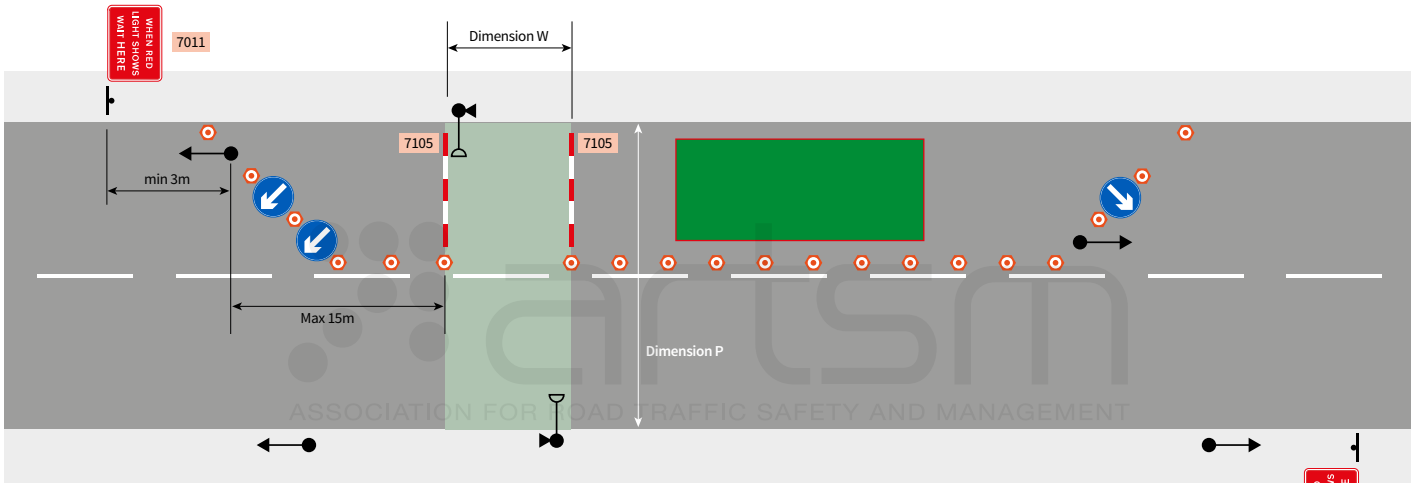










14. 2-Way Shuttle-Works Traffic Scheme with Pedestrian Crossing

32



I4. 2-Way Shuttle-Works Traffic Scheme with Pedestrian Crossing Plan Layout



-  Vehicle Signal 3000/3000.1
-  Pedestrian Signal 4002.1
-  Push Button 4003
-  Clear notionally designated crossing
-  Carriageway Works
-  Traffic Sign
-  Traffic Cone 7101.1
-  Traffic Direction Sign 610

7011 WHEN RED LIGHT SHOWS WAIT HERE

14. Points to Consider for 2-Way Shuttle-Works with a Pedestrian Crossing

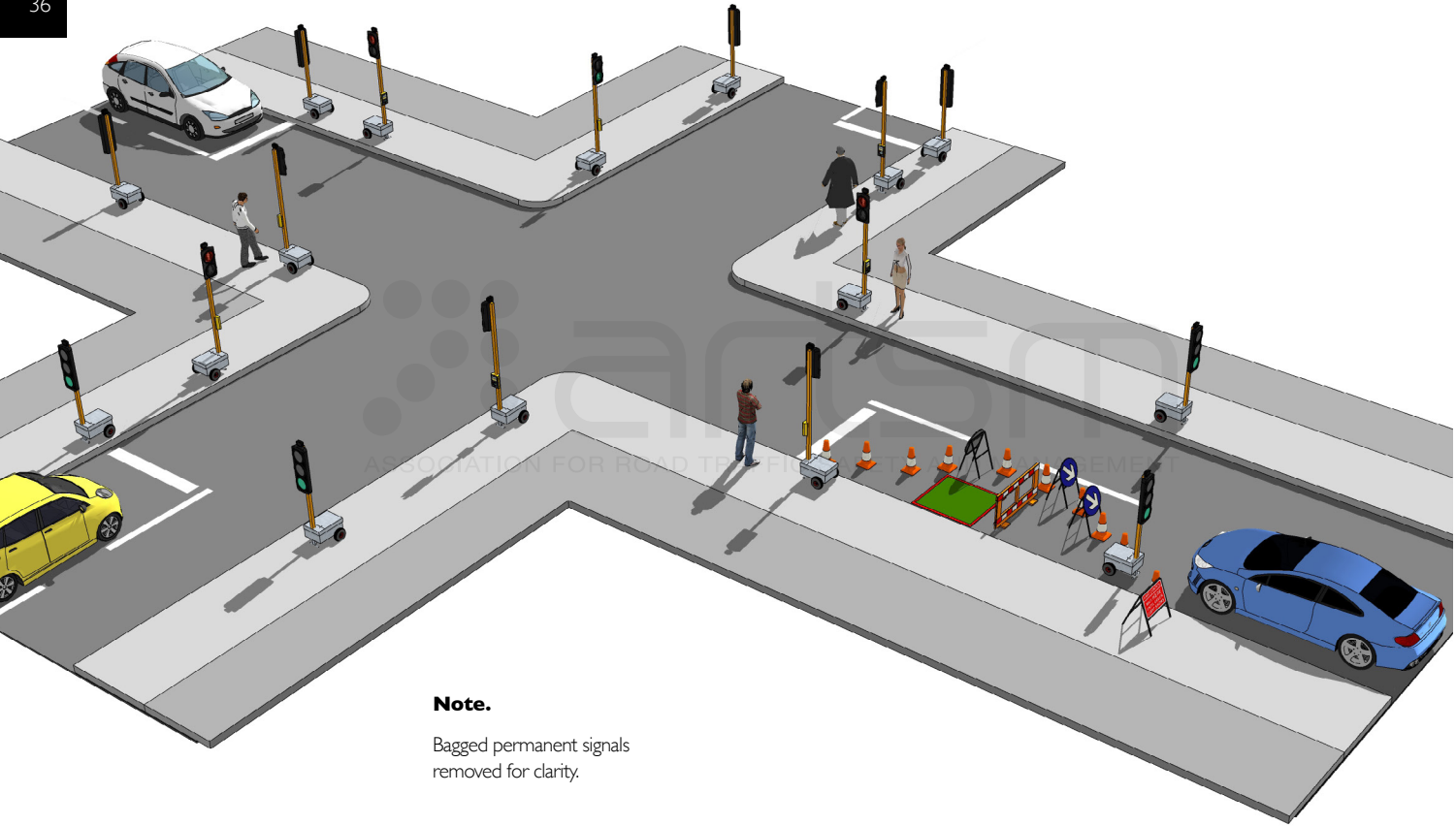
- 14.1 When considering the layout of portable pedestrian facilities, the safety of road users, particularly pedestrians, should be the foremost consideration.
- 14.2 A risk assessment must always be carried out when deciding what time of facility to provide. Particular care shall be taken on approaches that have more than one lane. On multi-lane approaches, the risk of drivers in the outside lane being unable to see the signals shall be considered.
- 14.3 You shall use 2 traffic signals for each approach where a pedestrian facility is used. If you use only one traffic signal per approach your risk assessment must clearly state how you mitigate the risks presented by only using one signal on an approach to a pedestrian crossing.
- 14.4 It is strongly recommended that portable pedestrian facilities of any type shall only be used on roads with a 30mph speed limit.**
- 14.5 Where the speed limit is greater than 30 mph and pedestrian facilities are considered necessary then a Temporary Traffic Regulation Order (TTRO) shall be considered to reduce the speed limit to 30mph.
- 14.6 Under all circumstances the speed of the vehicles on the relative approaches to a pedestrian facility shall be assessed. If the 85th percentile for approaching vehicles is above 35mph then speed reduction measures shall be considered.
- 14.7 Where a pedestrian facility is in a shuttle-works scheme, it shall be located at one end less than 15m from the primary vehicular signal.
- 14.8 In the signalling scheme, the safest implementation of the pedestrian phase is by implementation of a 'via'. This is a scheme where the pedestrian phase is only ever serviced after a call, after the closure of the traffic phase (less than 15m) nearest the crossing.
- 14.9 For a pedestrian crossing in 2-way works, the points in Section 20 'Signalled Pedestrian Facilities' should also be taken into consideration in the scheme.
- 14.10 Dimension W is the width of the crossing and should be typically 3 to 4 m. It must not be less than 2.4m and should not be greater than 10m.
- 14.11 Dimension P is the length of the crossing measured kerb to kerb. This dimension is required for setting the pedestrian signal timings (See Section 19.2).
- 14.12 Safe signalling for pedestrians may not always be possible within a scheme. Under these circumstances you should follow the guidance for Uncontrolled Facilities for Pedestrians (See Section 20).
- 14.13 Signalling systems registered to the following TOPAS specifications meet the minimum requirements for pedestrian facilities within works;
- TOPAS 2537 or TOPAS 2540 Appendix D

SECTION 15

Multi-Phase Traffic Scheme
with Pedestrian Crossings



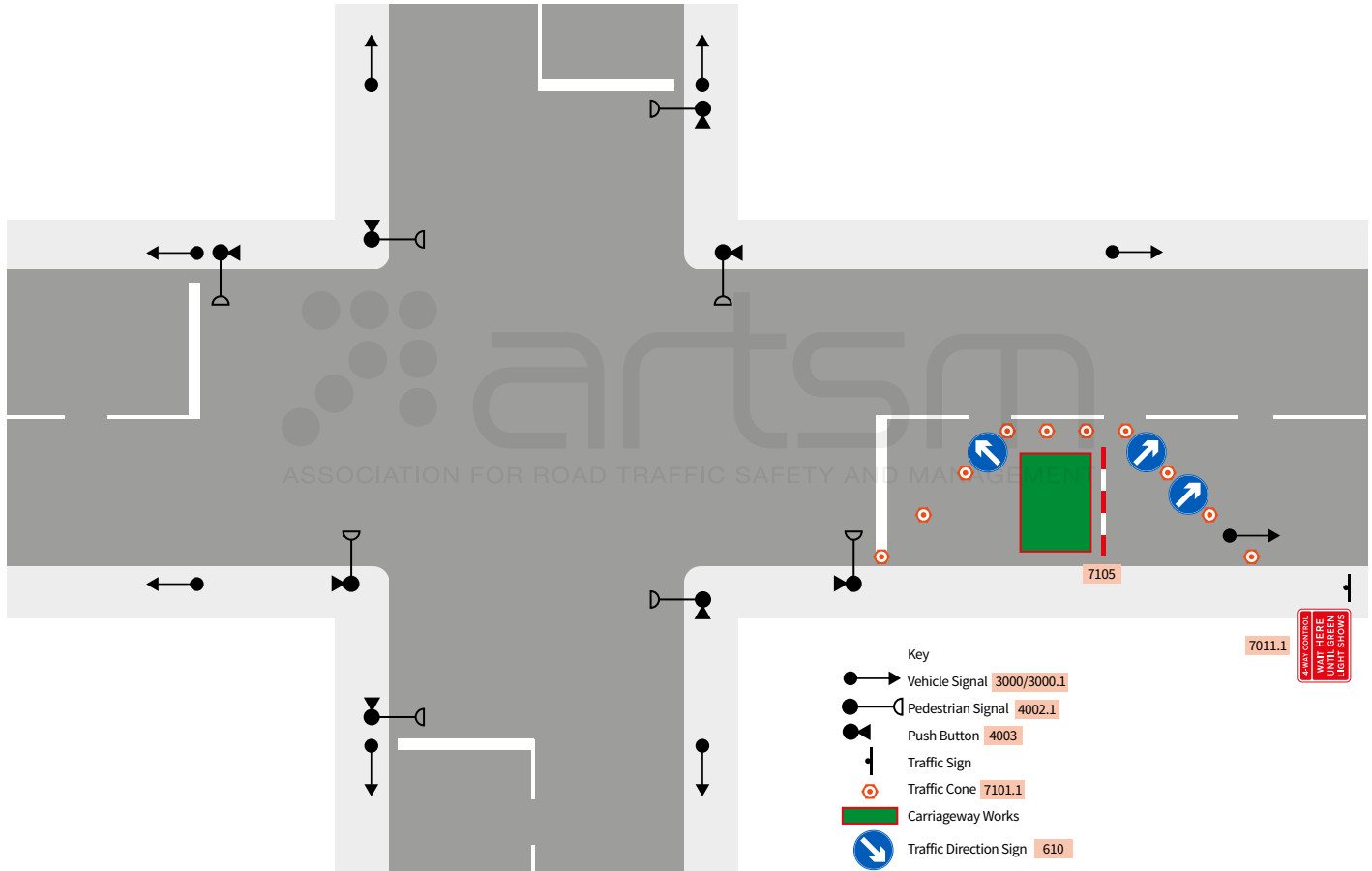
15. Multi-Phase Traffic Scheme with Pedestrian Crossings



Note.

Bagged permanent signals removed for clarity.

15. Multi-Phase Traffic Scheme with Pedestrian Crossings Plan Layout



15. Points to Consider for Multi-Phase Traffic Schemes with Pedestrian Crossings

- 15.1 When works are close to a permanent signalling facility then the existing permanent facility may be taken out of service (Section 5) and replaced with portable (or temporary) signals.
- 15.2 As a result, the works may introduce an extended distance within the scheme which will require longer red clearance times
- 15.3 Multi-phase signalling schemes (especially those with an extended 'arm' on an approach) can lead to excessive driver delays. These delays are magnified if pedestrian facilities are included so careful scheme planning is required.
- 15.4 These schemes are usually complex especially when pedestrian facilities are also required.
- 15.5 All the points for pedestrians 14.1 to 14.11 should be noted (inclusive of the extra points in Section 20)
- 15.6 Where there is more than one pedestrian crossing in a multi-phase scheme the dimension P noted in 14.10 shall be that for the longest crossing. This is important as it sets the longest safe pedestrian clearance time for all the crossings which usually run at the same time on most portable systems.
- 15.7 Signalling systems registered to the following TOPAS specifications meet the minimum requirements for Multi-Phase traffic schemes with pedestrian crossings;
- TOPAS 2537 or TOPAS 2540 Appendix D

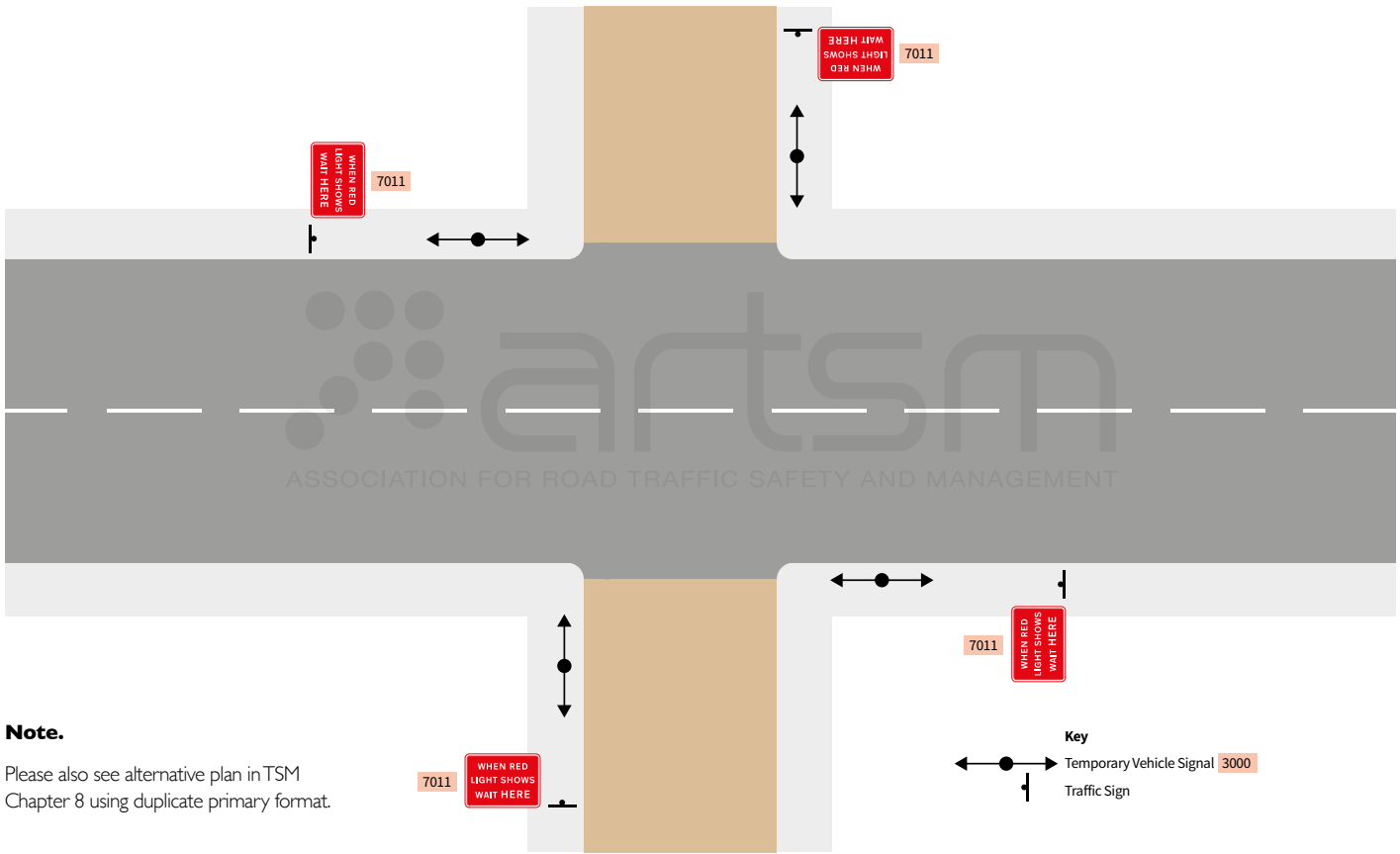


SECTION 16

Haul Route Crossing



16. Haul Route Crossing Plan Layout



Note.
Please also see alternative plan in TSM Chapter 8 using duplicate primary format.

Key
Temporary Vehicle Signal 3000
Traffic Sign

16. Points to Consider for Haul Route Crossings

- 16.1 Signalled Haul Route Crossings have specific guidance in TSM Chapter 8.
- 16.2 You shall use Temporary Vehicular Signals for Haul route crossings (not portable Vehicular signals).
- 16.3 The scheme depicted is with nearside primary signal and closely associated offside secondary signal per phase as an alternative to that depicted in TSM Chapter 8.
- 16.4 The signalling system shall have an 'arterial reversion' setting that allows the signals to rest on green on the main carriageway.
- 16.5 You may have a hold off setting that impedes a call from the Haul Route. This delays the call if a previous call has recently been serviced. This prevents the Haul Route interrupting the main route if it is very busy.
- 16.6 You may have a facility for the Haul Route to be called manually instead of by the detector under VA. This prevents calls being accidentally made by vehicles moving on or near the Haul Route which do not intend to use the crossing.
- 16.7 Signalling for Haul Routes may have part time operation.
- 16.8 Signalling for Haul Routes may include a separate pedestrian phase (see 15.5).



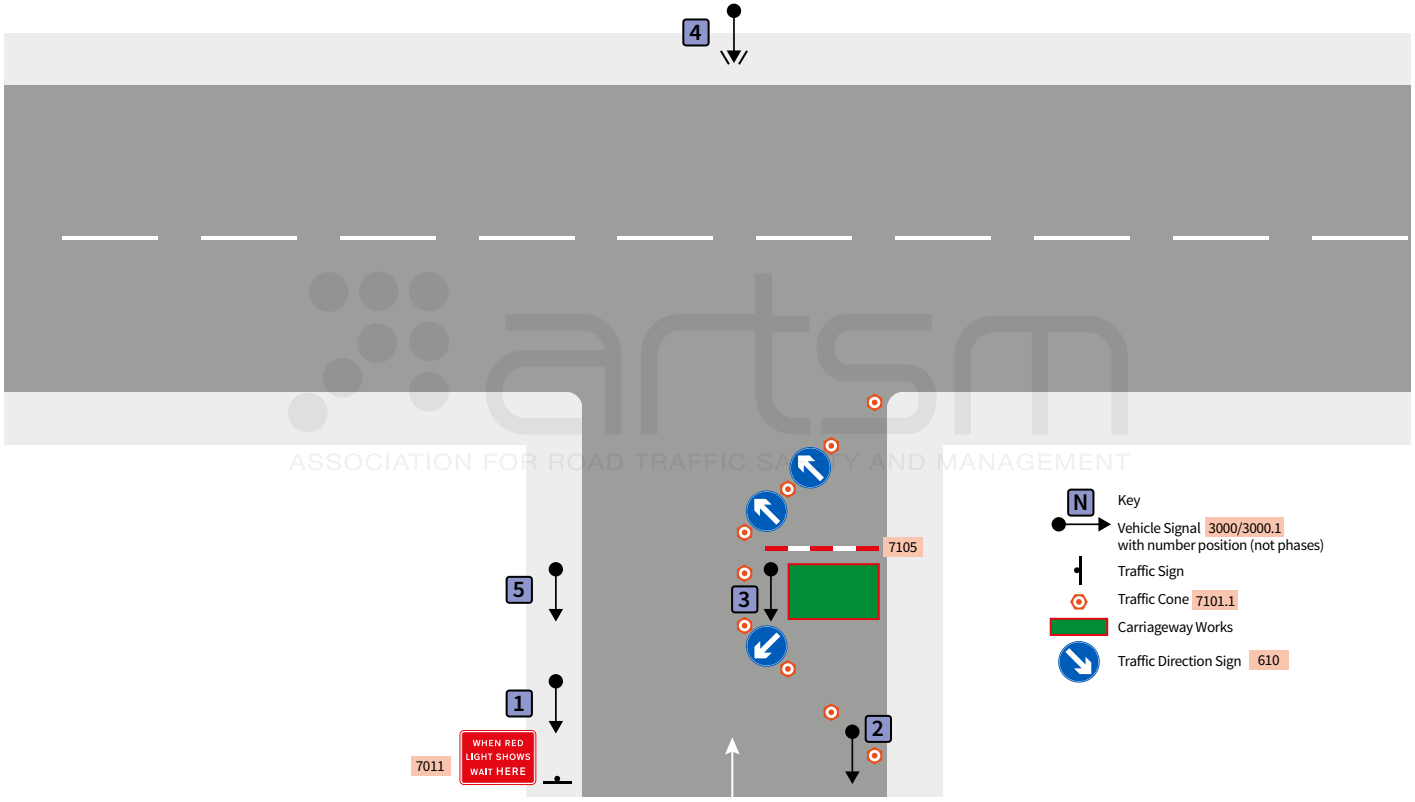
- 16.9 Signalling systems that meet the minimum requirements for Haul Route Crossings as follows:
- Equipment previously Type Approved to TR 0137
 - Equipment registered to TOPAS 2540 Appendix A

SECTION 17

Traffic Signal Location









17. Traffic Signal Location Plan Layout










Traffic Signal Locations for Approach

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ASSOCIATION FOR ROAD TRAFFIC SAFETY AND MANAGEMENT

-  Key
-  Vehicle Signal 3000/3000.1 with number position (not phases)
-  Traffic Sign
-  Traffic Cone 7101.1
-  Carriageway Works
-  Traffic Direction Sign 610

17. Traffic Signal Location Plan Layout

Signal Location	Description	Commentary
	<p>Nearside Primary</p>	<p>This is the preferred location for the primary traffic signal. For safe operation, a traffic signal shall be visible to approaching traffic as well as while waiting at the WAIT HERE sign. If this is not possible with one signal, a second traffic signal shall be used.</p>
	<p>Offside Primary if  is omitted Or Duplicate Primary if  is present</p>	<p>The offside primary location is used if the nearside primary location is not readily available. You must have at least one primary signal. A duplicate primary is acceptable if two traffic signals are required on an approach.</p>
	<p>Closely Associated Offside Secondary</p>	<p>Where two traffic signals are required on an approach this is a good location for the secondary when the Nearside Primary is used.</p>
	<p>Secondary</p>	<p>This signal should be less than 30m from the WAIT HERE sign and shall have hoods fitted.</p>
	<p>Closely Associated Nearside Secondary</p>	<p>This location for a secondary is available when two signals are required on an approach and no other locations are readily accessible.</p>

18. Modes of Operation

18.1 Modes of Operation

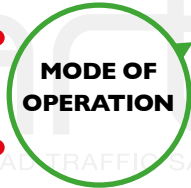
Controllers for portable traffic signals have several modes of operation. Whilst each system varies in how the modes are selected by the Traffic Management Operative (TMO), most controllers have a minimum of the basic four separate modes of operation detailed in this section.

18.2 All-Red

This holds **All** the signals at **Red** continuously when selected. This mode can be used when there is an issue on site that requires urgent intervention or the signal system needs to be adjusted.

18.4 Manual Control (MC)

This may be used if the area in the works needs to exclude traffic for short periods such as unloading. If this mode is used, all traffic approaches to the works should be clearly visible to the operator at all times.



18.3 Vehicle Actuation (VA)

Signal control should always be left on VA unless otherwise instructed. This mode reduces the delay to vehicles by ensuring the green time(s) are adjusted automatically with detection from the radar system. The green time will vary from the minimum green time set on the controller (typ 7 or 12 secs) to the maximum set for a phase (up to 60 secs).

18.5 Fixed Time

The system will cycle on fixed time set on the controller. This mode can be used if there is a suspected fault on the system but this mode may not be present on some older controllers.

18.6 UTC Operation

Some portable systems may be put into a mode that enables the signals to be operated by a local authorities Urban Traffic Control (UTC) system. This requires extra equipment from the portable signals to be connected to the local authority's road management system. It also requires specialist training and collaboration with the local authority to implement correctly and safely. It is usually only used where deployment is in a location of significant importance to the road network.

SECTION 19

Signal Timings

Disclaimer

All timings in this section are taken from existing guidance documents and specifications and are collated in this section for convenience.

The timing guidance forms the basis of an initial draft timing scheme and a full timing risk assessment should be performed for each site.

When the site is operational, all vehicle and pedestrian movements should be observed for a suitable period to assess safe operation of the site.

Any timing adjustments required for safe operation, should be implemented before leaving site.

19. Signal Timings

19.1 Vehicle to Vehicle Phase Intergreen

For both All-Red and Datum clearance time settings you should assess the traffic turning movements within the scheme. Vehicles performing turns or careful manoeuvres to avoid obstacles in the carriageway such as cover plates or ramps need more time to clear the site. When the All-Red and Datum distances are converted into clearance times for the controller you should consider adding 1 or 2 seconds extra red time depending on the severity of any identified turning movement(s).

19.2 20mph Roads

For roads with a 20mph speed limit, the All-Red times in Column 1 shall be increased by a minimum of 10% to the next highest whole number.

Vehicle to Vehicle All-Red Clearance Times

Distance Metres WAIT HERE to WAIT HERE or WAIT HERE to Datum	All-Red Time Seconds 6 to 36kph design speed		Bicycle/Adjustment Add to All-Red Time	
	COLUMN 1		COLUMN 2	COLUMN 3
<10	1 (5)	For no line sight between WAIT HERE signs use time in brackets. For Datum, the min time in brackets is the sum of lowest two datum distances	<3% uphill gradient 20kph design speed	Use alternative adjustment in brackets for >3% uphill gradient 15kph design speed
10 - 20	2 (5)			
20 - 30	3 (5)			
30 - 40	4 (5)			
40 - 50	5			(+1)
50 - 60	6			(+2)
60 - 70	7		+1	(+4)
70 - 80	8		+2	(+5)
80 - 90	9		+3	(+7)
90 - 100	10		+3	(+8)
100 - 110	11		+4	(+9)
110 - 120	12		+5	(+11)
120 - 130	13		+6	(+14)
130 - 140	14		+7	(+15)
140 - 150	15		+8	(+16)
150 - 200	16 - 20	Pro-rata times with distance	+9 to +12	(+17 to +22)
200 - 250	21 - 25		+13 to +16	(+23 to +30)
250 - 300	26 - 30		+17 to +20	(+31 to +37)
	Add +1 or +2 for turning movement to above values in column 1		NOTE: red values in columns 2 & 3 will incur excessive vehicle delays. Dedicated provision outside the vehicle allocated carriageway should be considered	

19. Signal Timings (Cont.)

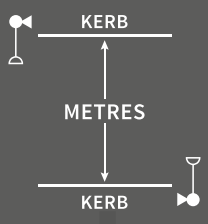
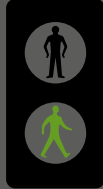


19.3 Pedestrian to Vehicle Phase Intergreen

The signal timings for the pedestrian phase are set by the width of the pedestrian crossing measured kerb to kerb in metres. Any part distances are always rounded up. The table shows the timings that shall be set for an average walking speed of 1.2m/s. It should be noted that some Highway Authorities may call for settings based on an average walking speed of 1.0m/s and the timings should be increased accordingly.

**** Excluding TfL, for pedestrian crossings greater than 21.6m, advice for timings should be sought from the Authority**

TSM Chapter 6 Pedestrian Timings

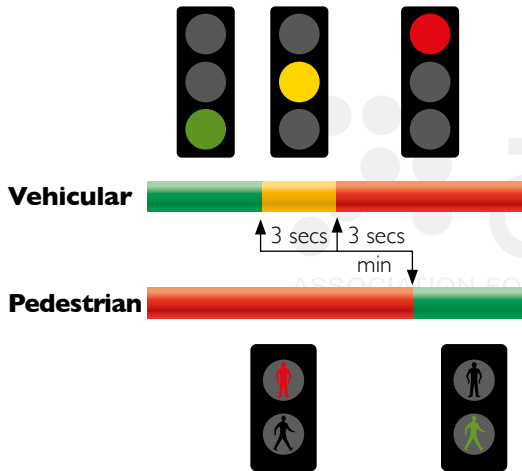
(TfL SQA-0645 timings noted in brackets)

Ped Crossing Length Dimension P (m)	Invitation Time	Blackout Time	Clearance Time
			
Up to 7.2	6 (6)	3 (3)	3 (3)
7.2 - 8.4	6 (6)	4 (4)	3 (3)
8.4 - 9.6	6 (6)	5 (4)	3 (4)
9.6 - 10.8	6 (6)	6 (5)	3 (4)
10.8 - 12.0	6 (6)	7 (5)	3 (5)
12.0 - 13.2	7 (6)	8 (6)	3 (5)
13.2 - 14.4	7 (6)	9 (6)	3 (6)
14.4 - 15.6	8 (6)	10 (7)	3 (6)
15.6 - 16.8	8 (6)	11 (7)	3 (7)
16.8 - 18.0	9 (6)	12 (8)	3 (7)
18.0 - 19.2	9 (6)	13 (8)	3 (8)
19.2 - 20.4	10 (6)	14 (9)	3 (8)
20.4 - 21.6	10 (6)	15 (9)	3 (9)
21.6 - 22.8	11 (6)	** (10)	** (9)
22.8 - 24.0	11 (6)	** (10)	** (10)

19. Signal Timings (Cont.)

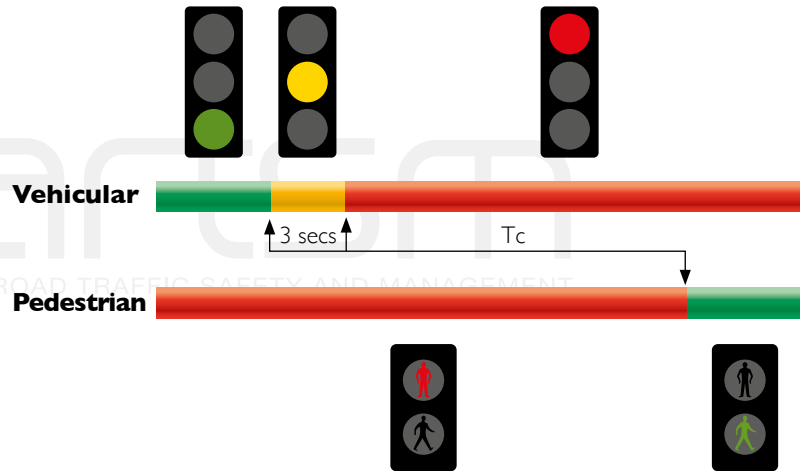
19.4 Vehicle to Pedestrian Phase Intergreen

Stand-Alone Pedestrian Crossing



All-Red clearance to be 3 secs (max 6 secs).

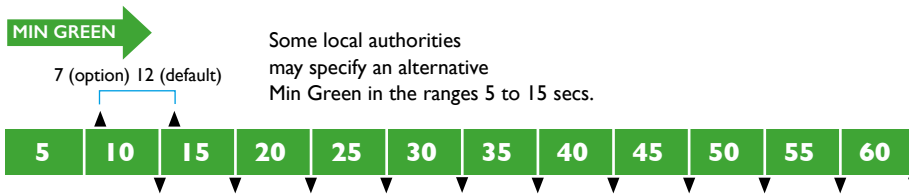
Pedestrian Facilities within Works



All-Red clearance time (T_c) cannot be less than the largest vehicle to vehicle All-Red clearance time for the site.

19. Signal Timings (Cont.)

19.5 Max & Min Green Time

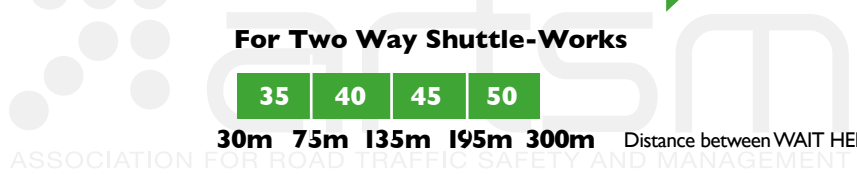


Max green time starts when opposing demand is registered

For Two Way Shuttle-Works

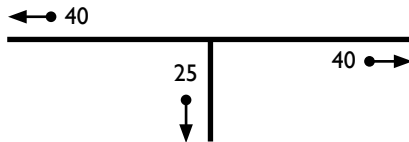


30m 75m 135m 195m 300m Distance between WAIT HERE Signs.

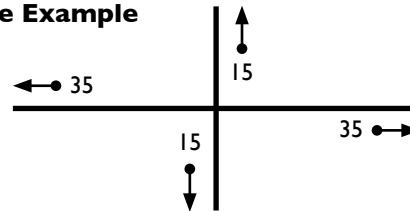


For Multi-Phase

3 - Phase Example



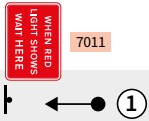
4 - Phase Example



Set higher Max green times on approaches with higher traffic.
Set lower Max Green times on approaches with light traffic.

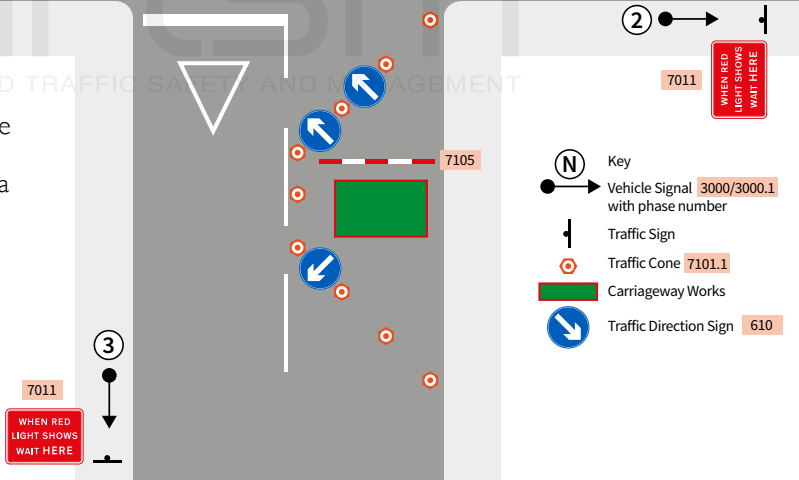
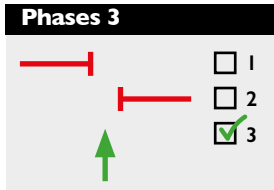
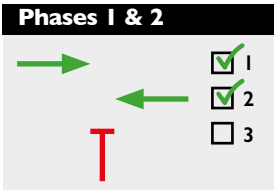
Do not allow the sum of all Max Green to become high as this may lead to very long cycle times.
Where possible the sum of all Max Green times should be below 120 secs.

19. Signal Timings (Cont.)



19.6 Advanced Signal Schemes (I)

In this scheme, the main road is free from obstruction so there is no conflict on phases 1 & 2. Some portable controllers have a 'linked phases' function. When used correctly this gives a significant increase in signalling efficiency.



19. Signal Timings (Cont.)

19.7 Advanced Signal Schemes (2)

Some schemes can get very complicated and require a significant amount of planning. They may have many of the elements described in earlier sections. In complex schemes the safety clearance timing shall be independently checked before deployment.



SECTION 20

Additional Guidance



20. Additional Guidance

General

- 20.1 Signal assemblies, pedestrian signal heads and push buttons should be mounted so as to reduce, as far as possible, the risk of injury from tripods, trolleys, post blocks etc.
- 20.2 Signal head assemblies, whether installed in the carriageway or on the footway, should be suitably coned off and provided with suitable guarding to prevent them from becoming a hazard.
- 20.3 Traffic signals must comply with TSRGD Schedule 14 Part 2.

Vehicular Signals - signals for the control of vehicular traffic must comply with either of:

- Diagram 3000.1 light signal for portable signal systems; or
- Diagram 3000 light signal for temporary signalling systems

Pedestrian Signals - signals and push buttons (or demand units) must comply with either of:

- Diagram 4002.1 far side light signal for pedestrians and 4003; or
- Diagram 4002.1 and 4003.8; or
- Diagram 4003.1

20.4 The signals shall be brought into service using the normal signal start up sequence as noted in the TOPAS specifications. The signals shall be normally on with the systems running but with no aspects illuminated to traffic (lamps out). The signals shall then be instructed to come into service using the start-up sequence when it is safe to do so.

20. Additional Guidance (Cont.)

- 20.5 The signals shall be taken out of service by changing the mode of operation to All-Red when the signals have normally cycled to an all-red condition. At a time not shorter than the maximum all-red clearance time set and when all vehicles, pedestrians and cyclists have finished their respective movements and it is safe to do so the signals shall be turned off.
- 20.6 Portable (or temporary) signal controllers have adjustments and settings available to the operator for the safe operation of the system. It is important that the access to these settings is securely locked when the signals are unattended so they are not accessible to the public (or unauthorised/untrained users) where tampering with the controller may lead to unsafe operation of the system.

Signalled Pedestrian Facilities

- 20.7 Signalled pedestrian facilities operate with the same sequence as pedestrian facilities at permanent junctions; red figure/green figure/black-out/red figure; (or red figure/green figure/red figure for nearside pedestrian signals)
- 20.8 Push buttons should be positioned so that they are readily accessible to anyone wishing to use the crossing. In the case of Diagram 4003.1 or 4003.8, these shall be mounted at right angles to the kerb. For other indicators (including Near Side Pedestrian Signals), care should be taken to ensure correct alignment.
- 20.9 If a drop kerb is not present, wherever possible, a pedestrian ramp from the footway to the carriageway should be installed at a signal-controlled pedestrian facility.
- 20.10 Where ramps are installed the crossing distance between the ramps shall not be less than 6.75m for a two-way single carriageway.

20. Additional Guidance (Cont.)

- 20.11 Tactile signals shall only be used where a drop kerb or ramp is provided. Audible signals are not used unless specified. If an audible signal is specified where a drop kerb or ramp is present, then a tactile signal shall be fitted.

	Audible	Tactile Indicator
Drop kerb or ramp present	Only if specified	Yes
No drop kerb or ramp	No	No

- 20.12 Tactile signals shall never be left disconnected and non-operational but still accessible to pedestrians at a site where there is no dropped kerb or ramp.
- 20.13 Diagram 701 1.2 WAIT HERE sign shall be used for a stand-alone pedestrian crossing.

Level Crossings

- 20.14 If the planned installation of portable signals is near the approach to a level crossing (or other barrier-controlled sites), you shall follow separate specific advice. Installation of signals near these sites as well as working near Tram-ways and Railways is potentially extremely hazardous.



20. Additional Guidance (Cont.)

Uncontrolled Facilities for Pedestrians

- 20.15 In some circumstances it may not be possible or appropriate to provide a crossing facility for pedestrians which is signalled and an uncontrolled pedestrian facility should be considered.
- 20.16 If site conditions permit, at any crossing facility where a drop kerb is not present, a pedestrian ramp from the footway to the carriageway should be installed. (See also 20.10)
- 20.17 When uncontrolled facilities for pedestrians are being used, it is essential there is good intervisibility between vehicle drivers and pedestrians.
- 20.18 Uncontrolled pedestrian facilities rely on the vehicle to vehicle phase intergreen period (Section 19.1) to create a safe period of no vehicle movements to cross. One option is to extend the distance between the end of works and the WAIT HERE sign. The all-red time provided for this period should be sufficient for pedestrians to cross safely.



- 20.19 The all-red time as used in 20.18 above, shall be greater than the sum of the invitation, blackout and clearance times for a given uncontrolled crossing length as specified in section 19.3.

20. Additional Guidance (Cont.)

Approaches With More than One Lane

- 20.20 Portable signals shall not be deployed on sites where an approach has 3 lanes. If the number of lanes cannot be reduced below three, then only a temporary signalling system shall be used which will usually consist of at least three vehicular signals on that approach (phase).

- 20.21 Where an approach has two lanes, reducing it to one lane should be considered if portable signals are required to be deployed. If a reduction to one lane is not possible then two vehicular traffic signals should be deployed on the approach. (see Section 17).

Bus Stops

- 20.22 If there are bus stops on the approaches or within the works they will generally need to be moved to a temporary location in agreement with the Traffic Authority and the bus operator.



21. Documentation

- 21.1 Deploying and maintaining traffic signalling schemes is an important and critical function for the safe management of vehicles and pedestrians.
- 21.2 The design for a TM scheme is a very important element for the safe deployment of signals as it should take into consideration many of the hazards identified in the risk assessment
- 21.3 It is important to note that a person producing a Traffic Management (TM) design for construction work is a Designer under the Construction (Design and Management) Regulations 2015.
- 21.4 The Designer must seek to eliminate hazards resulting from the TM design so far as is reasonably practicable. Where hazards cannot be eliminated the Designer must reduce or control foreseeable risk. The Designer must also highlight residual risk from their design to others involved in the construction process.
- 21.5 As a minimum your documentation should include:
 - The TM plan layout complete with dimensions
 - The Risk Assessment for the scheme (this must be completed/retained)
 - A Record of all the Signal Controller settings
 - Any updates or observations that were applied to the scheme
 - The commissioning and decommissioning dates and times.
- 21.6 You shall keep complete and correct records for the scheme that is deployed and should the scheme change, you shall update your records and shall update your risk assessment.
- 21.7 In the unfortunate situation that an incident occurs whilst the signals are in service your documentation provides the auditable safety trail for the site.



22. References

References

The following documents were used in compiling this guidance:

The Traffic Signs Regulations and General Directions (TSRGD)

An Introduction to the Use of Portable Signals (The Pink Book)

Safety at Street Works and Road Works 'A Code of Practice' (The Red Book)

TAL2/11 Portable Traffic Signals for the Control of Vehicular Traffic

TAL 3/11 Signal Controlled Pedestrian Facilities at Portable Traffic Signals

Traffic Signs Manual Chapter 8

Traffic Signs Manual Chapter 6 (including TAL 5/05 & LTN 2/95)

ADR Concerning the International Carriage of Dangerous Goods by Road (CDG)

Statutory Guidance for Highways Authority Permit Schemes – DfT 2019

HAUC (England) Guidance – Operation of Permit Schemes – Feb 2017

Health & Safety at Work Act - 1974

Construction (Design & Management) Regulations - 2015

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Enquiries

All enquiries about this publication should be sent to **general.secretary@artsm.org.uk**

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