Traffic Signs Manual

CHAPTER 8

Traffic Safety Measures and Signs for Road Works and Temporary Situations

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London: TSO

Traffic Signs Manual

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1 INTRODUCTION

1.1 Overview

1.1.1. The Traffic Signs Manual (the Manual) offers advice to traffic authorities and their contractors, designers and managing agents in the United Kingdom, on the correct use of traffic signs and road markings on the highway network. Mandatory requirements are set out in the Traffic Signs Regulations and General Directions 2016 (as amended) (TSRGD). In Northern Ireland the relevant legislation is the Traffic Signs Regulations (Northern Ireland) 1997 (as amended). Whilst the Manual can assist with complying with the mandatory requirements, it cannot provide a definitive legal interpretation, nor can it override them. This remains the prerogative of the courts or parking adjudicators in relation to the appearance and use of specific traffic signs, road markings etc. at specific locations.

1.1.2. The advice is given to assist authorities in the discharge of their duties under section 122 of the Road Traffic Regulation Act 1984 and Part 2 of the Traffic Management Act 2004 in England and under Part 1 of the Roads (Scotland) Act 1984. Subject to compliance with the Directions, which are mandatory (see **1.4.2** and **1.4.3**), it is for contractors and traffic authorities to determine what signing is necessary to meet those duties.

1.1.3. It includes advice on the use, siting, and illumination of traffic signs and road markings on all purpose roads and motorways, as well as temporary signs for use in connection with road works and in emergency situations. Following the advice in the Manual can also help traffic authorities reduce the amount of sign clutter on their roads.

1.1.4. The Manual applies to the United Kingdom. References to 'the national authority' should therefore be interpreted as referring to the Secretary of State for Transport, the Department for Infrastructure (Northern Ireland), the Scottish Government or the Welsh Government as appropriate. Any reference to the 'Department' is a reference to the Department for Transport or the appropriate national authority for Northern Ireland, Scotland or Wales as described above.

1.1.5. Unlike other Chapters of the Manual this document is not just design guidance but is a code of practice as it includes requirements as to how to install, maintain and remove Temporary Traffic Management (TTM) at both works and temporary situations. While the statutory and contractual force varies across the UK, this document defines or identifies legal requirements, or minimum requirements, mandated in various highway, roads and health and safety legislation. As such those designing or undertaking works or implementing temporary layouts and other situations must be able to show TTM meets the relevant requirements identified in this document even where there is no contractual requirement to work to this document. In addition, this document identifies requirements, or minimum requirements, relating to the enforceability of regulatory signs included as part of any TTM, including speed limits.

1.1.6. The document 'Safety at Street Works and Road Works: A Code of Practice' (generally known as the Red Book) has statutory force on many roads in Great Britain; this identifies the same signing and guarding requirements as this document but does not cover as great a range of circumstances, nor some other legislative aspects such as the wider consideration of road users with protected characteristics identified in this document. It is therefore recommended that those undertaking works coming under the Safety at Street Works and Road Works: A Code of Practice are also sufficiently aware of the requirements and guidance in this document.

1.2 Definitions

1.2.1. In this Manual, the words ‘must’ and ‘must not’ are used to indicate a legal requirement of the Traffic Signs Regulations and General Directions (or other legislation) that must be complied with.

Additionally, ‘must’ and ‘must not’ also indicate essential (or mandatory) compliance with requirements to other acts and regulations, including Highways Acts (and equivalent legislation), and Health and Safety legislation such as Construction Design and Management Regulations etc.

Finally, ‘must’ (or ‘needs to be’) is also used where two or more parts of a product, design option or method of operation are required to be combined to be suitable for use or adoption as part of a safe system of work.

The word ‘should’ indicates a course of action that is recommended and represents good practice. The word ‘may’ generally indicates a permissible action, or an option that requires consideration depending on the circumstances.

1.2.2. Section 64 of the Road Traffic Regulation Act 1984 defines a traffic sign as ‘any object or device (whether fixed or portable) for conveying to traffic on roads or any specified class of traffic, warnings, information, requirements, restrictions or prohibitions of any description and any line or mark on the road for so conveying such warnings, information, requirements, restrictions or prohibitions’ and stipulates that these signs be ‘specified by regulations made by the national authority, or authorised by the national authority’. The types of signs and carriageway markings and their appropriate use are prescribed in TSRGD.

1.2.3. ‘Signing’ includes not only traffic signs mounted on supports (and other structures such as gantries, bridges, railings, etc) but also carriageway markings, beacons, studs, bollards, traffic signals, matrix signals and other devices prescribed in TSRGD.

1.2.4. In this document the terms ‘traffic’ and ‘road users’ must be taken to include both motorised and non-motorised users such as pedestrians, cyclists, and horse riders.

1.2.5. This document primarily provides guidance and requirements on two topics.

- ‘Road works’ are defined as any works which cause partial or total obstruction of any road or highway, whether on the verge, hard shoulder, footway, cycle route, bridleway, or carriageway. Examples may include highway improvement schemes, excavations, structural inspections, maintenance works, street works, or any other work executed on or near the highway together with the necessary working space, safety zones, space required for the storage of any materials, the construction of any temporary structures, and the operation of any construction plant required for the execution of such work, including associated surveys and inspections. This includes any activity which would affect the operation of signalling and/or traffic control systems, whether or not there is any partial or total obstruction to that section of road. ‘Road works’ would also cover any traffic signs or remedial action needed to manage risk due to wear or deterioration of any aspect of the highway (this would not include information or warning signs identified in Chapter 4 to highlight transient risks associated with the permanent road layout).
- ‘Temporary situations’ are defined as any short term (up to six months only, unless approved by the national authority) alterations to a road or highway which is not related to a construction, inspection, or maintenance activity e.g. where the road or other infrastructure is damaged by external forces e.g. landslide or a bridge being washed out.

Any signs not part of road works which are in place for more than six months (or where TSRGD identifies a longer period) are not considered temporary signs and must be designed to the principles and requirements for permanent signs or be authorised/approved by the relevant national authority.

While not the primary purpose of this document it also provides the basic principles and some guidance for temporary signing and traffic management for public events such as sporting, entertainment, ceremonial and other public gatherings.

1.2.6. In this document the term ‘road worker’ is a description independent of any employment status or employer. It includes all those who may be undertaking inspection, survey, enforcement, maintenance, or construction activities as well as mobile works. It would not normally cover drivers or riders who are working where the nature of the employment is not related to the works, temporary situation, or the traffic authority. It is expected that road workers undertaking similar activities should have similar levels of risk irrespective of employment status or employer.

1.2.7. In this document the term ‘authority’ or ‘traffic authority’ will generally indicate a road authority, or road owner (see **1.7.1**). Any reference to other authorities will be identified in the text.

1.2.8. In this document Temporary Traffic Management (TTM) is a generic term for any sign, equipment or product placed on a road, mobile works vehicle, arrangement or technique used in the safe implementation of activities such as road works, events, or inspections etc.

1.3 Responsibility

1.3.1. Traffic signs are placed by the traffic authority (and their contractors), through the powers provided by the Road Traffic Regulation Act 1984, to provide warnings, information and details of restrictions to road users. The police and certain other public bodies and statutory authorities also have the right to place traffic signs, but only in the limited circumstances provided for by the relevant legislation. All traffic signs (including markings and equipment) must be lawful, that is prescribed or authorised, when installed. The condition of traffic signs in road works and temporary situations must be regularly checked and any that are damaged, worn or degraded to the point their nature ceases to comply with that prescribed or authorised must be promptly removed, replaced, or repaired. Examples of signs in marginal and unacceptable conditions are given in this document; road markings are considered to cease to be lawful contiguous markings where more than 30% of the marking (or part of the marking) is worn down to the underlying road surface.

1.3.2. In order to achieve safe and efficient operation of a highway network, it is essential that all signing provided is necessary, clear and unambiguous, and gives its message to road users at the appropriate time. The message must be quickly and easily understood at the point it is needed; neither too soon that the information might be forgotten, nor too late for the safe performance of any necessary manoeuvre.

1.3.3. Individuals who design and maintain the road network must be able to offer consistent standards that can satisfy the road user’s need for information and guidance. Traffic authorities depend on signing for the efficient control and movement of traffic, for enforcement of traffic regulations and, most importantly, as an aid to road safety. It is therefore recommended that all major traffic signing work should have been designed or checked by someone with an appropriate qualification.

1.3.4. Example qualifications would be the Institute of Highway Engineers' Professional Certificate or Diploma in Temporary Traffic Management Engineering, or their Professional Certificate in Traffic Sign Design, that allows applicants to demonstrate their experience and produce work to the required standard. A designer holding a Diploma level qualification would be likely to demonstrate the skills needed to adequately check traffic management schemes and/or signing work. For more information please see:

www.theihe.org/academy/professional-certificates-diplomas/

1.3.5. In describing the design and use of signs, mention is made of the definitions listed in **Table 1.1**. These are all elements that must be considered during the design stage of the signing process to ensure signs are seen accurately by drivers, within the appropriate time frame and to maintain road safety.

Table 1.1 Definitions

Sign legibility	The attributes of a sign face that allows recognition of its text characters, numerals and symbols. It is affected by the choice and size of type face, the contrast between colours and the amount of light reaching the observer from the sign. It directly relates to an observer's visual acuity, signs must be legible for road users with a visual acuity of 6/12 (decimal 0.5 on the Snellen scale).
Legibility distance	The furthest distance at which a sign is legible determines the time available for a driver to read its message, taking account of the speed at which they are travelling.
Readability	The character of a sign that leads to comprehension of its intended message. This depends on legibility, its layout and spacing, the clarity and ease of recognition of any symbology, the amount of information it contains, and the time available to read it. It is considered a subjective outcome.
Conspicuity	The capacity of a sign to stand out or be distinguishable from its surroundings and thus be readily discovered by the eye. It is improved if there is a noticeable contrast between a sign and its background. It is particularly likely to be an issue for smaller signs.
(Clear) Visibility	The physical attributes of a sign and its location that allow it to be seen at a given distance, even if not yet legible. This needs to be maintained taking into account factors such as vegetation growth and changes in TTM layout.
Planned works	Any works where there is the ability to identify and plan TTM to be used and a safe method of working chosen before the installation of any TTM. This would include any remedial works not undertaken at the time of a discovery of a safety critical failure e.g. overnight works to repair a failure identified during the day. Any immediate action to repair a safety critical failure would normally be considered Emergency Traffic Management (ETM) or enhanced ETM. See **Section 8**.

1.4 References

1.4.1. Any reference to a 'Chapter' is a reference to a Chapter of the Traffic Signs Manual, and any reference to a 'Section', unless otherwise stated, is a reference to a Section within a Chapter of the Manual. 'This document' refers to this Chapter.

1.4.2. Any reference to the 'Regulations' or the 'Directions' is a reference to the Traffic Signs Regulations and General Directions 2016, applicable to England, Scotland and Wales. Reference to a diagram number or to a Schedule is a reference to a diagram or Schedule in those Regulations.

1.4.3. References to Schedules, Parts, items, and paragraphs within TSRGD are shown in an abbreviated format. In this system, 'Schedule' is shortened to 'S' and 'Part' is indicated by the second number without a prefix. The final element, variously 'item' or 'paragraph' is also denoted by a number without a prefix. This is illustrated in the following examples:

- ‘Schedule 9, Part 6, item 25’ becomes ‘S9-6-25’
- ‘Schedule 11, Part 6, paragraph 3’ becomes ‘S11-6-3’
- ‘Schedule 12, Part 2’ becomes ‘S12-2’

1.4.4. In Northern Ireland, the relevant legislation is the Traffic Signs Regulations (Northern Ireland) 1997 as amended. Diagram numbering occasionally differs in these Regulations and references to Schedules do not apply to Northern Ireland. The design of road markings, meanings and permitted variants are generally similar but can vary; where the Northern Ireland Regulations apply, the designer is advised to read them in conjunction with the Manual. Detailed working drawings of traffic signs and road markings are available at:

https://www.infrastructure-ni.gov.uk/articles/traffic-signs-authorisations

1.4.5. Not all road markings referred to in the text are included in the Northern Ireland Regulations. References to directions are not applicable in Northern Ireland; where these are referred to, advice should be sought from the Department for Infrastructure’s Headquarters.

1.5 Format

1.5.1. The numbering system contained in the Manual utilises three levels comprising sections, sub-headings and numbered paragraphs. Internal references are in **bold blue**.

1.5.2. Dimensions on the figures are in millimetres unless stated otherwise. Many markings are fully dimensioned in TSRGD. Detailed working drawings of traffic signs and road markings are available at:

www.gov.uk/government/collections/traffic-signs-signals-and-road-markings

Additional information for Scottish bilingual signs is provided in TSRGD 2016 Schedule 17 Parts 9 and 10. Working drawings for Welsh and English bilingual signs are available at:

https://traffic.wales/traffic_signs.aspx

1.5.3. In addition to indicating overall dimensions, TSRGD prescribes maximum heights for road markings and road studs (regulation 10).

1.6 Further information

1.6.1. Revised chapters of the Manual are published infrequently, and the current version needs always to be used. Reference must always be made to the latest relevant legislation and harmonised standards, as amended, to ensure that decisions are taken in conformity with the current statutory requirements. As stated above, the requirements of legislation always take precedence. Also, designers should also be aware of any changes or updates to non-harmonised product standards, design standards and guidance notes on safe methods of operations.

1.6.2. Where more detailed background information might be helpful, reference is made to Standards and Specifications in the Design Manual for Roads and Bridges (DMRB), available at:

www.standardsforhighways.co.uk/dmrb

1.6.3. Technical enquiries regarding the content of the wider Manual should be made directly to the Department for Transport (traffic.signs@dft.gov.uk) or for this document National Highways, on behalf of the Secretary of State (chapter8@nationalhighways.co.uk).

1.7 Legal status

1.7.1. The Traffic Signs Manual is applicable in England, Northern Ireland, Scotland, and Wales. This document sets out a code of practice to enable the legal requirements to be met in a wide variety of circumstances. In Northern Ireland, an authorised officer for the Department may deem it to have a statutory force, via Article 31 of the Road Traffic Regulation (Northern Ireland) Order 1997 which deems this document to be a legal document for certain roads and only for the signs and devices used.

1.7.2. The Traffic Signs Manual applies to all types of roads to which the public have access. These roads include special toll roads, tunnels and bridges, industrial parks, retail parks, service areas, leisure parks, academic campus, hospitals, docks, railways, Ministry of Defence land, heritage parks, and similar estate roads, etc. All authorities, bodies, and organisations responsible for these types of roads (to which the public have access), are strongly recommended to make compliance with the requirements of this document a condition of contract in the case of works carried out on their behalf.

1.7.3. Many of the basic principles contained in this document are also covered in the Safety at Street Works and Road Works: A Code of Practice, which has legal backing under Sections 65 and 124 of the New Roads and Street Works Act 1991 and Article 25 of the Street Works (NI) Order 1995. The application of requirements in the Street Works code of practice does not remove the need to comply with the guidance and requirements identified in this document. See **2.14**.

1.7.4. Section 174 of the Highways Act 1980, Article 31 of the Road Traffic Regulation (NI) Order 1997 and Section 60 of the Roads (Scotland) Act 1984 make it clear that the proper signing, lighting and guarding of the works are the responsibility of the organisation or person carrying them out. This document identifies the minimum requirements relating to the design process and the provision of signs and equipment required to meet the legal duty to sign and guard the works.

1.7.5. While the requirements of secondary legislation e.g. relevant Construction (Design and Management) (CDM) Regulations, must be met, these cannot be used to justify the omission of signs and equipment identified in this document as needed for compliance with the primary legislative requirement to sign works. The restriction will apply to any site specific risk assessment or value management process. (See **2.2.3**.)

1.7.6. This responsibility to sign, light and guard works also includes making provision for, supporting and assisting the management of incidents within the works. The authority must not set, change, or remove any signs, or aspects on signals, within the works except as identified in the contractor's traffic management plan, or as specifically requested by the contractor.

1.7.7. When identifying the boundary of what sections of road are part of the works, this would include any section where the normal operation of the road is affected. This will include sections where there are no obstructions, but the safe and efficient operation of any signalling systems is affected by the works.

1.7.8. The requirements to sign, light and guard works extends to providing for the safe and effective operation of autonomous or assistive safety technology in vehicles. There are no specific requirements in this document but some specifications, design and maintenance requirements in this version of the document have been revised based on the known performance of in-vehicle sensors and control systems at the time of drafting. Designers should identify any updates for the design of AV 'friendly' TTM.

1.7.9. When planning and designing TTM, the requirements of the Traffic Management Act 2004 (not applicable in Scotland) and the New Roads and Street Works Act 1991 must also be taken into account for roads where these acts apply.

1.7.10. When using the Safety at Street Works and Road Works: A Code of Practice there is a need to show compliance with the Equality Act 2010 or the Disability Discrimination Act 1995 (in Northern Ireland). If there are highway features which are not included in the Safety at Street Works and Road Works: A Code of Practice, e.g. disabled access, then the works should be designed to the guidance in this document; the aspects which would mean that the street works code of practice is not directly applicable must be recorded.

1.7.11. TSRGD (TSR in N.I.) prescribes the design and conditions for the use of traffic signs (which includes road markings, traffic signals, pedestrian, cycle, and equestrian crossings) to be lawfully placed on or near roads in England, Scotland, and Wales. Many signs used in this document are prescribed in the TSRGD. Other signs, not prescribed in the TSRGD but used in this document, may be authorised by the national authority for use by individual traffic authorities. Any authorised sign must only be placed on a road in a manner specified or directed in the authorisation.

1.7.12. Traffic signs and other apparatus for the control of traffic must conform to the TSRGD in force at the time of the works (TSR in N.I). Any requirement for goods or materials to comply with a specified standard must be satisfied by compliance with the requirements for mutual recognition as per Regulation 12 and General Direction 10 of the TSRGD. The certification of construction products is in a period of transition and varies between Great Britain and Northern Ireland. It is recommended that the latest versions of standards (and any National Annexes) are read when confirming specific characteristics and classes of products to be used. The Specification for Highways Works (SHW), part of the DMRB, has been revised to provide an up to date and clear set of requirements; these documents (CC 130 ‘Construction of temporary traffic signs, road markings and road studs’, CD 130 ‘Design of temporary traffic management at road works and temporary layouts’, CD 131 ‘Design of temporary retroreflecting road studs’ and CD 132 ‘Design of flat traffic delineators’) apply to trunk roads but are suitable for most other public roads in the UK. It is expected that guidance from industry stakeholders and trade bodies will be updated.

1.7.13. The contents of this document may be considered as representing what is reasonably practicable for the enforcement of the Health and Safety at Work Act 1974, the Health and Safety at Work (NI) Order 2005, and associated regulations.

1.7.14. Designers of both TTM schemes and any permanent road feature being constructed as part of works, have a duty under the relevant CDM Regulations to eliminate, or control, risk to both road workers and road users. As indicated in paragraph **1.7.9** this document identifies a benchmark for what is reasonably practicable when applying any recommend TTM layout, method of working, or using the identified flexibilities in this document to design works from first principles. An example of a designer’s duty is to identify sign face material used in permanent signs and the acceptable (at least one) methods of masking out and/or bagging, signs as part of works without impacting on the long term durability of the permanent sign or any manufacturers guarantee.

1.7.15. Designers must have sufficient skills, knowledge and experience to ensure the safety requirements for design and application of works are met. Sufficient knowledge includes understanding that this document defines minimum legal requirements for complying with the CDM and other H&S Regulations for all roads in the UK irrespective of any other statutory or contractual requirement. In addition, there is a legal requirement for designers of permanent

and temporary works to provide sufficient information to the contractor (and authority where relevant) to meet the requirements for maintaining a safe worksite and safe and efficient road.

2 GENERAL

2.1 Concepts and objectives

2.1.1. Safe and efficient traffic management is founded upon the following simple principles:

- provision of clear and early warning of obstructions in the highway
- optimisation of road space and the provision of an adequate safety zone and working space at works locations.
- clear directions relating to decisions/actions required from road users.
- elimination of potential conflict between road users, and between road users and road workers and their operations.
- credibility of traffic signs and temporary requirements.
- speed limits and restrictions appropriate for the temporary highway geometry and safety features.
- minimising fatigue to road users passing through the works.

2.1.2. Compliance with the guidance and requirements provided in this code of practice should assist those involved with the design, installation, maintenance, and removal of TTM to develop and implement a safe and effective system of working at all times.

2.1.3. This document includes recommendations based on good practice, it is not a prescriptive specification and it is recognised that the guidance given may not be applicable to all situations.

2.1.4. Underlying the design of TTM arrangements should be the provision of adequate and effective signing for road users.

2.1.5. The exposure of road users and road workers to unsafe or unacceptable conditions should be minimised, if not eliminated (see **2.7**). For road users this can be taken as the level of safety and road user comprehension expected for the same road in non-works conditions. The identification of the minimum road user safety benchmark for a specific road, using relevant accident data, must exclude any increase in risk due to damage or wear to road markings, road surface etc.

2.1.6. Health and safety legislation imposes a duty upon designers to ensure that TTM designs can be implemented, modified, maintained, and removed safely, including where conditions change or the TTM is damaged or displaced.

2.1.7. The guidance and requirements included in this document should enable designers to design schemes which are safe and effective for the vast majority of highways and roads in the UK. Site specific parameters may result in additional TTM being required to achieve safety and flow requirements.

2.1.8. TTM solutions and methods of working not included in this document should not necessarily be viewed as unacceptable and can be adopted following a detailed site-specific risk assessment. Designers; however, need to take note of layouts, signs and methods of working which this document recommends are not used, identifies as being not effective, or prohibits.

2.2 Principles of temporary traffic management design

2.2.1. This section deals with the general principles of TTM design and its application to the planning of road works schemes. The complexity of traffic management arrangements vary from scheme to scheme, but the primary objective is always:

- to provide adequate signing and guarding (as defined in this document) and ensure road user safety is maintained.
- maximise the safety of the workforce and the travelling public during the installation, maintenance and removal of TTM.

The secondary objective is:

- to keep traffic flowing as freely as possible.
- limit any increase in congestion or delay.

2.2.2. Clients, project designers and traffic management designers need to be conscious of these objectives during all stages of the design process and particularly when considering the traffic management requirements of the design brief.

2.2.3. For planned works it is not acceptable for contractors or authorities to adopt a method of working which does not provide the required safety performance for both road users and road workers. Designers should note the requirements of **2.1.5** and **2.7.1**.

2.2.4. It is vital that risk assessments are carried out at all stages of the development of the project, bearing in mind the potential hazards to the workforce and the public, see **3.6**.

2.2.5. The final traffic management design will see the implementation of the project risk assessment process translated into a safe system of work for both road workers and road users.

2.2.6. There are a number of tasks which need to be undertaken in the course of the planning, design and implementation of TTM arrangements. When tasks are allocated, it is essential that the person or organisation responsible for each task is identified, and that satisfactory completion of each task is recorded.

2.2.7. During the planning stage of road works schemes the following points should be noted:

- safety is the primary consideration.
- attention must be paid to the needs of pedestrians. This applies especially in places where greater numbers of people may be expected (e.g. bus stops, shops, leisure facilities, day centres).
- maintenance works should be undertaken in the minimum time, taking up the minimum road space, but without compromising safety. Where practicable, additional resources or time-reducing techniques should be considered.
- liaison must always be maintained with the relevant traffic authorities to avoid concurrent works in close proximity.
- when a length of road is closed the opportunity should be taken to carry out any other maintenance required on that length of road.
- holiday periods, times of special events and festivals should be avoided as far as possible. If demand exceeds available capacity, queues will develop, and road users could be put at risk. If flows are expected to be lower than normal, then consideration should be given to carrying out the works at this time.

- TTM can impact public transport routes. Public transport operators and the local council should therefore be informed of any proposals. Alterations to routes and stopping arrangements for local bus services can be problematic for people with mobility impairments in accessing public transport.
- where appropriate, communication should be made with the police, other emergency services and any adjacent local highway authorities or transport operators who have significant fleet operations in or through the works affected area.

2.2.8. The requirements of the Traffic Management Act 2004 (not applicable in Scotland) and the New Roads and Street Works Act 1991 must also be taken into account.

2.2.9. The live carriageway of any road is a dangerous working environment. It is therefore essential that TTM operations are designed, planned, and implemented in accordance with a safe system of work.

2.2.10. On motorways and dual carriageway roads subject to the national speed limit, individuals should not make their own way into and out of the site across live traffic lanes. The acceptability of crossing a slip road to access a site would need to be considered on a site-by-site basis.

2.2.11. Obstruction to part of a road may require drivers of vehicles to carry out unusual manoeuvres, so drivers must be given a clear indication of the path they need to take. Temporary delineation in the form of traffic cones, cylinders and barriers should be used for this purpose, augmented where practicable by temporary carriageway markings or temporary reflective road studs to indicate the edge of the route to be followed. Existing road markings will need to be removed or masked, unless traffic is to be confined to a single lane delineated by cones on each side; however, in this situation the design of the scheme will need to ensure that road users are given clear information on the route to take and that there is no increase in risk when overrunning a marking.

2.2.12. The detailed principles for guiding and controlling traffic safely past common types of road works are set out in this document. These should be followed as far as they are applicable to any particular site.

2.2.13. In each case, plans provided in the document illustrate the minimum signing required. The individual features of each site's layout and location must be carefully considered, and additional signs should always be used in order to meet the requirements of providing effective information to road users. Too many signs however can also be a problem for drivers due to sign overload and distraction, care should be taken to only add signs that are considered necessary.

2.2.14. In the interests of road safety and driver comprehension of traffic management schemes at major road works, it is essential that all schemes should adhere as closely as possible to the principles illustrated in the plans provided in this document. If this is achieved, road users will always encounter the same signing and layouts in similar situations. Where there is no plan available to suit a particular situation, as many of the relevant standard features as possible should be incorporated into the proposed layout; any special signs should follow the principles established in the existing prescribed and authorised signs for road works.

2.2.15. There will be some short-duration works which may be carried out either as static traffic management or by mobile traffic management techniques (Mobile Lane Closure, Mobile Carriageway Closures or Single Vehicle Works), see **Section 10**, **Section 11** and **12.1**.

2.2.16. Consideration should be given in the early stages of planning to the use of an approved Mobile Carriageway Closure technique to support the safe installation, maintenance, and removal of TTM schemes where appropriate. Guidance in DMRB document GG117 Appendix A may also be referred to.

2.3 Standard works and relaxations

2.3.1. Static TTM schemes referred to in this document may be either 'standard' or 'relaxation' schemes. Mobile works are standalone schemes and do not come under this classification.

2.3.2. 'Standard' schemes are appropriate for works carried out in all weather, visibility and traffic conditions.

2.3.3. 'Relaxation' schemes are appropriate for certain types of works (as indicated within this document) for short-term situations with good visibility, good weather and low traffic flows where risks to both road users and road workers are sufficiently low. To be a relaxation scheme the following points need to be met:

- 'short-term situations' are those that are expected to last less than 24 hours.
- 'good visibility' means visibility extending to the full length of the desirable Stopping Sight Distance (SSD).
- 'SSD' is the distance required for a vehicle to come to a stop, taking into account the time taken to perceive, react, brake (but not needing to undertake an emergency brake application) and stop safely in the prevailing weather conditions (for full details see Table 2.10 of CD 109 'Highway Link Design').
- 'good weather' means weather conditions which would not impact the performance of permanent signs and markings, the TTM equipment or impair road users ability to drive safely through the works.
- 'low traffic flows' means flows less than the reduced available carriageway capacity for the whole period when the works are in place. Generally low traffic flow is where the free flow traffic flow through the works and can be taken as not more than 1200 vehicles per hour per traffic lane left open where the HGV content is less than 10%, or 1000 vehicles per hour per traffic lane left open where the HGV content is between 10% and 30%, or 900 vehicles per hour per lane left open where the HGV content is greater than 30%.
- the scheme is sufficiently safe for both road users and road workers at the permanent speed limit.

2.3.4. Individual plans state, where appropriate, what relaxations may be applied. Plans for single carriageway roads can be found in **Section 6** and plans for dual carriageway road in **Section 7**.

2.3.5. The relaxations contained within this document are intended to retain fundamental signing principles whilst reducing the number of temporary traffic signs, road markings, and delineators. The general principle is that signing for relaxation schemes is a subset of signing for standard schemes, such that should conditions at the site deteriorate then additional signing can be added to bring the signing up to the level of the equivalent standard scheme (or works curtailed). Relaxations should therefore only be applied at works which are staffed continuously.

2.3.6. When identifying suitable relaxation schemes, the designer should identify how the relevant signing and TTM equipment could be safely enhanced, replaced, or removed if the conditions deteriorate. Where it may not be possible to easily remove or enhance signs in a section (e.g. signs in a lane change zone), the designer may want to provide TTM equipment suitable for standard schemes (e.g. a 150m 'standard' taper) where practicable. Signs and

equipment suitable for relaxation schemes should be used in the remaining sections of the scheme.

2.3.7. Incorporating aspects for which there are no relaxations identified in this document will require the works to be undertaken as a standard scheme (e.g. full carriageway closures).

2.3.8. For short duration standard schemes e.g. from overnight closures to works lasting up to seven days, it is likely that a scheme specific design will be needed. Some aspects identified in this document for standard schemes e.g. masking or removing markings, providing vehicle restraint barriers, mandatory reduced speed limits etc, may not be justified for a short duration scheme. The designer may identify what aspect of the guidance in this document would not be relevant; however, the design of the scheme will need to ensure that road users are given clear information.

2.4 Principles of emergency traffic management design

2.4.1. Emergency Traffic Management (ETM) is only to be deployed for short-term incident management and emergency works. Further information on the use of ETM can be seen within **Section 8**. The provision of assistance to a contractor by the police or traffic officers to set up, maintain or remove TTM may be provided as part of the safe system of working, and is therefore not considered to be ETM.

2.4.2. Where incidents are expected to last longer than 20 minutes it is reasonable to consider the need to enhance the ETM. The starting point for any enhancement should be to meet the provision for a relaxation scheme. Where possible, ETM should then be enhanced to be as close to a standard TTM as practicable, but this will be dependent on circumstances and the availability of TTM equipment.

2.4.3. Where incidents are expected to last longer than 90 minutes, there needs to be an assessment as to the provision of enhanced ETM. In this situation it is desirable to install additional TTM equipment meeting the requirements identified in other areas of this document for standard schemes. On motorways and high speed all-purpose dual carriageways it should be the default to provide for the enhancement of ETM; however, this is not always practicable, particularly where a maintaining organisation is requested to enhance ETM for two or more locations at the same time. Where ETM is not enhanced in this situation the reasons for not doing so need to be recoded. The benchmark for road user safety where incidents last at least 90 minutes is the same as for planned works.

2.5 Health and safety issues

2.5.1. Specific guidance relating to the health and safety aspects of the setting up, maintenance, and removal of traffic management arrangements is given in various documents from relevant overseeing organisations, industry bodies, and the HSE. Where specific documents have a wider potential application, references are provided in this document. Designers should note if the documents are Codes of Practice, or identified potential methods of working.

2.5.2. Where works are in progress on a highway, or on any road to which the public have access, the Health and Safety at Work Act 1974 (or Health and Safety at Work Order 1978 (NI)) requires those responsible for the works to establish and maintain, as low as is reasonably practicable, a safe system of work, including:

- provision and maintenance of plant and systems of work that are safe and without risks to health.

- arrangements for ensuring the safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances.
- the provision of such information, instruction, training and supervision as is necessary to ensure the health and safety at work of their employees.
- the maintenance of any place of work, under the employer's control, to a condition that is safe and without risks to health. This includes the provision and maintenance of means of access to and egress from the place of work that are safe and without such risks.
- the provision and maintenance of a working environment that is safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work.

2.5.3. The Management of Health and Safety at Work Regulations 1999 and the Management of Health and Safety at Work Regulations (NI) 2000 require risk assessments and the principles of prevention be applied to protective measures to control risks identified by the risk assessments. Where works are in progress on a road, those responsible for the works are obligated to take such steps as are reasonably practicable to protect all road users from personal injury and property damage. Therefore, sufficient warning signs, barriers and other measures needed to highlight any danger should be placed at or near the site of the works to the extent necessary to discharge that obligation. These measures must be removed when no longer required. While those undertaking works have a legal duty in respect of safety (including signing and guarding), the authority has the ultimate responsibility for the coordination of all work that affects its roads.

2.5.4. The Construction (Design and Management) Regulations 2015 and the Construction (Design and Management) Regulations (NI) 2016 place duties on clients, designers, co-ordinators, and contractors to manage the risks which are under their control. The term 'designer' within these regulations has a broad definition. Further guidance on the application of these regulations can be found in 'Managing Health and Safety in Construction, Construction Design and Management Regulations 2015, Approved Code of Practice' HSE Legal Series publication L153. See References (**Appendix B**).

2.5.5. The Manual Handling Operations Regulations 1992 (as amended) apply to a wide range of manual handling activities. This includes the lifting and lowering of traffic management equipment. Further guidance on the application of these regulations can be found in 'Manual Handling, Manual Handling Operations Regulations 1992, Guidance on the Regulations' HSE publication L23 and 'Manual Handling at work a brief guide' HSE Guidance publication INDG143. See References (**Appendix B**).

2.5.6. Working on live roads carries a potentially high risk. Road users may not expect to encounter standing or slow-moving works vehicles, or people at work in the carriageway. In addition, the personnel involved may have little protection from oncoming traffic. Hence the work must be managed properly to ensure that the risks are as low as is reasonably practicable (ALARP). In the context of road and street works the term so far as is reasonably practicable (SFAIRP) is also used by some organisations and can be taken as being equivalent to ALARP. See Definitions (**Appendix A2**).

2.5.7. High-speed roads, particularly motorways, and class A roads can present a greater risk when obstructed by road works unless the boundary of the works is effectively delineated and precautions are taken to ensure that the travelling public is adequately warned of the presence of any obstruction.

2.5.8. Although the potential consequences of an accident on heavily-trafficked high-speed roads are more severe, the risks involved in working on lower category routes cannot be

ignored. Commonly, such roads will not meet current SSD or other design standards and in many cases the available carriageway width will be limited.

2.5.9. As installing, maintaining and removing TTM is a potentially hazardous activity, the selection of the actual method of work must be made by a competent person and reflect the risks and site-specific circumstances of the planned work.

2.6 Reporting of incidents

2.6.1. The effective analysis of incidents and accurate assembly of information is essential if long term monitoring is to be meaningful. Incident reports leading on to appropriate levels of investigation are the basis for all further analysis. The authority should be consulted for the appropriate procedure to report incidents.

2.6.2. The police must be informed of all road accidents which involve an injury occurring on a section of highway open to public use and, on behalf of HM Coroner, of any deaths occurring on site.

2.6.3. Under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR), basic reports are required by the HSE for certain categories of accident and incident. These are not required for accidents unless they are caused as a result of the works. Reports are to be recorded on the online form at:

https://www.hse.gov.uk/forms/incident/index.htm (formerly form F2508).

2.6.4. In addition to any statutory recording of accidents, incidents or dangerous occurrences that must be carried out, there may be contractual requirements for recording and passing on data on these situations. Authorities, road owners, statutory undertakers, contractors, or any organisations with employees working on or near a road should record the following occurrences:

- any collisions with entry tapers, crossovers or changeovers, that result in the requirement for maintenance of the TTM equipment in these zones.
- any instance of a vehicle which is not a works vehicle or other permitted vehicle (e.g. material deliveries) entering the works area, working space or safety zones. All such incursions and any breaches of the TTM, including unauthorised use of works accesses. Emergency services, traffic officers or third party recovery vehicles will need to be recorded as an incursion unless authorised to enter the works area.
- all injuries sustained by road workers when in either the safety zone or on a live carriageway.
- all collisions with works vehicles (including IPVs) when in a live lane or on a hard shoulder.

Any comments or complaints received relating to the TTM and any personal data relating to the above should only be kept for as long as it is needed to ensure the records of any occurrences are accurate. Records, with personal data removed, should be kept for at least seven years.

2.6.5. The continuing improvement of road worker safety, road user safety, and road works safety performance depends on accurate incident information. It is considered reasonable to provide to the Secretary of State for Transport or the relevant minister (or anybody acting on their behalf), copies of any record relating to a statutory report of an accident or a record relating to an occurrence identified in this section within 14 days of it being requested.

2.6.6. This data should be made available for organisation’s own designers to use in future general and scheme specific risk assessments.

2.6.7. All data captured, stored, and shared under the requirements of this Section must comply with the Data Protection Act (2018).

2.7 Risk sharing

2.7.1. It is the responsibility of those undertaking the works to identify, design and implement a safe method of working. Authorities may impose restrictions and requirements on the timing and nature of planned works; in doing so they share some of the risk with those undertaking the works. However, these restrictions and requirements do not remove the responsibility of those undertaking the works to implement a safe method of working.

2.7.2. It is not possible for an authority to transfer risk to themselves or protect contractors for using specific methods of work (except for civil claims). Those undertaking works must assess whether methods of work identified by authorities are suitable and sufficient. They must also inform the authority if they are not considered to provide the required level of safety. Designers and contractors will need to take note of the authority's policies and instructions (including any risk management standards); however, these must not be read or implemented in a way which provides a lower provision of signing or guarding, or road user or road worker safety than identified in this document.

2.7.3. Authorities should provide comments and feedback on scheme designs, such as the impact on traffic on the wider network, they also may include comments and requirements which may impact on the identified methods of working. Comments relating to safety of the identified method of working may result in the authority sharing part of the designer's liability and should normally be avoided. Where an authority prohibits the contractor from adopting a specific safe method of working, identified in this document or a site-specific risk assessment, or identifies a specific method to be used, then the authority shares risk with those undertaking the works. The authority must ensure that anybody within their organisation involved with identifying a method of working to use (or not use) has the required level of knowledge and expertise, including, but not limited to, relevant highway and traffic sign design. This requirement would also apply to any third party tasked by the authority to review or comment on the contractors' proposed method of work.

2.7.4. Authorities may identify specific requirements on adopting a method of working. In such cases, sufficient extra financial resources to adopt these methods of working should be provided by the authority, if they are more expansive or more complicated than a method of working identified or recommended in this document.

2.7.5. Where an authority is providing signals, equipment, vehicles, or personnel to facilitate the installation, maintenance, or removal of planned works (or manage incidents in the works), or be part of the signing or guarding of the works, via integrated or arms lengths maintenance groups, internal Incident Support Units (ISUs), traffic officers etc, the requirements in this document will need to be met as though they were being carried out by the contractor. Equipment and processes used for congestion management, incident management or ETM cannot be assumed to be suitable for planned works, nor provide the required level of road user safety. It is not acceptable to accept lower performing equipment or TTM design to facilitate the use of permanent signals and equipment. If permanent equipment, such as stopped vehicle detection systems, are not fully effective, or requires a greater reduction in mandatory speed limits than identified in this document, then temporary systems with the required level of performance and reliability will need to be used instead. Any assistance for planned works will need to be assessed as a part of the scheme specific risk assessment. However, subject to **Section 8**, the equipment and processes may be suitable to support a contractor where TTM needs to be repaired, changed, or removed due to incidents, damage, or unforeseen change in conditions (e.g. unexpected weather or a sudden increase in traffic flow).

2.8 Basic considerations

2.8.1. Space at road works sites is often at a premium and consideration should be given to ensuring that the works and traffic management scheme can be carried out in a safe manner and minimise the disruption to traffic. In particular, the project designer and traffic management designer should consider:

- number and width of temporary traffic lanes, including use of hard shoulder (**Section 4.3**).
- safety zones and the necessary working space (**Section 4.2**).
- adequacy of workspace for the proposed work operations and for storage of materials and equipment, including consideration of the selection of suitable plant and machinery to do the work planned (**Sections 4.2** and **4.28**).
- arrangements for access to and exit from the site. (**Section 4.25**).
- option of using static or mobile traffic management (**Sections 7.24** and **10**).
- option of using convoy working where lateral safety clearance is restricted (not applicable for use on motorways) (**Section 9**).
- option of using a contraflow traffic management technique on dual carriageways (**Section 7.4**).
- lane restrictions and use of temporary speed limits (**Section 4.8**).
- spacing of temporary road works signs and installation of signals and barriers. (**Section 5**).
- variations in conditions over the length of time the works are in place. This includes common weather issues such as rain and wind, but also will need to include actions such as the essential need to cut back vegetation to main visibility of signs, and actions and equipment needed to manage situations such as winter service and mitigating the potential for flooding. Also, the need to alter the scheme to accommodate seasonal holiday and/or event traffic should be planned for in the scheme design.

2.9 Highway / road authorities

2.9.1. The authority may impose specific requirements and be aware of constraints that will have a bearing on the management of the site and may influence the traffic management design. These may include the following:

- minimum carriageway / lane availability requirements.
- capacity and congestion issues.
- working hours and constraints.
- production of traffic regulation orders.
- road closures and diversion routes requirements (**Section 4.24**).
- co-ordination arrangements with other planned road works and street works (**Section 3.3**).
- emergency services access requirements (**Section 2.10**).
- legal agreements and land restraint requirements, including public access to buildings.
- incident management arrangements and provisions for vehicle recovery (**Section 4.34** to **4.38**).
- winter maintenance arrangements.
- publicity requirements (e.g. press and advance signing) (**Section 4.41**).
- abnormal loads movement requirements.
- vulnerable road users and protected groups' requirements.

2.9.2. Under the Traffic Management Act 2004 (not applicable in Scotland, however the Transport (Scotland) Act 2005 may apply) road works may require a permit under the appropriate permit scheme.

2.9.3. Where the works have an impact on an adjoining authority's network, the client or their agents will need to obtain their agreement on access, signing, and diversion routes at adjacent concurrent works.

2.9.4. On roads which are not public highways/roads but to which the public have access, if there is a hazard or obstruction (e.g. road works) then the Health and Safety (Safety Signs and Signals Regulations) 1996 require that the signs used must conform to the signs in TSRGD where there are relevant prescribed signs.

2.9.5. The authority may have a risk management policy or standard. Designers and contractors will need to take note of these policies; however, any policy or standard must not be read or implemented in a way which provides a lower provision of signing or guarding, or road user and road worker safety than identified in this document.

2.9.6. An authority may identify further guidance, or specific requirements, via standards (e.g. DMRB), specifications (e.g. MCHW/SHW) or guidance notes. Those drafting these documents should take note of the need for clarity and consistency; therefore, the drafting rules for these documents must allow for them to be written using language consistent with this document and using the same, or consistently similar, terminology.

2.9.7. Where an authority has signs and signals (including lane usage and/or Variable Mandatory Speed Limit equipment) controlled through their own control centre, any relevant Statutory Instrument must be checked to see if it provides for setting signs under Road Traffic Regulation Act 1984 Section 64/65 for use in temporary situations. Where works are being undertaken the contractor is legally responsible for the signing of the works; the control centre must not set signs or signals in works except if as identified in the contractor's TTM plan, or as requested directly by the contractor. Incident management signing within schemes is the responsibility of these undertaking the work; traffic officers, ISU etc, may undertake incident management activities only where agreed with, or requested by, the contractor.

2.10 Emergency services

2.10.1. Police, fire, and ambulance services should, if appropriate, be consulted in relation to the timing and layout of works along with the emergency routes through the works, see **Section 7.7**. In certain circumstances, there may be other organisations that will need to be consulted in the planning of the works, such as the coastguard, lifeboat crews, and mountain rescue teams. Discussions may also be appropriate with the principal breakdown organisations on permitted access.

2.10.2. Where appropriate the client should liaise with the Police about implementation of traffic management and enforcement issues. For certain trunk roads in England, advice will also need to be sought from the Regional Operations Centres (ROCs), responsible for Traffic Officers. In Northern Ireland, this will be the Roads Service Traffic Control Centre, Traffic Scotland in Scotland, and in Wales, the National Assembly of Wales Traffic Control Centres. Other points that may influence the traffic management design that may need to be considered:

- enforcement of traffic regulation orders and use of speed cameras (**Section 4.8**).
- arrangements for routeing emergency vehicles (**Section 7.7**).
- incident management procedures (**Section 8**).
- controlling traffic at a railway or tramway level crossing (**Section 6.17** and **6.18**).

2.11 Statutory undertakers

2.11.1. Under the New Roads and Street Works Act 1991 (as amended), there is a duty on road authorities and statutory undertakers to co-ordinate their works. This will include programming of TTM and arrangements for the statutory undertaker's contractors.

2.11.2. Emergencies dealt with by public utilities will normally be signed by them, sometimes in conjunction with the police or traffic officers (if appropriate), where the emergency lasts for only a few hours. Where emergency and remedial work is expected to be of longer duration, the authority or its maintaining agents should be consulted as soon as possible in order to agree to the erection of appropriate signs.

2.12 Documentation

2.12.1. The TTM design will need to be set out clearly in documentation including drawings and specifications. The documentation should not include any standard drawings, or details, which are not applicable to the scheme.

2.12.2. Scheme specific risk assessments should be provided to any contractual or regulatory body as well as the public, on request; to enable this, commercial and sensitive information will need to be omitted from risk assessments without altering the validity of the site-specific assessment.

2.13 Designer training and worker competence

2.13.1. In the case of street works, designers should be fully familiar with the current code of practice 'Safety at Street Works and Road Works – A Code of Practice' (2013) (see **Section 2.14** and, **Appendix B**). Designers should undertake regular refresher training to ensure their knowledge and skills remain up to date.

2.13.2. Designers may wish to obtain a Street Works Qualification. This may be as a supervisor or operative in accordance with the New Roads and Street Works Act (NRSWA) 1991 and associated regulations. In England the Street Works (Qualifications of Supervisors and Operatives) (England) Regulations 2016 provides the necessary details regarding street works.

2.13.3. There are three other equivalent Statutory Instruments for Northern Ireland, Scotland and Wales. Respectively, they are:

- Statutory Instruments No. 20 Street Works (Qualifications of Supervisors and Operatives) Regulations (Northern Ireland) 1998.
- Statutory Instruments No. 1675 (S.162) The Road Works (Qualifications of Supervisors and Operatives) (Scotland) Regulations 1992.
- Statutory Instrument No. 1687 The Street Works (Qualifications of Supervisors and Operatives) Regulations 1992 (Note that this Statutory Instrument no longer applies to England).

2.13.4. Designers need to be sufficiently competent in terms of knowledge and application of the principles of signing and guarding of road works and also have an adequate knowledge of the installation, maintenance and removal of TTM. There is no current, universally identified, minimum level of competence. To give organisations confidence that those undertaking design work for them are competent, each organisation should have a policy on the expected technical, academic, and professional competencies or qualifications of designers. The exact nature of these requirements should be clear, relevant, and obtainable; setting irrelevant, unrealistic, or costly requirements may preclude otherwise competent practitioners, increase costs and

limit development opportunities. While current qualifications can be identified as a benchmark for knowledge and competency, given that qualifications change over time, any requirements should allow for equivalent qualifications or experience to be counted.

2.13.5. Practitioners and employers are encouraged to consider relevant professional certificates, diplomas or third-party accreditation (e.g. IHE professional certificates/diplomas). These provide a benchmarked and transferrable assessment of competence relevant to the nature of the work as per **1.3.4**. While an initial or base qualification e.g. IHE professional certificate, would be suitable for designers of schemes fully complying with the guidance in this document, schemes which have elements designed and assessed from first principles (see **2.1.8**) would justify either the designer, or the person signing off the design, having competencies and experience meeting those needed to obtain the IHE professional diploma, or equivalent. Those leading design teams may benefit from having professional registration with the Engineering Council.

2.13.6. The Sector Schemes (NHSS) 12A, 12B, 12C and 12D provide nationally recognised training and competency assessment regimes that may be considered appropriate for some authority road works traffic management design and operation activities. Although NHSS 12D recognises the training, assessment, and accreditation for street works (see New Roads and Street Works Act (NRSWA) 1991 and Traffic Management Act 2004), it provides for training and competency assessment beyond that required by the 1991 Act, including requirements for positive TTM for activities other than those covered by the Act e.g. some events. However, it does not cover the design of TTM on all types of road.

2.13.7. While most Sector Schemes are quality management systems (QMS, e.g. NHSS7), NHSS 12 is a competency training system. While authorities may consider flexibilities for QMS they must understand that NHSS 12A to 12D (and the similar training system for recovery operators in NHSS 13) are part of the fundamental safe method of working on high speed roads, this must be taken into account when setting specifications or requirements. Details of all these sector schemes can be downloaded from the NHSS/Lantra website. https://www.lantra.co.uk/national-highway-sector-schemes-nhss

2.13.8. Organisations engaged in traffic management operations in England, Scotland and Wales, if required by the authority, need to comply fully with any identified training competency requirements. For works on overseeing organisation roads this will need to be training to the requirements of the relevant section of NHSS 12A to 12D. The contractor is responsible for ensuring that all designers (including any sub-contractor personnel) meet the requirements in this document. The road authority should only specify compliance with the specific NHSS relevant to the activity in question. For example, NHSS 12C should be specified where mobile works are to be used and NHSS 12D should not be specified where works only involve motorway; NHSS 12 covers common activities, where a contractor is undertaking activities which are not in the scope of NHSS 12 there may be a need for a site, or activity, specific training requirement to be defined and operative's compliance with the training requirements checked.

2.13.9. It is essential that the designer, operative and supervisor in overall charge of any traffic management involving portable traffic signals on a public highway has a full understanding of the signing requirements and the correct operation of the signals and likely consequences if they are improperly set. Designers should therefore have attained the appropriate Street Works Qualification (in the case of street works) as set out in the Regulations or (in the case of authority road works) attend a suitable course on the use of portable traffic signal equipment and correct signing of works. Information on training and competency assessment can be found in NHSS 12D.

2.14 Safety at Street Works and Road Works: A Code of Practice (Red Book)

2.14.1. The Safety at Street Works and Road Works: A Code of Practice (Red Book) has legal backing under Sections 65 and 124 of the New Roads and Street Works Act 1991 and Article 25 of the Street Works (NI) Order 1995. This legal backing applies to all street works and works for roads purposes in England, Wales and Northern Ireland, on all single carriageway roads and also dual carriageways with a permanent speed limit of up to, and including, 50 mph.

2.14.2. Where the Red Book has statutory effect and identifies an additional or specific requirement, the requirement in the Red Book must take precedence over any flexibilities or permitted options included in this document. Compliance with the Red Book does not indicate that other legal duties, such as to sign, light and guard works or to adopt suitable reasonable adjustments, are met.

2.14.3. Authorities, undertakers and contractors need to be aware that while the Red Book contains specific requirements, as well as being a handy on-site guide, it is not a standalone document. There are likely to be regular occasions where the nature of the underlying road, and / or the works, are not provided for in the contents of the Red Book. Therefore, an understanding of the requirements of this document and other relevant guidance will need to be known and understood by designers, supervisors and potentially operatives to ensure that signing lighting and guarding is sufficient to meet the requirements of Section 174 of the Highways Act 1980 (and equivalents) in any given situation.

2.14.4. The Red Book derives requirements from this document to ensure consistency in the design of schemes across the country; however, to facilitate a simpler design process and enable more efficient methods of installing common TTM layouts some design options in this document may be restricted. The on-site handy nature of the Red Book does not permit all the flexibilities provided for in this document, with specific requirements relating the signs and equipment used, their locations and size. There may also be restrictions on where certain methods of working can be implemented or require specific methods of working.

2.14.5. The Red Book shows indicative sign face diagrams to be used. Some of these signs are covered by revised working drawings or TSRGD Schedule 13 Part 9. These may permit variations in the design of the signs as well as the permissible sizes which are not consistent with the requirements in the Red Book. All designs shall set out signs that are suitable for the characteristics of the specific site. It is not acceptable to use a generic set of equipment that is not lawful or correct for a site-specific location or arrangement. Designers will need to identify compliant sign designs to be provided as part of the TTM for each specific scheme.

2.14.6. For those roads and activities where the application of the contents of the Red Book is not a statutory requirement, it's still a useful guide for designers, on-site supervisors and operatives. However, the lack of statutory underpinning means that designers etc. must comply with the requirements of the relevant CDM Regulations, to determine by risk assessment, if the layouts etc. included in the Red Book remain both safe and the safest option. If a requirement or guidance in this document is relevant for the identification of a safe method of working, it cannot be discounted on the basis of not being included in the Red Book.

2.15 Incursions and road worker abuse

2.15.1. Road workers, both those undertaking construction and maintenance activities as well as those installing, maintaining and removing TTM, are occasionally subject to abusive behaviour from the general public. This is unacceptable and must be considered in a project risk assessment, especially if lone working is required. The motivation for these actions varies, with intoxication and frustration with 'unfair' road works being a significant factor.

2.15.2. It is recommended that all cases of abuse are recorded and if there was a potential for an injury reported to the relevant road authority (as this is normally considered to be a near miss) and it is expected that the contractor will have a policy on when and how to report these to the Police.

2.15.3. The ability to provide physical separation using barriers or site equipment should be included in any risk assessment, or method of working, with the need for staff to use verbal techniques considered as a last resort. Contractors and other organisations with staff on road e.g. vehicle recovery operators, utility contractors etc, should consider training on dispute resolution.

2.15.4. Some of the causes of abuse come from frustrated road users where the works are not seen as 'fair' i.e. causing more delay than expected or considered acceptable, or where certain features are delaying some users significantly or proportionally more than others. An example is temporary/portable signals at works where the design, controlled length and timings are not managing the traffic demand effectively, or where works are causing queues to extend past the previous controlled junction. Therefore, contractors should always consider and review by monitoring delays and congestion, including over weekends, and adjust works, signal timings etc to meet the requirements of this document and legislation to maximise flow and align capacity to demand.

2.15.5. Incursions also frequently occur during full carriageway and road closures. These closures should be limited, to minimise the increase in road user risk, to where it is essential; however, there will still be a need to close some roads and carriageways. The identified signing for diversion routes in this document is the minimum for relatively simple diversions; large or complicated closure and associated diversion routes will require significantly more expansive signing strategies to meet the requirements of this document to be clear to road users, reduce poor behaviours from the general public and reduce incursions. This would cover both the advance notice of the closure and diversions during the closure. Additional measures which are likely to reduce the likelihood of poor behaviour are related to ensuring closures are not initiated early, diversions route are lawfully signed, access to residential and community properties (pedestrian and/or vehicle) are maintained and effectively managed and communicated. Routes that are not closed but can normally only be accessed using a closed road must be effectively managed to maintain alternative access provision and be included in the design risk assessment.

2.15.6. Incursions into works zones through works access/exits are common. There are various common causes including drivers following works vehicles into works or confusing works access / exits as a normal junction. The recommended signing of works accesses is the minimum provision; locations where there is a risk that works access / exit may be misinterpreted by road users, such as on the outside of curves, or near existing junctions should be avoided. Where it is essential to locate access / exits in locations where the minimum signing and marking may not be fully effective, there will be a need to improve the signing of works accesses/exits (e.g. using solid edge line and not diverge markings, additional diagram 610's (S3-2-3) etc.). Sections of closed road used for works vehicle access and works areas (including working spaces), may still need additional provision to control incursions. This will need to be passively safe and / or conspicuous and designed to restrain vehicles and not disable them. If the signing cannot be shown to be sufficiently unambiguous then the contractor may be liable for any injury or damage.

3 DESIGN PROCESS

3.1 Design brief

3.1.1. The traffic management design brief is generally prepared by the project designer. It should identify the proposed works and programme, whilst also providing an outline of the traffic management proposals and phases.

3.1.2. For small scale road repairs, such as those carried out by local authorities, a formal design brief may not be required. However, a risk assessment will need to be carried out and the relevant health and safety issues addressed, refer to **Section 2.5**.

3.1.3. Consultation with all relevant authorities and interested parties should take place during the planning of the works. The following sections cover a number of areas where consultation should be carried out.

3.2 Site information

3.2.1. Any feature that has an impact on the operational safety of the works will need to be considered during the design.

3.2.2. To help ensure the safety of those involved with the works, existing information about the site must be passed to those responsible for the detailed design brief and traffic management design operation. Site information could include:

- health and safety plans/risk assessments.
- information on traffic flows and patterns.
- information on pedestrian usage and usage by other vulnerable road users.
- availability of alternative routes for diverted traffic.
- details of any traffic sensitive streets and sites of specific engineering difficulty.
- details of any railway or tram restrictions.
- location and nature of permanent signs and road markings.
- location and nature of any geometry departures or relaxations.
- information about existing safety barriers.
- accident records.
- the presence of underground and/or overhead services.
- the presence of rail crossings and other rail signalling equipment.
- local weather conditions (e.g. susceptibility to local flooding).
- safe refuge for vehicles used in association with the TTM.
- needs of local residents and businesses.

3.2.3. The organisation undertaking the TTM operations must be provided with information in relation to site-specific highway features and traffic levels. Information should be provided by the designer. Example information includes:

- carriageway layout, lane widths, stopping sight distance (SSD) and levels.
- narrow central reservations.
- narrow or weak hard shoulders.
- other departures or relaxations relating to road geometry.

- Variable Message Signs (VMS) and/or matrix signals.
- safe taper positions.
- absence of a hard shoulder.
- locations which do not provide space for stationary traffic management vehicles off the carriageway.
- permanent mounting facilities for temporary signs.
- traffic data.

3.3 Programming

3.3.1. The detailed programme is usually developed during the planning of the construction works. However, the designer should consider the need for a realistic programme when establishing contract length, considering constraints and closedowns. The requirements of the Traffic Management Act 2004 (not applicable in Scotland) must be taken into account.

3.3.2. In order to minimise the number of times road works are in place, contractors should identify any activities (e.g. monitoring, maintenance) which could also be completed using the planned traffic management. Activities should not be excluded based on contractual arrangements (e.g. lump sum or individual charge).

3.3.3. It is considered practicable for authorities to draft contracts or agreements that promote the combination of activities where possible. Authorities should not draft contracts or agreements which penalise contractors for combining maintenance activities where they identify it is suitable to do so.

3.3.4. Designing roads and identifying construction product requirements that would reduce the number of maintenance interventions can help to reduce delays, congestion and risk to road users and workers. It is considered practicable to include in any value management or other appraisal process for identifying renewal activities, a method of assessing and scoring the impact of each intervention option on the increase/decrease of road work activities.

3.4 Detailed traffic management design

3.4.1. For large scale works, the scheme traffic management design is led by the traffic management designer. They will produce detailed traffic management layouts, including scale plans of the scheme if appropriate and possible alternatives which have been evaluated and assessed.

3.4.2. For smaller scale works, a schedule of constraints must be supplied to the contractor who will then produce the detailed traffic management design. The information provided may include an indicative design.

3.4.3. The detailed traffic management layout is intended to demonstrate a practical solution which allows for safe passage of traffic, including pedestrians, past the works, while ensuring the safety of the workforce. This requires a detailed objective overview of all previously considered factors (e.g. design brief, consultation and site constraints) to ensure production of a composite solution. It is therefore important to have knowledge of the site and the ability to visualise traffic flow through the works, as well as familiarity with the appropriate standards and advice notes.

3.4.4. The traffic management designer has responsibility for the health and safety implications of the detailed traffic management design. They must consider the implications of installation, modification, and removal of the traffic management arrangements. This includes temporary vehicle restraint barriers. As part of the design, the traffic management designer should advise

on the minimum standard of maintenance and inspection required to maintain the safety and integrity of the design (see **Section 13.4**).

3.5 Design reviews

3.5.1. Upon completion of the detailed traffic management design, the proposals should be reviewed by the project designer. A formal risk assessment should also be completed. At this stage, the programme for the works should be finalised and the traffic management requirements confirmed.

3.5.2. Post-design reviews should include a suitable road safety audit independent of the designer if the scheme design is complex, makes significant temporary alterations of permanent non-motorised user facilities, or where a change of layout could raise user risk.

3.5.3. The post-design review also provides the opportunity to check that the traffic restrictions required by the detailed temporary traffic management design are appropriately covered by traffic regulation orders and that any sign authorisations and equipment type approvals are in place.

3.5.4. Following the installation and operation of a significant section of static TTM or the significant alteration of an existing layout where established traffic patterns are being amended, a suitable safety audit will be needed. The nature of the audit needs to be appropriate to the situation but consideration should be given to carrying out a formal interim Stage 3 Safety Audit to GG 119 ‘Road safety audit’. For temporary sections of road e.g. to allow an on-line construction of a bridge or avoid a landslip, a formal road safety audit will be required where the road has been in use for six months or more; for trunk roads this will need to be to GG 119.

3.6 Risk assessment

3.6.1. The Management of Health and Safety at Work Regulations 1999 and the Management of Health and Safety at Work Regulations (NI) 2000 require that a suitable and sufficient risk assessment must be carried out. The risk assessment must be specific to the activity being performed and will inform the development of the method statement. The risk assessment must consider the risks posed to operatives and the public. Firstly, all ways to eliminate risk must be considered. If some risks cannot be eliminated entirely, the risk assessment must then consider ways to minimise residual risk. Finally control measures e.g. mandatory reduced speed limits and other related signed restrictions may need to be considered. Information on formulating a risk assessment is given in the HSE free publication ‘Five steps to risk assessment’.

3.6.2. The principle of As Low As Reasonably Practicable (ALARP) must be applied in all cases to the management of risk to road users and road workers arising as a result of the use of TTM. The principle of Globally At Least Equivalent (GALE) can be suitable for the design of roads when in normal use but is not acceptable when TTM is in use. It is not acceptable for the design of TTM to be based on GALE principles.

3.6.3. Permanent road features which have an impact during works may have been designed according to design standards adhering to ALARP principles. However, designers will need to identify if they may have relaxations or departures from design standards under the permission of the traffic authority - or justified using other risk models, such as GALE.

3.6.4. Consideration to the impact of site-specific non-standard permanent road features on the safety of both road users and road workers should be considered. Failing to consider this impact can result in conditions where maintaining the road environment safely and effectively is difficult and the risk posed to road users and workers is not ALARP.

3.6.5. Two of the most likely non-standard permanent road features to impact TTM are departures from standard regarding cross sections, (lane widths and set-backs etc.) and SSD (See CD 109 'Highway link design', CD 127 'Cross-sections and Headrooms', 'Manual for Streets' and Chapter 5 'Road Markings' 2019). As such, designers of road works being carried out at these locations should identify and apply alternative layouts and/or principles in order to ensure risk remains ALARP for road users and road workers.

3.6.6. Permanent road features that are designed to be used during maintenance work must be designed in accordance with ALARP principles, even if the primary purpose of the feature is not for maintenance work. It is essential that designers of permanent road features engage with the authority and maintaining organisations when applying relaxations (or departures from standard). This is to ensure that applying the proposed relaxations (or departures) still results in a road design where risk to road users and road workers can remain ALARP during maintenance work. Under the CDM Regulations designers of permanent road features that are involved in maintenance take on part of the designer responsibility for any works using the feature and therefore must have, or have access to, appropriate competency in TTM design.

3.6.7. Information regarding relaxations (or departures from standard) applied to the final design of permanent road features must be recorded by the designer and provided to the authority. The authority must share any such information with the maintaining organisations to support the development of effective, risk-based TTM designs. Maintaining organisations and contractors should raise to the authority any concerns about the design of permanent features not meeting the principles of ALARP.

3.6.8. Where roads are designed to, or have elements that are designed to, the principle of GALE, the benchmark for road user safety during TTM is the greatest of:

- the level of safety that would be achieved by designing the road in accordance with the principle of ALARP, or
- the level of safety for the road before the design, or design elements to the principle of GALE, were implemented, or
- the level of safety of the road as built, incorporating design or design elements to the principle of GALE.

3.7 Method statements

3.7.1. A detailed project-specific method statement should be prepared for the installation, maintenance, and removal of traffic management arrangements.

3.7.2. Generic method statements should only be used as a template for writing the project-specific method statement. They should always be reviewed and adapted to address the particular circumstances of the site and the specific activity proposed.

3.7.3. All method statements should be prepared by the organisation responsible for undertaking the works activities. Its formulation should take into account the available resources, including the skill, knowledge and experience of the various elements of the workforce. For each activity, the method statement should identify the resource implication, both human and equipment.

3.7.4. Where a method statement includes activities which impact other organisations, detailed liaison must take place to facilitate co-operation and ensure a cohesive operation. Such liaison is likely to include the Police, the authority, and the organisation responsible for construction of the works.

3.7.5. To ensure sufficient scope in the production of the method statement, consideration should be given to points raised throughout this document. In particular, the following issues should be addressed:

- Working period – the amount of work which can be carried out in one working period should be considered.
- Work during the hours of darkness – traffic management activities conducted during hours of darkness require additional pre-planning, resources, and procedures to those needed for daytime activities. Refer also to **Section 13.6**.
- Positioning of vehicles – if parking the vehicle in a live traffic lane is unavoidable, a risk assessment must be carried out. For works on dual carriageway roads, consideration should be given to utilising an Impact Protection Vehicle (see **Section 14.9**), or a vehicle-signed as per the guidance and requirements on single vehicle works is given in **Section 12.1**.
- Crossing the carriageway on foot – this can be a hazardous activity which may carry an increased level of risk and alternative methods of installing TTM should be considered. It should be planned so that the location provides adequate sight lines along with a place of safety on both sides of the carriageway. The crossing of more than four continuous lanes should not be considered. For further guidance, refer to the HSE information sheet 'Reducing risk in TTM operations (2015), CIS 53 (Rev1.)'. See **Section 13.2**.
- Pre-placement – the safest, most efficient method of implementing TTM can often be to place it out in advance, ready for erection or delayed removal. In such cases, this should only take place as part of the ongoing TTM operations. Equipment should be left in position for the minimum time practicable before erection or removal.
- Any temporary arrangements for pedestrians (including the provision of ramps) should be installed prior to the closure or diversion of footways. Meanwhile the placing of signs on or adjacent to footways should not hinder passage by pedestrians. Also see **Section 4.32**.
- Carriageway closure during installation and removal – consideration should be given at an early stage to the use of an approved closure technique to provide a safe working environment. This may be achieved either by use of Police, traffic officers or any technique approved by the relevant authority, such as the Mobile Carriageway Closure technique described in **Section 11**.
- Storage of equipment – this should allow easy access and availability.
- Erection of signs – the sequence of erection should ensure that the first sign erected provides protection for the erection of the remaining signs. Consideration should also be given to the associated manual handling implications; refer to **2.5.5**. It is crucial to ensure that at all stages of TTM implementation and removal, the signs displayed do not conflict with the prevailing situation in such a manner as to create a hazard. When MLC or MCC operations are used to deploy static signs on the central reservation, it is imperative to avoid any possible conflict between the static and mobile signs. Such conflict can sometimes be avoided by locating the MLC operation on the other carriageway.
- Construction of tapers – the detailed sequence in which this work is to be carried out should be clearly indicated.
- Placement of longitudinal cones – method of placement should be clearly indicated, either pre-placement or directly placed from a vehicle.
- Maintenance regime – consideration should be given to access, and to the availability of a place of safety whilst carrying out maintenance tasks. Arrangements for remedial action and the replacement of damaged equipment should be considered.
- Contingency planning – the method statement should cover contingency plans for foreseeable problems, such as the effect of the weather.

- When a mandatory temporary speed limit is being imposed at the works site, the detailed enforcement regime to be put in place should be clearly indicated.

3.8 Temporary traffic regulation orders

3.8.1. When required, temporary traffic regulation orders must be used to close roads or carriageways, ban turning movements and enforce lane and carriageway restrictions such as contraflow working, carriageway closures and speed and vehicle restrictions which are needed to guide and control traffic safely past the works.

3.8.2. Where temporary traffic restrictions are required, these should be established for each site and made by means of a temporary order under Section 14 of the Road Traffic Regulation Act 1984 or Article 50 of the Road Traffic Regulation (NI) Order 1997.

3.8.3. If all running lanes are to be closed and only the hard shoulder is to be used as a running lane, then a temporary order is required. The Authority should be consulted to ascertain whether additional orders are needed for hard shoulder running, or if a route order is in place.

3.8.4. The design programme for such works should make provision for the time necessary to obtain the appropriate temporary traffic regulation orders. Where there is insufficient time to obtain temporary traffic regulation orders under normal procurement procedures, consideration should be given to obtaining a traffic order under emergency notice procedures (Section 14(2) of the Road Traffic Regulation Act 1984), or in collaboration with the Police under their powers.

3.8.5. The designer may need to give consideration to the following issues:

- speed-related issues (**Section 4.8**).
- no overtaking orders.
- signing and enforcement.
- use of the hard shoulder as a running lane.
- contraflow running.
- road closures and prohibited turns.
- lay-by and refuge closures.
- bus, cycle, and taxi lane closures.
- footway closures.
- pedestrian, cyclist and equestrian bans.
- clearways/waiting restrictions.
- width/height/length restrictions.
- weight restrictions and arrangements to deal with overweight vehicles.
- wording of orders to ensure they reflect pattern and phasing of works.
- arrangements for escorted vehicles.

3.8.6. When identifying the start and end points for restrictions needed for the scheme design, and therefore the wording in the order, the design must allow for the prohibition or restriction to be signed at the start of the restriction, or as close as practicable downstream of the start as indicated by this document. While advance signing will be needed to meet the requirement for adequate road user guidance it cannot permit the omission of a sign at the start of the restriction as this affects enforcement. Similarly at the end of a restriction, where a sign is identified as being required in this document, this should be at, or slightly before, the end of the point the order identifies as the end of the prohibition or restriction.

3.8.7. Road works end signs to diagrams 7001 (S13-2-9) with ‘end’ plate or 7006 (S13-6-44) cancels all restrictions and prohibitions. The display of the VMS legend ‘END’ has the same effect.

3.8.8. Orders and the restrictions related to them are elements of the safe method of operation. To be effective risk management features, the restrictions must be effectively signed and the orders should be sufficiently well published and be made available to the public (including online and hard copies e.g. council offices and libraries). If these requirements are not met then the relevant restriction or requirement is unlikely to be a sufficiently effective safety measure.

3.9 Planning considerations

3.9.1. Those planning TTM operations should seek to eliminate potential conflicts between road users, and between road users and road workers and their operations. Where it is not possible to eliminate all risk, they should seek to minimise and control those conflicts.

3.9.2. When planning road works schemes, the following issues, which are intended to eliminate or reduce and control the risk from TTM operations, should be noted.

- Road works schemes are designed to balance the need to complete the works quickly and efficiently against the need to maintain acceptable traffic flow and safety. Schemes should be planned to optimise efficiency and safety and to minimise traffic and road user congestion, delay, and inconvenience.
- Meetings or consultations with other interested parties (e.g. the Police) should precede the start of works. Traffic regulation orders should be sought before the works begin, allowing enough time for the authority to process the order so that the impact on the work schedule is minimised.
- Risks to the safety of the workforce should be eliminated where possible by making changes in the working method. If they cannot be eliminated, then they should be otherwise reduced ALARP. The presence of vulnerable work operations on foot should always be minimised. Temporary speed limits must not be imposed at road works sites for the direct purpose of protecting the workforce.
- When a length of road is closed, the opportunity should be taken to carry out as much other maintenance as is practicable on that length of road while it is closed.
- Traffic management must be designed to safely manage the expected demand on the affected road or roads while work is in progress. Whenever possible, any work involving a reduction in the number of traffic lanes, particularly on heavily-trafficked commuter routes, should be avoided at peak periods. If demand exceeds available capacity, queues will develop, and road users could be put at risk. This must be avoided wherever possible.
- Where possible, plant, machinery and other equipment should be kept on site to avoid unnecessary movement in and out of the site. For the same reason, materials should be transported to the site in bulk and partial loads combined into full loads where practicable (see **Section 4.29**).
- The relevant authority must always be consulted regarding concurrent works, this is to avoid planning works in close proximity to each other. **Section 4.5** details the minimum recommended distances between sites for different types of road.

3.9.3. The needs of pedestrians, particularly those with a disability (or other relevant protected characteristic in Great Britain), must be considered when planning road work schemes. Guidance is given in **Section 4.32**.

3.9.4. Measures for enforcing permanent or temporary speed limits will need to be agreed with the Police or enforcement body at the planning stage. These could include speed cameras, use of fixed and/or mobile VMS or increased Police patrols. Speed control and temporary speed limits are dealt with in **Section 4.8**.

3.9.5. Sites should be occupied and operating as much as possible during normal working hours. Long stretches of coning with no activity is undesirable from a road user satisfaction point of view (and often road user safety as well) and can bring into question the validity of legitimate TTM. Where workers may be out of sight of road users (e.g. when working underneath a bridge), an information sign should be erected. The sign must be in accordance with diagram 7005 (S13-6-43), varied to include a short description of the work in progress and omitting the warning triangle and distance plate as shown in **Figure 3.1**. A Schedule 13 Part 9 sign may be used as an alternative method of signing to provide clear and concise information relating to the works. Further guidance on driver information signs is given in **Section 5**.



Figure 3.1 Diagram 7005 (S13-6-43) Information for drivers in respect of road works

3.9.6. Traffic flows at all sites should be monitored regularly so that, if problems develop, the control centre, police or traffic officers can be asked to take appropriate action. On motorways this might include activating VMS upstream of the works. Care needs to be taken to ensure that any signals activated correctly describe the lanes open and the lanes closed for traffic.

3.9.7. The forward visibility available to drivers may be adversely impacted when driving through a road works site because of temporary structures, machinery or other equipment provided as part of the works. Impact on road user visibility should be kept to a minimum at all times. Temporary cabins or other movable objects need to be placed in a way that does not impair visibility through the site or at side road junctions. A temporary reduction in the speed limit throughout the works may be appropriate where forward visibility is reduced.

3.9.8. Safe design of road works schemes may involve reducing the overall width of the road. However, this can cause issues for vehicles carrying wide loads. On designated Abnormal Indivisible Load (AIL) routes, early notification should be provided to known AIL operators of the timing and limitations which will apply during the works, to enable operators to plan their load movements. Guidance on the escorting of abnormal loads is provided in the National Highways codes of practices (**Appendix B**), these include:

- Lighting and Marking for Abnormal Load Self Escorting Vehicles Incorporating Operating Guidance.
- Lighting and Marking for Special Order, VR1, STGO, and C&U Loads.

3.10 Trials and innovations

3.10.1. Trials of new or different TTM methods and equipment may be carried out.

- by contractors, maintaining organisations, authorities, and other bodies.
- during road works to support the evaluation of products or processes intended to promote safety and efficiency.
- must comply with all relevant legislation, Regulations, Directions, and/or be permitted under an appropriate statutory authorisation or order.

3.10.2. Any TTM signs and equipment used in trials must comply with any relevant Traffic Signs Regulations, Directions or other statutory requirement or be authorised by the national authority. Those planning trials must ensure that all equipment used in the trials is either prescribed or is authorised for its intended use. Methods of working must comply with the terms of any approval, traffic sign authorisation or order granted. Any agreement or license to undertake trials does not guarantee permission to place non-prescribed traffic signs or equipment on road (see **Section 5**).

3.10.3. An organisation planning a trial needs to identify any contractual or other requirements to consult with the authority regarding suitable arrangements for the trial, including any requirement to share trial outcome(s). Authorities must ensure only sufficiently competent specialists and practitioners provide such approvals or agreements and they should ensure that any authorisations needed are in place. These requirements should be identified before the trial is started to allow sufficient time to undertake the consultation. Notifying the authority may not be needed if the products in question are covered by harmonised standards or if changes in material supplier, material type or performance classes are consistent with the guidance in this document.

3.10.4. If the road authority is required to give formal agreement of a trial plan, the authority must ensure that sufficient experience and competency is available within their organisation to be able to adequately assess the suitability and relevance of any trial plan. Experience and competency in the areas of highway design, traffic sign design, management of TTM and/or management of health and safety must be ensured. Authorities should consider if providing comments and feedback on identified methods of working is appropriate (see **Section 2.7**). When undertaking trials, those designing a trial evaluation method and assessing the results should have the appropriate competence to provide an impartial assessment of the trial outcome. Organisations or individuals delivering on-road activity in support of trials should have appropriate experience, competence, and authority to design and undertake the work required safely.

3.10.5. It is possible that the evidence gathered during a trial is limited due to constraints in the trial design. Limitations can arise from situations such as an off-road static evaluation of a product intended for on-road use, an on-road evaluation carried out at a single site, an assessment under lower traffic flows and/or a trial at a site with traffic compositions that are not typical of those experienced on the network. Any limitations in trial evaluation or evidence should be clearly identified.

3.10.6. Any trial limitations that make the findings unrepresentative of the road or conditions where the product or process would be used must be recognised and accounted for when implementing the product or technique further. If evidence from trialling is used to develop formal guidance, then the results should be sufficient to provide designers and/or those undertaking the works with data that can reliably support their designs, risk assessments, or working practices. Providing guidance outside the boundaries of a trial is only acceptable if this is supported from existing data or data from other trials. The use of data from ETM or congestion management activities would not be suitable for consideration for planned works. Data relating to innovations tested only in relaxation schemes would need to be revalidated if these are intended to be used in standard schemes.

4 DESIGN CRITERIA

4.1 General

4.1.1. This section gives advice on general design issues and applies to all situations, but criteria should be followed as appropriate.

4.1.2. The basic principle for maintaining safety of road users and road workers, while still enabling roads to be continued to be used, is to isolate / separate road workers from road users. This can be by using mobile works (e.g. MLC and MCC) but for the majority of works (and temporary situations) the most effective and practicable solution is to sign, light and guard sections of the road, hard shoulder, footpath and verge (which may also involve vehicle restraint systems) using fixed signs and equipment.

4.1.3. Coned-off areas consist of works area, working space and safety zones (which may include access routes). They cease to be a refuge or place of relative safety for road users and as a works site must only be entered by authorised traffic where it is safe to do so.

4.1.4. Areas of the permanent carriageway which are not in use during a scheme as a running lane and can be used as a temporary refuge area for road users must not be coned-off. If needed temporary markings can be used to delineate these areas. Road marking products are available which can be removed with minimal impact on the road surface.

4.2 Safety clearances

4.2.1. Minimum clearances are required around works areas to establish suitable safety zones. A safety zone is the space reserved to provide a safe distance between the works and road users. A safety zone must be provided where there is an obstruction or hazard in a live lane, where a pedestrian walkway is located in the carriageway, or if people are present in the works. An example of a safety zone is shown in **Figure 4.1**.

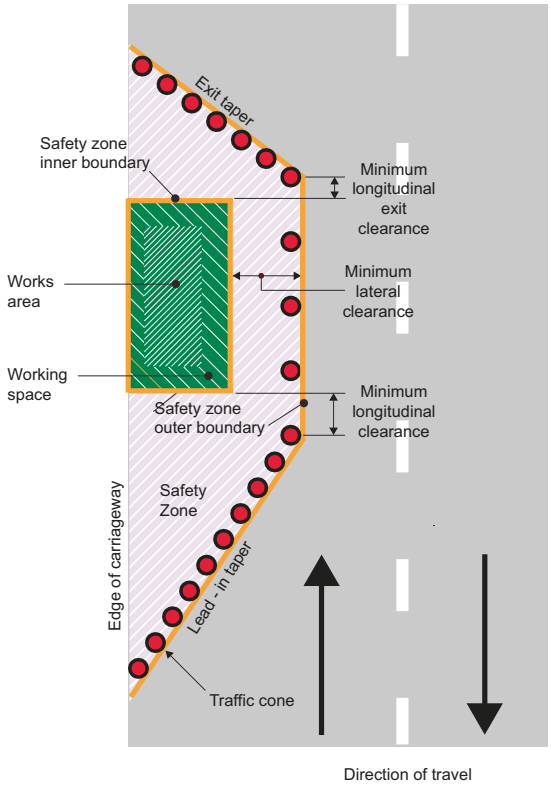


Figure 4.1 Safety zones – typical single carriageway site layout

4.2.2. As shown in **Figure 4.1**, the safety zone extends to the outside (traffic facing) edge of the cones, road markings, or studs used to mark out the area.

4.2.3. Workers, vehicles, machinery, equipment, or materials cannot enter or be left in the safety zone during the course of the works. Moving parts of plant or machinery are not allowed to encroach into the safety zone. This is so that errant vehicles that enter the safety zone can stop safely without the risk of colliding with workers or objects.

4.2.4. The safety zone should only be entered when it is absolutely necessary to place, replace, remove, clean, and otherwise maintain the traffic cones and cylinders, warning lights, signs, temporary barriers, and fences, etc. The number of these activities should be kept to an absolute minimum. Operators of 'STOP/GO' signs, shown in **Figure 4.2**, are not to stand in the lateral safety zone.



Figure 4.2 Diagrams 7023 (S14-2-64) STOP and 7024 (S14-2-65) GO (Dual sided equipment)

4.2.5. As shown in **Figure 4.1**, the longitudinal safety zone is an open or unoccupied space between the end of the lead-in taper and the working space. This provides a margin of safety between the traffic and the road workers. The minimum longitudinal clearance is based on the road's permanent speed limit (or underlying design speed if higher) and not on any temporary reduced speed limit. In Scotland, the minimum longitudinal clearance may be based on a temporary speed limit if agreed with Transport Scotland.

4.2.6. The outer boundary of the safety zone should be marked with either traffic cones, traffic barriers, or a temporary vehicle restraint safety barrier. During darkness, traffic cones on the outer boundary should normally be fitted with warning lights, even where this is not a legal requirement.

4.2.7. On roads where the permanent speed limit is greater than 40 mph, the inner boundary between the works area and the safety zone should be marked so that workers are aware of the boundary. Where practicable, a lightweight barrier should be used. Other suitable markings for the inner boundary may be traffic cones or suitably supported traffic tape.

4.2.8. The height of lightweight barriers above the road surface should be the same throughout the length of the barrier. A conspicuously coloured barrier (e.g. fluorescent orange) should be used, cleaned, and maintained regularly to remain easily visible. Barrier supports should not be driven into the road surface but be stable enough to withstand wind buffeting from passing vehicles. Barrier systems should be constructed in short adjacent lengths, no more than 50 m. Long interconnected lengths of barrier should be avoided to minimise the hazards posed to workers if a section is struck by an errant vehicle.

4.2.9. If using traffic cones, those on the inner boundary may be spaced so they are longitudinally offset from the cones on the outer boundary, see **Figure 4.3**. Offset spacing can give the appearance of a more substantial boundary between the safety zone and the live lane.

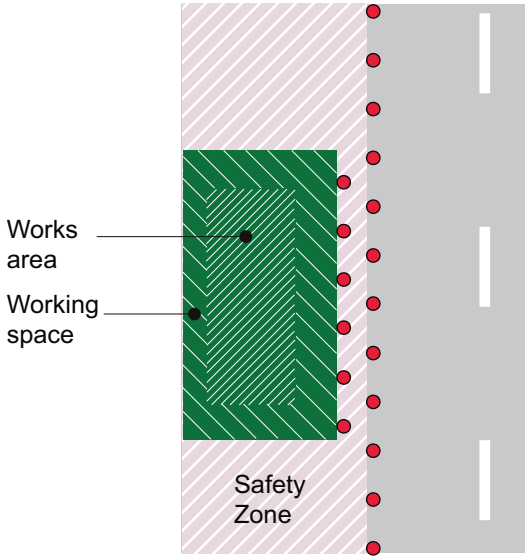


Figure 4.3 Works area and working space with longitudinally offset cones - All roads

4.2.10. If traffic tape is used, it should be strong enough to withstand strong winds but break cleanly when excessive force is applied. This is to avoid excessive injury if a person hits the tape. When tape is used, there is a risk that it can drag runs of cones over in the wind. Cones can be double-stacked or triple-stacked to mitigate this risk, however this in turn creates additional risk should the cones be struck and become a projectile. These risks must be considered by traffic management teams when considering the use of traffic tape.

4.2.11. At works lasting less than one hour, including progressive works being carried out throughout the length of a closure, delineators such as temporary safety barriers may not be suitable for marking out the inner boundary. In such cases, operatives should attempt to indicate the extent of the safety zone by placing traffic cones or a light movable barrier at the point where work is in progress.

4.2.12. Delineated safety zones are not required at mobile works provided work is not being carried out on foot. If work is being carried out on foot a delineated safety zone should be provided whenever practicable. When work on a hard shoulder is undertaken on foot, a safety zone lateral clearance of at least 1.2 m should be provided between the working space and the carriageway open to traffic.

4.2.13. Adequate working space should be provided around the works area to allow the movement of people, machinery, equipment, and transport without having to enter the safety zone. Working space can also be used for temporary works or stores. The working space does not need to be a constant width around the works and, if required, can be changed throughout the course of the works. The inner boundary between the working space and the safety zone should be clearly visible.

4.2.14. When a site is unoccupied the working space can be removed to reduce the overall size of the site. The safety zone may be reduced in size to minimise traffic obstruction except when pedestrians are diverted into the carriageway. When pedestrians are diverted into the carriageway, the safety zone should be measured between the outer pedestrian barrier and the coning.

4.2.15. In urban areas with a 30 mph or less permanent speed limit, the minimum longitudinal clearance and minimum lateral clearance are both 0.5 m. The longitudinal clearance should be as great as is practicable. The minimum and desirable longitudinal clearance and exit clearance distances for different speed limits are detailed in **Table 4.1.**

Table 4.1 Minimum and desirable longitudinal and longitudinal exit clearances

Permanent speed limit (mph)	Longitudinal clearance (m)		Longitudinal exit clearance (m)	
	Minimum	Desirable	Minimum	Desirable
30 or less	0.5	10.0	0.5	9.0
40	15.0	30.0	3.0	9.0
50	30.0	50.0	3.0	9.0
60	60.0	100.0	9.0	9.0
70	100.0	200.0	9.0	9.0

4.2.16. Excavations or structures very close to the live carriageway may cause drivers to shy away from the edge of the works and encroach on another traffic lane. Where possible, additional lateral safety clearance should be provided, and the nearside traffic lane width should be made as large as possible.

4.2.17. For all roads with a permanent speed limit of 50 mph or more, the minimum safety zone lateral clearance should not be less than 1.2 m.

4.2.18. On some single carriageway roads, a safety zone lateral clearance of 1.2 m may not be possible. In this case the safety zone lateral clearance should be as large as possible and no less than 0.5 m.

4.2.19. Posting a temporary speed limit is not a sufficient safety measure alone. Enforcement of the temporary speed limit may be used in addition to physical safety measures such as chicanes, temporary speed ramps, or traffic control.

4.2.20. For roads with a permanent speed of 40 mph or less, the safety zone lateral clearance should not be less than 0.5 m. This is the minimum acceptable safety zone lateral clearance.

4.2.21. Additional safety zone lateral clearance over the minimum should be provided where possible, outside of pinch points. The impact of providing any additional safety zone lateral clearance on the safety of road users and on road capacity should be considered. A reduction in available lanes and or lane widths may cause excessive delays for the road user.

4.2.22. Certain structures, such as bridges and tunnels, may limit highway width. If the full 1.2 m safety zone lateral clearance is used this can make it difficult to maintain adequate space for traffic. In such cases, the safety zone lateral clearance may be reduced to no less than 0.5 m providing a temporary mandatory speed limit of 40 mph is enforced when work is in progress. Additionally, the inner boundary of the safety zone should always be marked by a continuous barrier or fence.

4.2.23. On roads other than motorways where there is insufficient space to provide a safety zone lateral clearance of 0.5 m, and convoy working is not practicable (see Section 9) the road should be closed and traffic diverted along a suitable route. For more guidance on the design of diversions and road closures, see **Section 4.24**. If a diversion is not practicable, the following options are available:

- Establish a safe method of working on the site, which should be agreed with the authority. Traffic speeds must be reduced to 10 mph or less.
- Chicanes can be used on single carriageway roads for short lengths (50 m or less) where the width of road is restricted so that traffic can only pass in one direction at a time (i.e. shuttle working), see **Figure 4.4**. At least one chicane in each direction is required, each being wide enough to allow a large vehicle to pass through slowly. If using chicanes, positive traffic

control must also be in place. Positive traffic control must bring traffic to a stop before the chicane, then release traffic in small groups. ‘STOP/GO’ signs or manually controlled portable traffic signals may be used for this.

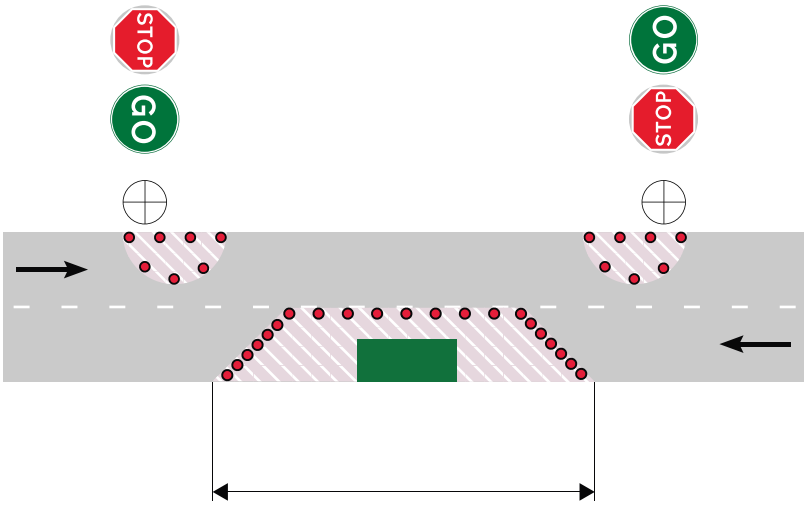


Figure 4.4 Chicane used for shuttle working on a single carriageway road

- ‘STOP/GO’ signs must not be used for extended all-red periods. On single carriageway roads with ‘low traffic flows’, an extended all-red period may be used for short periods of time. These can be undertaken using portable traffic signals or ‘STOP/WORKS’.
- For longer site lengths, a convoy working system may be used see **Section 9**.

4.2.24. Lateral and longitudinal safety clearances are measured at ground level but apply vertically, with the vertical clearance extending up to the height requirements defined in **4.2.25** and **4.2.26**. All parts of the safety zone should be clear of obstruction.

4.2.25. The minimum headroom to be provided at temporary structures (e.g. scaffolds, falsework, temporary accesses, etc.) should always be:

- where the temporary structure is free-standing, the headroom should be 5.41 m (minimum).
- where the temporary structure is attached or associated with a permanent structure, the minimum headroom for the temporary structure should be the same as for the permanent structure. In cases where this is not possible, the temporary structure should be 5.41 m unless it is a high-load route.
- where the road has a high-load clearance requirement greater than 5.41 m, the headroom appropriate to the high-load route plus 0.15 m should be provided.

4.2.26. The minimum headroom requirements for each of the three scenarios described in **4.2.25** are shown in **Figure 4.5**.

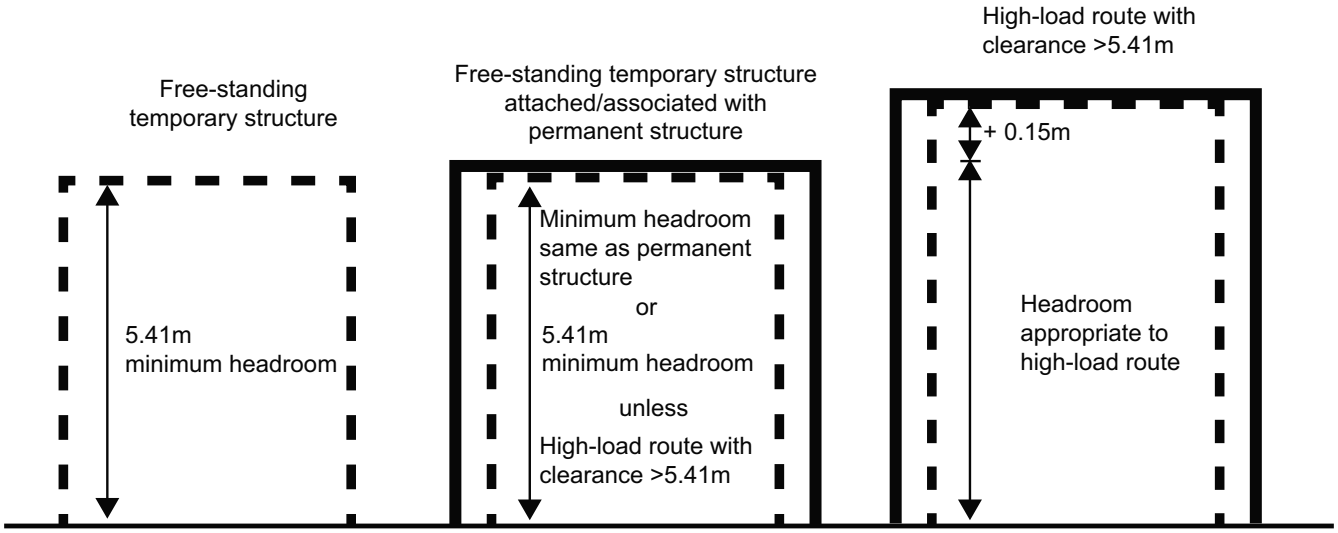


Figure 4.5 Minimum headroom requirements

4.2.27. To allow for vertical curvature, cross fall and the longitudinal grade of the road headroom should always be increased as necessary and should take account of the deflection of the temporary structure under dead and live loads. If the required headroom is not obtainable over the full width, then the part of the carriageway beneath the temporary structure should always be closed. The authority may use its powers to divert traffic when the required headroom is not available.

4.2.28. Where the works impose a temporary height restriction, warning of the restriction must be given by means of the 'headroom at hazard' sign to diagram 530A (S2-4-2) or 629.2A (S2-4-5), see **Figure 4.6**. This should be attached to the structure. Another 'headroom at hazard' sign to diagram 530A (S2-4-2) must be used alongside a 'distance to hazard' plate 572 (S2-5-5) in advance of a suitable diversion point before the hazard, see **Figure 4.7**. For further information on restricted headroom, see **Section 4.24**.

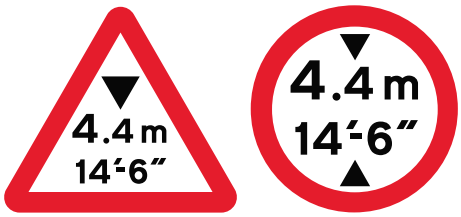


Figure 4.6 Diagrams 530A (S2-4-2) and 629.2A (S2-4-5)



Figure 4.7 Diagrams 530A (S2-4-2) and 572 (S2-5-5)

4.2.29. On motorways and dual carriageway roads a minimum lateral clearance of 0.45 m should be provided between the live carriageway and any temporary road works sign as depicted in **Figure 4.8**.

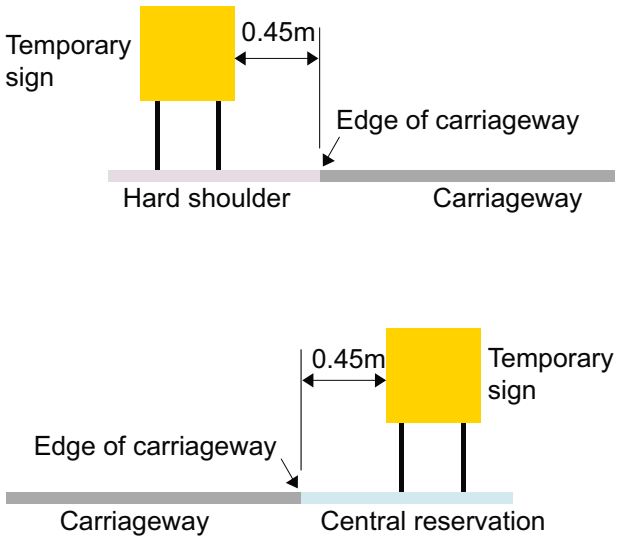


Figure 4.8 Required safety clearance for temporary signs on motorways and dual carriageway roads

4.2.30. The standard orientation of a sign should be 95°, see **Figure 4.9**. If the 0.45 m clearance cannot be achieved at a 95° angle, then the road sign may be angled between 60-70° so that the minimum clearance can be achieved. Where the regulations permit, the sign may also be designed to be narrower to achieve the minimum clearance. If the 0.45 m clearance still cannot be achieved, then the next smallest size of sign may be used subject to a risk assessment where a suitable alternative location cannot be identified and angled appropriately to achieve the minimum clearance.

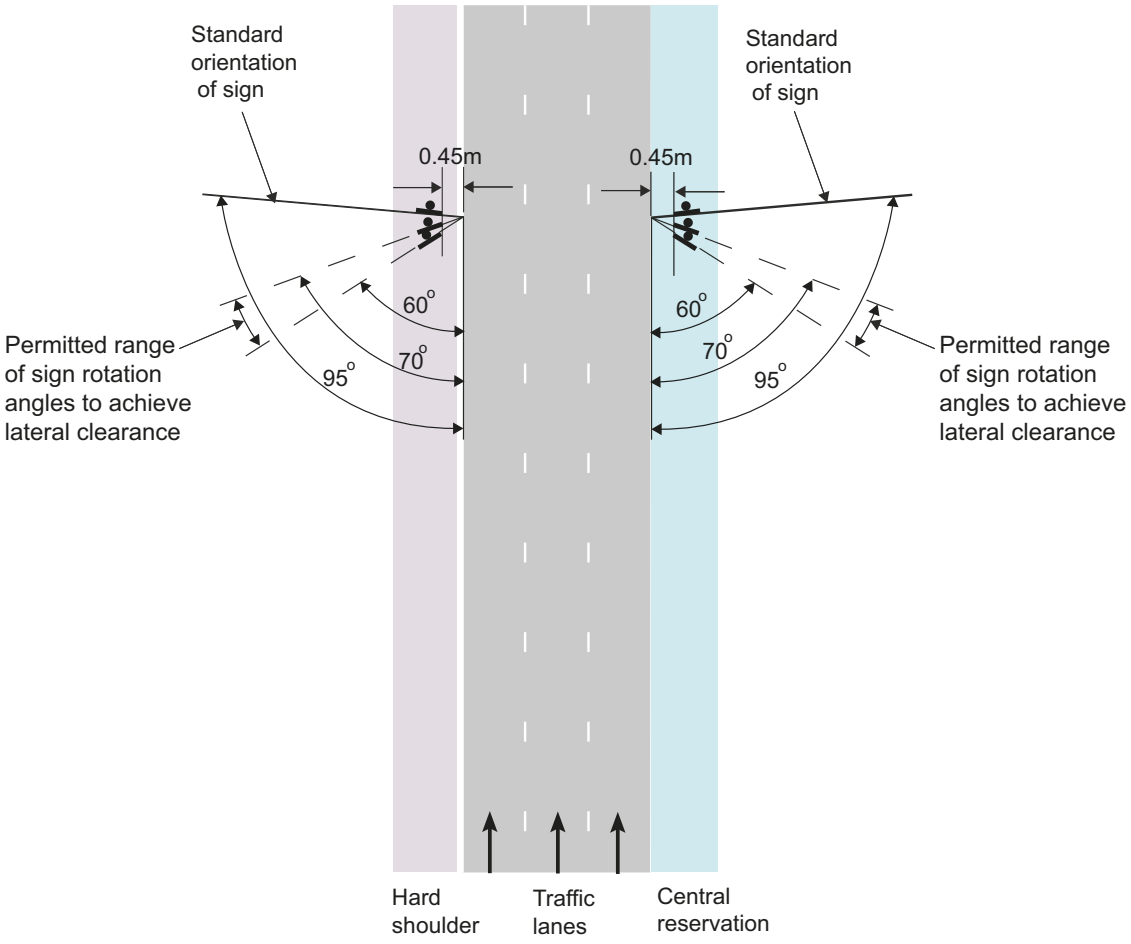
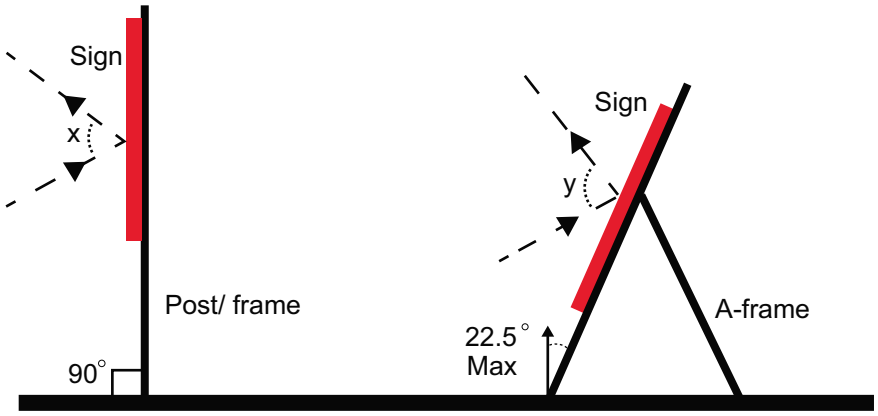


Figure 4.9 Permitted temporary sign rotation angles to achieve the appropriate lateral clearance

4.2.31. Reflectorised signs are sensitive to changes in orientation. The contractor should ensure that the signs and material properties are suitable for the required orientation. Signs

should be mounted vertically (as shown in **Figure 4.10** (a)) unless the material manufacturer has certified that the material performs adequately when mounted at an angle off vertical. In such cases, signs can be constructed so that the sign face is reclined at an angle no greater than 22.5° when erected (as shown in **Figure 4.10** (b)).



(a) Sign mounted vertically on post/frame (normal case)

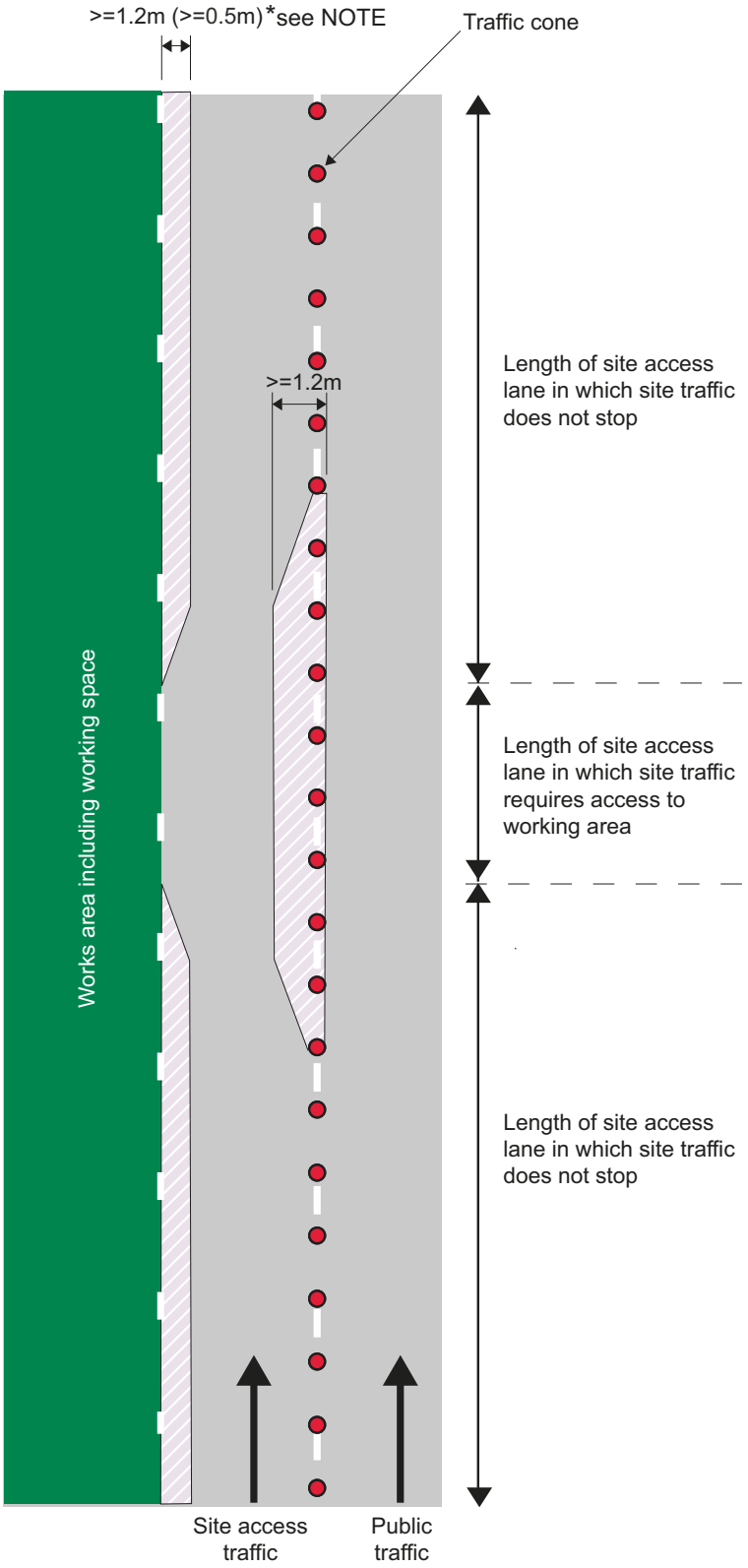
(b) Sign mounted on A-frame (special case)

Figure 4.10 Permitted reflectorised sign mounting angles

4.2.32. For narrow lanes on motorways and dual carriageways, permission may be given to reduce the setback to the central reservation barrier. This can provide additional paving for use as part of a temporary running surface. Permissible relaxations on setbacks to VRS may be found in CD 377 'Requirements for road restraint systems'.

4.2.33. Any extension of the paving carried out to reduce the size of the setback to the central reservation should be strong enough to carry the expected traffic load. This can be carried out as part of the preliminary works. Safety zone lateral clearances between traffic and the works must be provided.

4.2.34. On motorways and dual carriageways, a works access lane (**Figure 4.11**) may be required on major reconstruction works. The lane should be kept free from plant and materials, but may be used temporarily by broken-down vehicles in order to keep the running lanes clear. The safety zone should be located between the live highway and the access lane if the works traffic is required to stop, or between the access lane and the works if works traffic is unlikely to stop. The safety zone should be not less than 1.2 m wide, except that, where it is located between the access lane and the works, it may be reduced to not less than 0.50 m if a temporary speed limit of 40 mph or less is applied to the access lane.



*Note: Width of safety zone adjacent to access lane can be reduced to at least 0.5 m if temporary speed limit of works access lane is 40 mph or less

Figure 4.11 Location of safety zones in relation to works access lane

4.2.35. When works are being carried out on the central reservation of a dual carriageway, consider establishing a safety lane. This would be in addition to the lanes required to carry out the work. Hard shoulder running should be implemented if feasible. Safety lanes should be provided on both sides of the central reservation barrier. This would normally involve closing the offside lane of the secondary carriageway. In cases where the central reservation is sufficiently

wide to enable the works to be undertaken safely, a risk assessment may be conducted to determine whether a lane closure on the secondary carriageway is necessary.

4.2.36. Some traffic management schemes require vehicles to travel outside the normal limits of the carriageway and/or hard shoulder. In such cases, a clearance of at least 0.6 m should be used between the edge of the trafficked lane and the nearest part of any permanent traffic sign. Additional safety barriers may be used if necessary.

4.3 Lane widths

4.3.1. On all roads, the running lane width may be reduced according to the expected type of usage. Where large or heavy vehicles are expected (including public service vehicles, caravans, etc.), the lane width may be reduced to a desirable minimum of 3.25 m. Where necessary a minimum width of 3.0 m may be used. Where two lanes are required for HGVs, the nearside lane should be 3.25 m at absolute minimum. On dual carriageways any lane in addition to those needed for HGVs may be reduced to 2.75 m (desirable) or 2.5 m (absolute minimum). This must be accompanied by a traffic order restricting vehicles widths and a width limit signed, see **Section 7.3**.

4.3.2. On single carriageway roads, two-way operation of traffic should be maintained. This requires an unobstructed width of carriageway of 5.5 m for cars and light vehicles only, or 6.75 m for all traffic including buses and HGVs. Considerations should be made for bus routes and cyclists. If the width of the unobstructed carriageway is less than 5.5 m, shuttle working should be used with an appropriate method of traffic control described in **Sections 6.5**, **6.6**, **6.7**, and **6.10**.

4.3.3. As shown in **Figure 4.12**, cones should be used to limit the traffic lane width for one way shuttle working to no greater than 3.7 m, so that traffic is limited to moving in one direction at a time. When such measures are in place, an absolute minimum lane width of no less than 3 m should be maintained.

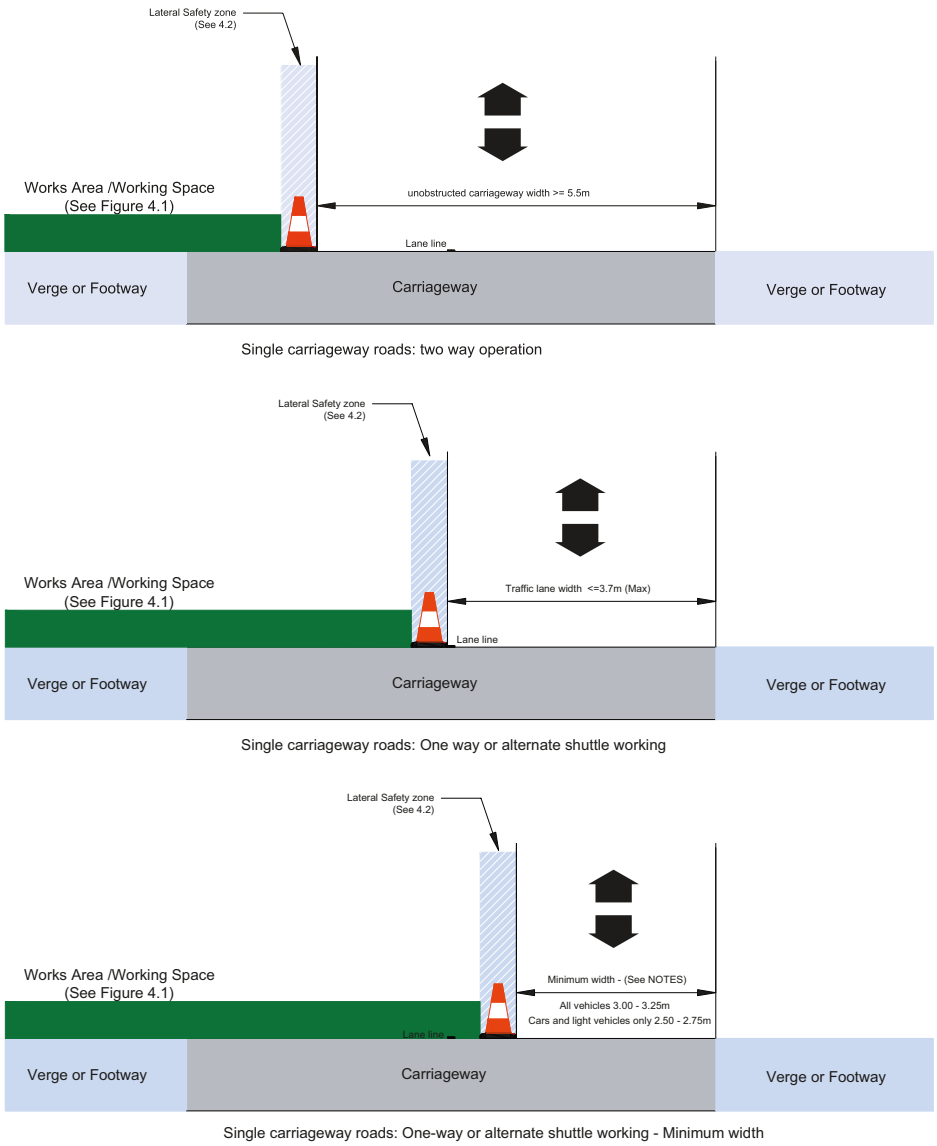


Figure 4.12 Carriageway lane widths for unobstructed and shuttle working scenarios

NOTES:

1. To maintain shuttle working, the following minimum widths apply:
2. All vehicles, desirable minimum width = 3.25 m
3. All vehicles, absolute minimum width = 3.0 m
4. Cars and light vehicles desirable minimum width = 2.75 m
5. Cars and light vehicles absolute minimum lane width = 2.5 m
6. Advance warning of narrow lanes on single carriageways should be given using signs to diagram 516 (S2-2-13; **Figure 4.13**) or 517 (S2-2-14; **Figure 4.14**).



Figure 4.13 Diagram 516 (S2-2-13) Road narrows on both sides ahead without and combined with supplementary plate Oncoming vehicles in middle of road

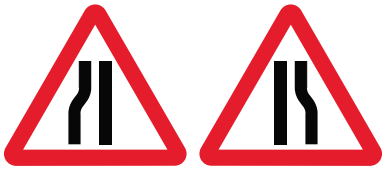


Figure 4.14 Diagram 517 (S2-2-14) Road narrows on one side ahead (left and right side versions)

4.3.4. For works on minor roads where speeds are restricted to 30 mph or less, the width of a single lane may be reduced to an absolute minimum of 2.5 m for cars and light vehicles, see **Figure 4.15**.

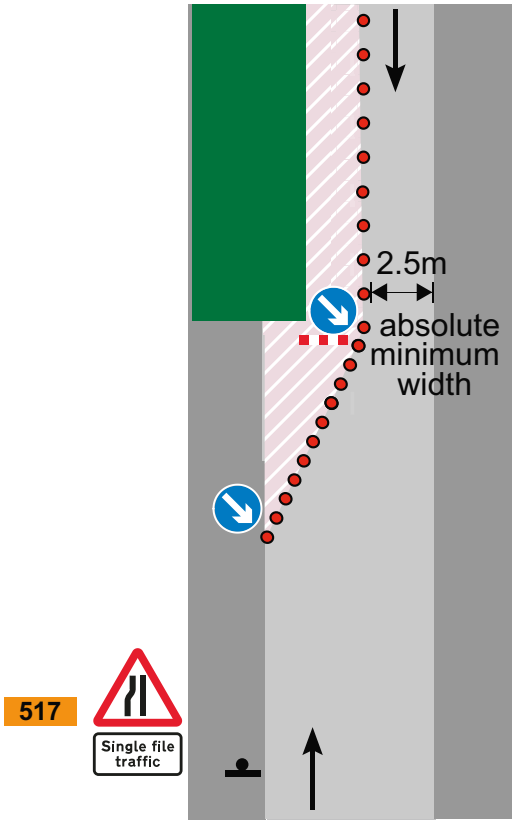


Figure 4.15 Absolute minimum width for cars and light vehicles on minor roads (30 mph speed limit or less)

4.3.5. Works on dual carriageways may require some traffic lanes to be reduced in width to less than 3.0 m. Advance warning of the narrow lanes will need to be given (see **4.3.1**) and it will be necessary to re-mark the carriageway; see **Section 7.3**.

4.3.6. Some works will restrict the lane widths of a single carriageway road where overtaking is normally permissible. Temporary barriers, fences, cones, or cylinders would normally be used to prevent overtaking at places where it would be dangerous, while permitting it elsewhere. However, this is not always appropriate and in such cases it is advised to consider if imposing a 'no overtaking restriction' for the duration of the works is required. The appropriate signs to be used are the 'road narrows' signs to diagram 516 (S2-2-13; **Figure 4.13**) or 517 (S2-2-14; **Figure 4.16**) with a 'Single file traffic' plate. Where only a single lane is in use during single carriageway works and overtaking (e.g. crossing the centre line) is likely to be unsafe, the use of a 'no overtaking' sign to diagram 632 (S3-2-5; **Figure 4.17**) should be considered. This must never be used without a traffic order, nor should a worded sign indicating a restriction on passing be used (e.g. narrow lanes no overtaking cycles) as it is not lawful. The situations where a general 'no overtaking' restriction are likely to be limited, however the use of this option is acceptable. The design of works must not require overtaking restrictions specific to

one, or more, classes of road users e.g. cyclists, to maintain acceptable level of road user safety; the use of such a control measure would mean the works would not meet the minimum design requirements for safety. In this case an alternative option would be needed, such as a requirement to dismount and using footways. Where there is more than one lane in a direction on a single carriageway road a ‘no overtaking’ restriction is not applicable.



Figure 4.16 Diagram 517 (S2-2-14) Road narrows on one side ahead (left and right side versions) combined with supplementary plate ‘Single file traffic’



Figure 4.17 Diagram 632 (S3-2-5) No overtaking

4.3.7. Works in narrow roads may leave insufficient width for public service vehicles to pass. Bus operators and the public transport co-ordinator should be advised of a proposal where:

- the width of any road which forms part of a bus route is to be reduced to less than 3.0 m.
- for two-way working on a bus route, where the width is to be reduced to less than 6.75 m, or
- any bus stop which may become unusable during the works.

Designers should consider whether lane widths are adequate for vehicles to overtake cyclists. See **Figure 4.18**.

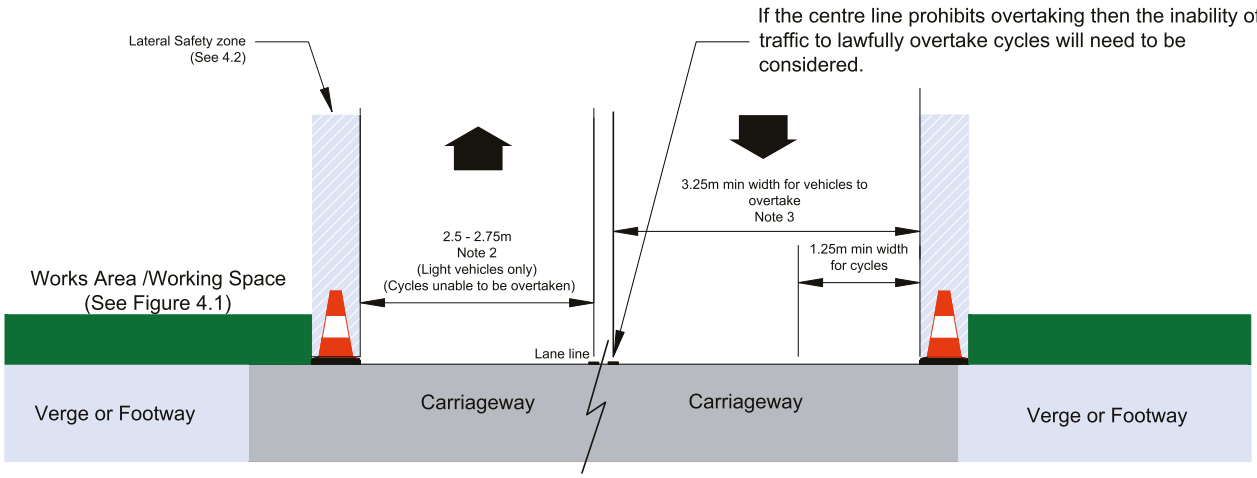


Figure 4.18 Minimum lane widths to allow vehicles to overtake cyclists

NOTES:

1. Where HGVs and buses are expected, additional lane width will be required if only a single lane is present, or the centre line cannot be crossed if on a single carriageway.

2. Where lane widths of between 2.5 m and 2.75 m are used, it should be assumed cyclists will be towards the middle of the lane and overtaking will not be possible. Therefore, the use of this layout may need to be limited to shorter lengths where the lack of overtaking would not unacceptably impact capacity.

3. Depending on the nature of the works the use of lanes 2.75 m and narrower may negatively impact the safety of other road users and road workers, including increasing the likelihood of TTM being damaged or displaced. Where it is not possible to design or safely undertake works with lanes of less than 2.75 m, or greater than 3.25 m, then cycles may need to be prohibited from the main carriageway and alternative provision provided for cyclists made. This may include dismounting if requiring them to use a footpath - which needs to be wide enough to be safely used by dismounted cyclists and pedestrians at the same time.

4. For a restricted road the design of any cycling provision must be safe at the permanent speed limit unless speeds are physically restricted e.g. convoy control.

5. For additional guidance, refer to Traffic Advisory Leaflet 15/99. Local Transport Note 1/20 ‘Cycle Infrastructure Design’ gives general advice on the provision of cycling infrastructure; however, note that the advice in section 13.12 of 1/20 must only be considered with reference to the updated requirements in this document.

4.4 Lane capacity

4.4.1. Lane capacity in free flowing conditions is defined as the maximum number of vehicles that can pass through a section of lane in a given time when there is a queue present upstream. Lane capacity is measured in terms of the number of vehicles per lane per hour. **Table 4.2** below gives the likely maximum values for the capacity of normal width traffic lanes for different percentages of heavy goods vehicles.

Table 4.2 Capacity value of normal width traffic lanes

Capacity values (veh/lane/hr)						
Road Type	**Percentage HGVs**					
	5%	**10%**	**15%**	**20%**	**25%**	**30%**
1 lane rural	1330	1270	1220	1170	1120	1080
2+ lanes rural AP dual carriageway	1710	1640	1570	1500	1440	1380
2, 3, 4+ lanes motorway urban or rural	1900	1820	1740	1670	1600	1540
1, 2 lanes urban road	1330	1270	1220	1170	1120	1080
1 lane suburban road	1330	1270	1220	1170	1120	1080
2 lanes suburban dual carriageway	1710	1640	1570	1500	1440	1380

4.4.2. For narrow lanes, capacity should be taken as 10 to 15 percent less than the figures given in **Table 4.2**.

4.4.3. Low capacity can be experienced during the first few days of operation, until drivers become accustomed to the situation. Inappropriate changes should not be made during this period.

4.5 Length of works

4.5.1. The recommended maximum length of a works site on a major road (including all-purpose and motorway trunk roads) is 4 km. The length of a site is taken as the distance between the end of the lead taper (or changeover where present) and the start of the exit taper. The recommended maximum length is based on the need to reduce the likelihood of an accident resulting from the increase of driver workload and reduced delineation of road markings and studs through the works. The distance can be increased to 6 km for relaxation schemes if fixed taper points are used for speeding up the installation and removal of the works. The design of the works should be reviewed to eliminate or minimise any increase in risk.

4.5.2. The adoption of works longer than the recommended maximum length is permissible if agreed by the authority as not having an unacceptable impact on the network or road users. Only where there would be a shortening of the construction period would it be considered acceptable to undertake works in sections longer than the recommended maximum. An example of the level of reduction in construction time needed to justify longer works would be where a scheme done in two 6 km sections takes 24 months to complete but could be completed in under 18 months using a single 12 km scheme.

4.5.3. Where a longer length of works is proposed, a more detailed design and site specific risk assessment must be carried out to identify a safe maximum length. For works over the recommended maximum length, the contractor should identify the difference in cost and time of undertaking the works as planned and for completing the scheme in sections of no more than the recommended maximum. Authorities need to be made aware that permitting longer lengths of works may result in them sharing the designer's risk.

4.5.4. When an authority has agreed to a section of road works longer than 6 km, it is considered practicable for contractors to fund any additional cost of enabling the accelerated works. In some cases, the authority may take responsibility for funding additional resources. This will be specified in relevant contracts or agreements with those undertaking the works.

4.5.5. It is recommended that Authorities not agree to works longer than the recommended maximum length if it is expected that work activities would not normally be visible for most of the length of the scheme. Road user compliance with traffic restrictions within works is reduced where large portions of a scheme show no visible activity.

4.5.6. When considering the use of longer lengths of works, designers will need to account for the following negative driver behaviours within the scheme-specific risk assessment:

- increased speeding towards the end of the works, both in terms of the amount of time spent over the speed limit and the amount by which the speed limit is exceeded.
- increased fatigue resulting in less stable driving speeds (yo-yoing), amongst HGV drivers in particular.
- increased frequency of lane changing, especially towards the end of longer works.
- greater variance of lateral position amongst vehicles, especially within contraflows.

These factors may put road workers and road users at greater risk, as drivers may be more likely to stray into the works or have less stopping distance to react to hazards.

4.5.7. The prevalence of the behaviours specified in **4.5.6** relates to both the length and nature of the works. For instance, long lengths of narrow lanes show a greater tendency to cause these negative behaviours than similar lengths of other layouts. The negative behaviours are likely to continue downstream of the works, particularly when caused by fatigue. The impact of longer works on the provision and accessibility of service areas, rest areas, and related facilities

will need to be included in the scheme-specific risk assessment. Designers must identify sufficient provision for breaks before and after works and consider measures such as additional information or warning signs on the approach to the nearest facilities before and after works.

4.5.8. Where the works are longer than the recommended maximum length (for relaxation schemes, including those using fixed taper positions), the delineation of the works should be improved as appropriate by using the following: higher performance cones, barriers, warning lamps, temporary road markings and/or temporary road studs as appropriate. Designers should consider if set-backs could be increased without negatively affecting the ability to undertake the works.

4.5.9. Where narrow lanes are used in works that are longer than the recommended maximum length, improvements outlined in **4.5.8** should also be applied. Drivers require a raised level of concentration when navigating narrow lanes for long periods. This should be taken into consideration when determining the maximum length of a scheme.

4.5.10. Narrow lanes of at least 3.25 m width may be acceptable for a continuous length of 6 km, providing there are no other hazards. A temporary speed restriction of up to 60 mph is acceptable where narrow lanes providing 150 mm lane lines are used. Narrow lanes of less than 3.25 m width should not be adopted for lengths of more than 4 km, though lane widths between 3.25 m and 3.0 m may be acceptable at pinch points within the recommended 6 km maximum length. Where mandatory lane restrictions are in place lane widths from **4.3.1** may be acceptable.

4.5.11. While it is recommended that narrow lanes are limited to a maximum continuous length of 6 km, it may be acceptable to have multiple lengths of narrow lanes within a longer length of works. It is recommended that the minimum separation between lengths of narrow lane works should be at least equal to the length of the first section of narrow lanes.

4.5.12. The recommended minimum distance between sites, based on site lengths of 4 km, is shown in **Table 4.3**, except where otherwise agreed by the authority.

Table 4.3 Distance between sites

Type of road	Distance between sites	
	One or more Standard schemes (km)	**Both relaxation schemes (km)**
Single carriageway road with a permanent speed limit of 30 mph or less	2	1
Single carriageway road with a permanent speed limit of 40 mph	5	2
Single carriageway road with a permanent speed limit of 50 mph or more	10	5
Dual carriageway road with a permanent speed limit of 40 mph or less	5	2
Dual carriageway road with a permanent speed limit of 50 mph or more	10	5

NOTES:

1. These requirements relate to trunk and primary roads and may be varied on other roads, with the approval of the authority.

2. Road or carriageway closures are standard schemes. Where the signed diversion route is from the start of the first works to the end of the second works and the gap between the works is for local traffic only then the distance between sites can be reduced to that relevant for two relaxation schemes.

3. Where the distance between sites is 5km or less it is recommended that advanced warning of the second site is placed after the end of the first site.

The distance between sites should be measured from the road works end sign of the first site to the start of the coning at the second site. Permitted road works end signs are given below in **Figure 4.19**, **Figure 4.20** and **Figure 4.21**.



Figure 4.19 Diagram 7001 (S13-2-9) Road works or temporary obstruction of the carriageway ahead combined with supplementary plate 'End'



Figure 4.20 Diagram 7001 (S13-2-9) Road works ahead combined with supplementary plate End and diagram 670 (S10-2-1) Maximum speed limit



Figure 4.21 Diagram 7006 (S13-6-44) End of road works and any associated temporary statutory restrictions (single and dual language versions)

4.5.13. When setting the distance between sites, the standard works column in **Table 4.3** should be used if one or both of the works are standard works. The works with relaxation column should only be used when both sites are relaxation works. As long as either site is not a road or carriageway closure, the given distances between sites may be halved if the traffic demand is not expected to exceed the capacity of the lanes left open to traffic at the second site. Where traffic demand is high and where longer lengths of work are proposed consideration may need to be given to increasing the distance between sites.

4.5.14. Where the distance between works is reduced, the TTM between them should be linked, subject to the maximum length of works identified in this section.

4.5.15. If there is a justification for two closely spaced closures they should be signed and managed as a single scheme. This would apply even if the closures were on roads under a different authority; see **Section 4.24** for information and guidance on diversions.

4.5.16. Where a designer wishes to carry out works that are closer to other works than the distance stated in **Table 4.3**, and it is not deemed appropriate to combine the signing for those two works, they should be aware of potential adverse effects from such an arrangement.

These have been shown to include increased driver frustration, erratic driving (including more variability of lateral position), and increased lane changing. This may have negative impacts for the safety of road workers as drivers may be more likely to stray into the works as well as other drivers. The design of the works must be reviewed to eliminate or minimise any increase in risk.

4.6 Safe taper positions

4.6.1. Tapers are a fundamental element of traffic management layouts. Their position will also be influenced by permanent road features; they should be situated where sight lines are good (in both the vertical and horizontal planes). If the nature of the road does not allow good visibility, then additional lengths of lane closure may be required, and the taper should be positioned at the location with the best available visibility as long as the taper and other TTM can be installed safely.

4.6.2. A taper closing an offside lane should only be positioned at a location where each successive cone is clearly visible to the left of the preceding cone. Similarly, for a taper closing a nearside lane, each successive cone should be clearly visible to the right of the preceding cone.

4.6.3. Backlit sequential flashing taper lamps, where the separate steady and flash elements comply with the Device Type WL7 in National Annex of BS EN 12352 ‘Warning and safety light devices’ need to be used on trunk roads and should be considered for other roads. The lamps need to be clearly visible to vehicles and sequenced in such a way that they show an apparent movement of light which indicates a required change of lane away from a closure. The direction of the apparent movement of light must match the required direction for the change in lane, see **Figure 4.22**.

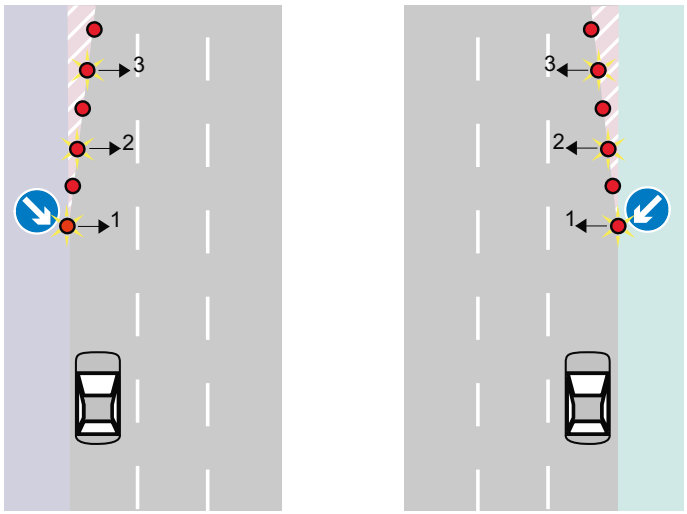


Figure 4.22 Taper with sequential flashing lamps closing an offside lane or closing a nearside lane

4.6.4. The locations of safe taper positions should be identified on all networks and the details recorded. These details should be held by those responsible for maintaining the highway, or their agents, and they must make them available to those responsible for design and operation of TTM.

4.6.5. The location of tapers should be decided following a risk assessment but, in general, on dual carriageways tapers should not be installed adjacent to, or within 200 m of entry or exit slip roads.

4.6.6. A site visit should be conducted before detailing tapers as part of the identification of a safe taper location to ensure that the theoretical layout can be achieved in practice. Safety issues should also be considered when deciding taper positions. Safety issues include the

placing, erecting, and removing of advance warning signs and cones in the taper, as well as safe pulling off points for traffic management vehicles.

4.6.7. On roads without hard shoulders, stationary or slow-moving works vehicles should not encroach into live lanes when pre-placing, erecting, or removing traffic management equipment. Safe taper positions should be designed to prevent encroachment into live lanes while allowing advance signing to be implemented.

4.6.8. Where road works are situated near to a bend in the road, adequate advance warning should be given to approaching drivers to compensate for the reduced visibility, see **Figure 4.23**. An indication should be given of the path that must be followed to avoid any obstruction in the carriageway.

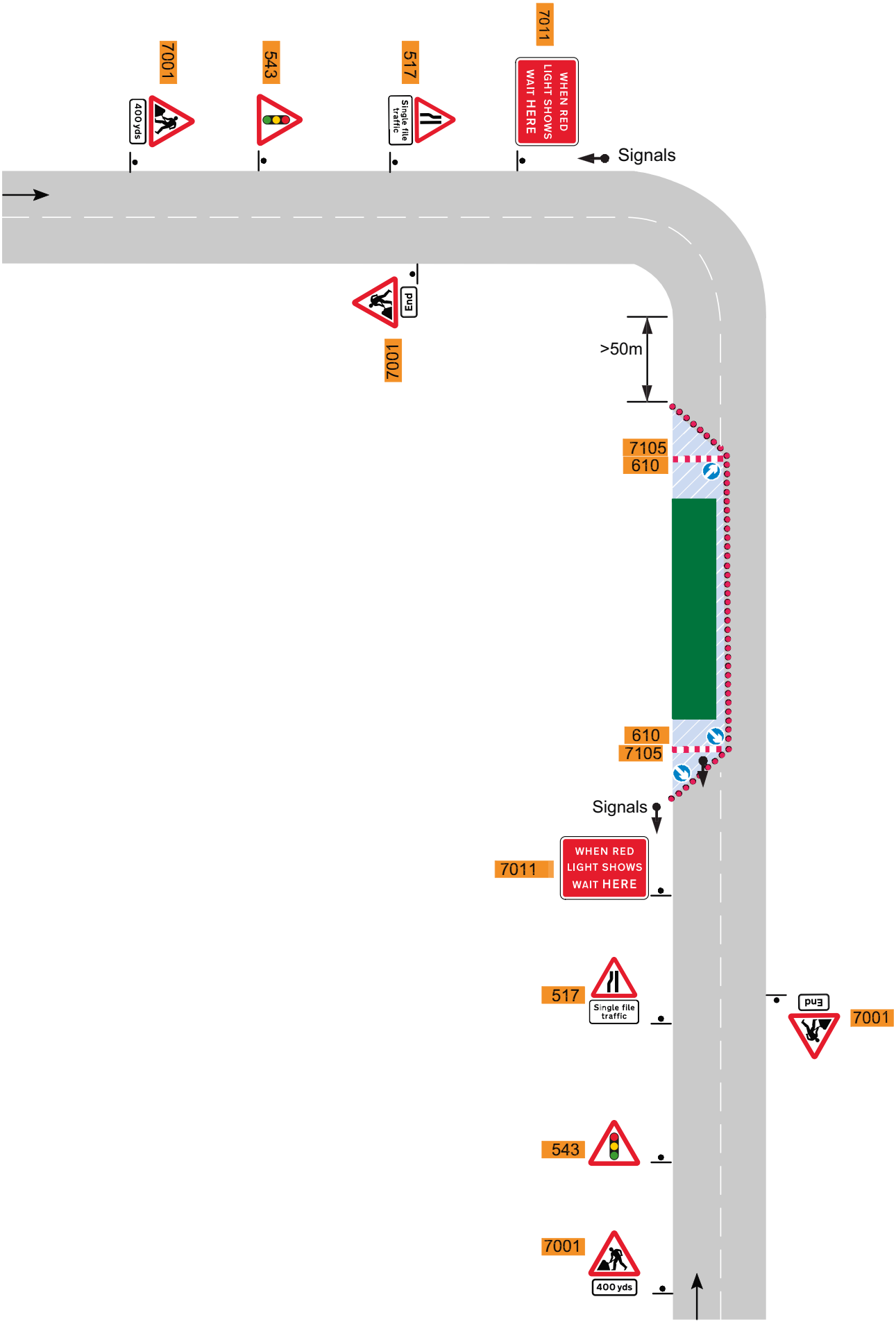


Figure 4.23 Indicative signing giving advance warning to drivers where road works are located close to a bend in the road

4.6.9. If using a relaxation taper (or a 150m standard taper), then the visibility to the start point of the taper must be equal to or greater than the desirable minimum SSD. A relaxation taper is not suitable for use where visibility is less than the desirable minimum SSD.

4.6.10. If putting out cones and signs on foot, then there should be sufficient storage space at locations of relative safety to allow TTM to be installed without excessive manual handling. Suitable locations of relative safety for this activity are; continuous hard shoulders or verges greater than 1.2 m wide; or 0.5 m for roads where the permanent speed limit is 40mph or lower. If there are no locations of relative safety included in the permanent design then suitable locations for works vehicles (including IPVs, TTM vehicles, etc.) to pull off the main carriageway should be provided.

4.6.11. TTM must be installed using a safe system of work which is designed to assure the safety of people and vehicles during cone and sign installation. For example, additional guidance is provided in the Traffic Management Contractors Association (TMCA) guidance documents, including Advice note 1 ‘Temporary Traffic Management Vehicle Selection and Operation on High Speed Dual Carriageways including Motorways’ which can be found at: www.TMCA.org.uk.

4.6.12. People supervising or conducting the works should be made aware of the location of the start and end points of various taper options. Reference markers may be provided on the verge, hard shoulder, or barrier so long as they could not be interpreted as a traffic sign. The nature of the marker should normally be determined by the maintaining organisation.

4.7 Fixed taper positions

4.7.1. Fixed Taper Positions (FTPs) are fixed points at which a cone taper can be safely installed. The FTP will be used as the datum for lane closures to enable safe maintenance at any point downstream, see **Figure 4.24**.

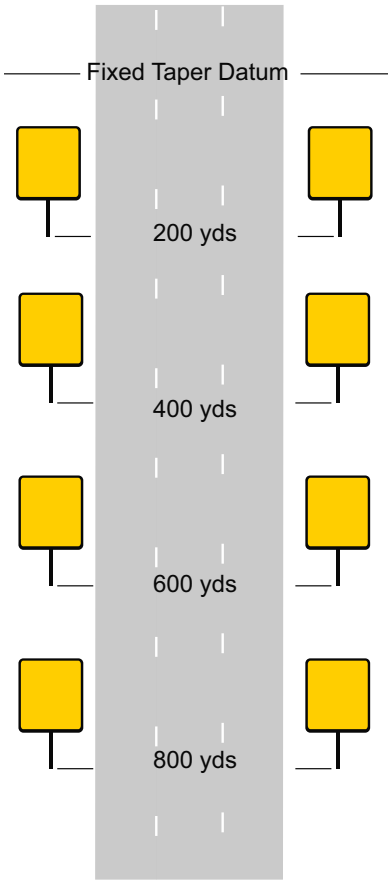


Figure 4.24 Fixed taper position (datum) and location of advance signing

4.7.2. Using FTPs has the potential to speed up the installation and removal of works which can reduce the risk to road users and workers as well as reduce congestion. FTPs may range from simply identifying taper start points, to the road authority providing some or all elements of road works signing as part of the permanent road design.

4.7.3. FTPs can be used on all dual carriageway roads. They are considered the default option for carriageways with three lanes or more that do not have a continuous place of relative safety (e.g. a hard shoulder) from which to install TTM.

4.7.4. When selecting an appropriate location for the placement of FTPs, the following minimum requirements apply:

- the minimum clear visibility is provided to approach signing.
- for relaxation schemes, the minimum desirable SSD is also provided in all traffic lanes.
- the horizontal geometry of the road should not impact the visual effect of sequential warning lamps on the taper to approaching traffic.
- all traffic lanes meet the desirable minimum lane width for the type of vehicle permitted, or required, to use it.
- cones, signs, and barriers for lane closure tapers can be safely stored to enable the taper to be quickly installed from a place of relative safety. Alternatively, sufficient works vehicles and IPVs are available to install the taper with mobile works.
- it must be possible to place all signs required for a standard works scheme on the road. This applies to all works schemes, including relaxation works where some signs are not required by the design. This allows for the enhancement of relaxation scheme signing as part of a safe system of work.
- where there is not a continuous place of relative safety, contractors must identify a safe system of work for placing warning signs on the approach to the FTP. The safe system of work should specify the required number of works vehicles, IPVs or enhanced MCC vehicles needed to safely install the signs, and other TTM equipment.

4.7.5. If the requirement **4.7.4** are not met, then an alternative location should be used where these requirements can be met.

4.7.6. The use of FTPs may speed up installation of works and reduce the need for road workers to be in the live lane. If conditions allow (traffic flows, weather) then relaxation works may be used. If using a relaxation works scheme, then the contractor and/or TTM provider must monitor conditions and check whether relaxation works are still appropriate. If they are no longer appropriate, then contingency arrangements must be in place to ensure the risk to both road users and workers is maintained to ALARP and upgraded to standard works.

4.7.7. Implementing contingency arrangements may introduce risk to road users and road workers. As such, TTM should be set out relative to the worst expected road conditions, reducing the likelihood of implementing contingency arrangements.

4.7.8. The spacing of FTPs will depend on site specific factors. The default spacing for FTPs should be a maximum of 4 km. If the design of the FTP allows for the approach signs and taper to be installed more quickly than usual, then the spacing of the FTPs may be up to 6 km.

4.7.9. The maintaining organisation is likely to be best placed to identify suitable FTPs. Where FTPs are planned as part of the design of the road, then the designer must discuss their provision with the maintaining organisation, confirming that the provision of FTPs are required to allow safe methods of working to be undertaken.

4.7.10. Personnel involved in the design of FTPs and other features used for maintenance works should be sufficiently competent in the methods of signing and undertaking works. Designing organisations should be responsible for ensuring competency.

4.8 Speed management including temporary reduced speed limits

4.8.1. Traffic speeds through works are mainly influenced by the physical nature of the TTM. Where schemes are designed to the requirements and guidance in this document, road users will normally proceed at speeds corresponding to the nature of the road layout and TTM used, and not consider the permanent speed limit as a target. While the management of speed though works is an intrinsic part of the design of schemes it is essential to note that speed management in works (enforcement and reduced mandatory limits) are a control measure, as such they are not an acceptable substitute for undertaking works in a way which eliminates, reduces or isolates risk. Authorities and enforcement bodies should note that speed management is, as with other aspects of the scheme design, the responsibility of the designer. While authorities can query whether the requirements in this section are met, and should identify issues on the wider network e.g. delay due to increased transit time, the designer is responsible for identification of the design speed of the TTM, based on the guidance and requirements in this document. Authorities may also give an indication of the highest safe speed they expect for roads on their network. Authorities should ensure that this is identified by a practitioner with both highway and TTM design competencies. Many assumptions relating to setting permanent speed limits are not valid for temporary situations.

4.8.2. The requirements and flexibility in the signing of speed limits (including repeater spacing) are based upon UK legislation and data on road user behaviours. It is important to note that the requirements in this section are the minimum needed for adequate comprehension. Authorities and enforcement bodies cannot approve a lower provision e.g. omitting speed camera signs, agreeing limited visibility distances, increased spacing of the repeaters, not fully obscuring signs for the permanent limit etc. Road users generally are supportive of active speed management in works and temporary situations but feedback from various sources shows negative feedback on the clarity and quality of speed limit signing has a strong correlation with the number of violations.

4.8.3. Reduced speed limits are a control measure and are not sufficiently reliable to be a primary safety measure for road worker or road users (especially where limits are not aligned with the underlying nature of the works, or the relevant design speed). Inappropriately reduced or implemented speed limits have also been shown, in many situations to induce undesirable road user behaviours such as reduced headways, poor lateral positioning in lanes and increased variation in speeds. Works should be designed to minimise the risks to road users and the workforce before consideration, firstly of enforcement of the permanent mandatory speed limit and then secondarily a reduction in speed limit. Road worker safety measures (e.g. safety zones) must be effective at the permanent limit (or underlying permanent design speed if higher), except where speed is physically limited (e.g. convoy working).

4.8.4. Works and temporary situations must not be designed and planned based on a preselected temporary reduced speed limit e.g. assumed 50 mph temporary limit on high speed dual carriageway, or 30 mph temporary limit for other roads. Applying limits ‘just in case’ would likely to indicate an insufficiently reliable risk assessment or scheme design process. The requirement for the identification and justification of a temporary reduced limit requires more aspects to be considered than for identifying suitable permanent limits.

4.8.5. The majority of risk related to speeding vehicles can be mitigated by enforcing the permanent speed limit; contractors, authorities and enforcement bodies are required to facilitate

this where this option is identified by the TTM designer as being sufficient. If there is an identified safety issue at a scheme then lowering the limit may be justified if accidents occur at speeds less than the mandatory speed limit; if not then lowering the speed limit should not be implemented as an alternative to enforcement.

4.8.6. Temporary reduced mandatory speed limits may be applied in situations or layouts where it is not practicable to design the TTM to be safe for road users at the permanent mandatory speed limit. The majority of the safety benefit of a reduced mandatory limit is though managing traffic flows that align to the reduced design speed. Stakeholders should be aware of that applying a reduced temporary speed limit below the design speed identified in **Table 4.6** has no additional reliable safety benefit. Authorities, enforcement authorities and the designer should be able to provide evidence, as part of the risk assessment, to support the intended temporary speed limits to be adopted.

4.8.7. For other temporary situations, while implementing a temporary reduced speed limit through a notice (up to seven days), see **4.8.12**, may be acceptable as an interim safety measure, a temporary mandatory reduced speed limit is not an acceptable, or effective, primary safety option for a longer time frame where any risk to road users is due to the lack of prompt remedial action for wear or deterioration of the road surface, road markings, drainage or other highway feature. Safety of road users in these situations must be provided by applying relevant TTM or other physical measures. If the relevant TTM etc justifies a reduced mandatory speed limit, as part of the traffic management measures, then this may be incorporated into the works. Normally the lack of vehicle restraint system (or a substandard system) would not justify a reduced mandatory speed limit except if left in a part complete state and which would itself result in an increase in road user's risk if hit. Other than for short, periods e.g. a week or less, the preferable option would be to remove the part complete barrier and, if justified, provide a compliant temporary barrier system.

4.8.8. The requirements identified in this section indicate what is considered to be the absolute minimum for adequate guidance to road users and also defines the Secretary of States' directions identified in Section 85 of the Road Traffic Regulation Act 1984. Additional signing may also be needed, on a scheme by scheme basis, to maintain road user comprehension. While contractors, authorities and enforcement bodies have flexibilities as to the signing and adoption of reduced speed limits, if the minimum guidance and requirements outlined in this document are not met then it may not be possible to enforce the reduced mandatory speed limit.

4.8.9. Temporary reduced speed limits at works are most effective where signs are clear to road users and the nature of any hazards are visible and clear to road users. Poorly signed, inappropriate speed limits or where there is no visually obvious hazard, reduces road user's confidence in limits set for all works. In addition to ensuring that temporary speed limits are adequately and clearly signed, it is essential that all existing signs which indicate directly, or indirectly, the permanent speed limit must be removed, covered, or completely obscured for the whole length of the reduced limit. If this is not met then it is possible the whole length of the limit will not be enforceable.

4.8.10. Temporary speed restrictions may not be necessary where the nature of the works naturally reduces traffic speeds. The scheme's design speed needs to be consistent and any hazard to road users sufficiently clear. However, where the presence of design features identified in **Table 4.6** limits the achievable design speed (particularly on longer works where these features vary) there may be a safety benefit to applying a reduced mandatory speed limit which is aligned with design speed (or underlying nature) of the works. This may also improve traffic flow and capacity if traffic speeds are more consistent. On dual carriageways, where works requiring protection are taking place within the central reservation or on the other

carriageway, appropriate physical measures should be used as the primary form of protection on the unobstructed carriageway rather than speed restrictions.

4.8.11. Enforcement bodies should always be consulted and, where appropriate, involved early in the design of speed limit signing for a road works scheme. This will help to ensure agreement on enforcement issues and the siting of cameras and signs (and removing or obscuring permanent speed limit signs), as well as help ensure compliance. The locations of cameras should be designed to reduce the likelihood of drivers making sharp braking manoeuvres. Therefore, cameras should not be located between the initial terminal speed limit signing and the first repeater sign. There may also be a benefit in not having fixed, average, or mobile enforcement between the last speed limit repeater and the end of the works. The design programme for such works should allow for the necessary time required to obtain Temporary Traffic Regulation Orders (TTRO).

4.8.12. In the event of an emergency, such as a road surface failure or if the condition of a vehicle restraint barrier poses an additional risk to road users, or when justified by the TTM used to maintain safety, if there is insufficient time to obtain a temporary traffic regulation order under normal procedures, consideration should be given to obtaining a traffic order under emergency notice procedures (Section 14(2) of the Road Traffic Regulation Act 1984).

4.8.13. For roads other than motorways, where the highway width does not allow for the appropriate lateral safety clearance to be used, a temporary mandatory speed limit of 10 mph may be imposed and a safe method of working imposed on site i.e. convoy control, see **Section 9**. For high-speed roads, a temporary mandatory speed limit of 40 mph should be imposed in advance of the 10 mph speed limit (a limit of 50 mph may be used as an alternative on dual carriageways subject to the national speed limit).

4.8.14. At structures, where highway width is limited, it can be difficult to maintain adequate traffic capacity with full lateral clearance. In such cases, a reduced safety clearance may be considered alongside enforcement of a reduced mandatory speed limit of 40 mph or less. This only applies to permanent features / barriers and not temporary structures and barrier systems. Information relating to setback and working width of barriers can be found in CD 377 ‘Requirements for road restraint systems’.

4.8.15. Temporary reduced speed limits, other than in association with physical measures, must not be imposed at works sites solely for the purpose of protecting the workforce. While not recommended, the use of a reduced temporary mandatory speed limit may need to be considered when physical measures to reduce risk to workers are incorporated but may not be fully effective at the permanent speed limit (e.g. there is not an available temporary barrier system which has an acceptable working width at the permanent limit). Reduced speed limits may also be justified where physical measures to protect workers represent a potential risk to road users and it is not practicable to design these features to the design speed (or default speed) identified in this document.

4.8.16. Temporary mandatory speed limits are imposed at road works in response to hazards arising from the TTM. However, it may be appropriate to continue a temporary reduced speed limit between discrete work areas which are within 800 m of each other.

4.8.17. Changes can happen to the work being undertaken which remove or change the need for TTM. In such instances, the temporary reduction in speed limit will need to be reviewed and adjusted to match the new temporary arrangements. The designer should make provision within a TTRO to accommodate this. A temporary speed limit must not remain in force once works are completed (or where works are left in a part complete state for any significant length of time)

unless its immediate removal would create additional risk to road users. It is not acceptable to leave TTM in situ to justify maintaining a temporary speed limit where there would be no benefit to road user risk.

4.8.18. Where works are suspended during holiday periods, temporary reduced speed limits should be removed. In instances where TTM remains to protect part complete works and poses a risk to road users, the temporary speed limit may be maintained but only for sections where there are part complete works. In situations where lane closures are reduced to hard shoulder closures, temporary speed limits should be removed or set at a higher level.

4.8.19. Where temporary speed limits are expected to be regularly imposed, changed or removed, the use of remotely operated signs should be considered. The spacing of repeater signs will need to comply with requirements (see **Table 4.5** in **4.8.27**) for the lowest speed limit the signs will display. Traffic regulation orders should be written in a way that allows for temporary speed limits to be changed to reflect changes to TTM.

4.8.20. The use of temporary speed limits may be required for purposes other than supporting works or temporary situations e.g. public events etc. In such instances, the requirements for temporary speed limits and signing in this document still apply. For situations such as air quality / environmental concerns the requirements for permanent speed limits in Chapter 3 will apply (including mounting signs vertically).

4.8.21. Signing may be provided to identify the reasons restrictions are in place; however, the text must not be framed solely to refer to the reduced speed limit.

4.8.22. Temporary speed limits should generally be imposed 50 m in advance of the first sign at road works indicating a restriction or lane closure, as shown in **Figure 4.25**. Terminal signs (both start and end of a limit) for temporary limits must be provided on both sides of the road or carriageway. The recommended position can be varied to enable signs to be paced on both sides of the road or carriageway, as well as providing the relevant clear visibility distance from **Table A1.1**. On a two-lane single carriageway, this is likely to be the ‘road narrows ahead’ sign to diagram 517 (S2-2-14). On dual carriageways, a lane closure sign to diagram 7202.1 (S13-6-13) or 7244 (S13-6-15) or 7245 (S13-6-16) as appropriate should be used.

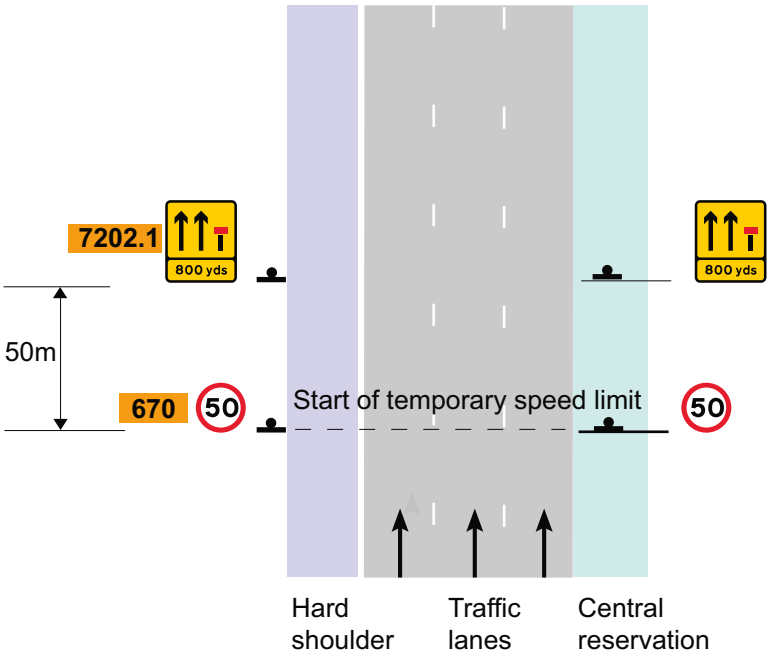


Figure 4.25 Start of temporary speed limit 50 metres in advance of first sign showing a restriction or lane closure

4.8.23. Speed restrictions should extend beyond the last cone of the TTM arrangement. The distance at which they should extend is 90 m for dual carriageway roads and 45 m for one-way single carriageway roads. On two-way single carriageway roads, signs indicating the end of the speed restriction must be located back to back with those in the other direction that indicate the start of the speed restriction.

4.8.24. Signs to diagram 7001 with an 'End' plate (S13-2-9) must be placed at the end of the works, as shown in **Figure 4.26**, to indicate the end of the works and the end of the temporary reduced mandatory speed limit. Where the temporary reduced mandatory speed limit continues past the end of the works, a combined end of works and speed limit roundel must be placed on both sides of the carriageway. These combined signs must also be placed on both sides of the carriageway where the speed limit downstream of the works is different from the permanent limit on the approach to the works, or at any intermediate junctions. To avoid the potential for large variations in vehicle speeds downstream of works, the combined end of works and speed limit roundel should be used on high-speed roads even when not mandated. Where the end of the works transitions into an area of variable mandatory speed limits (VMSL) and the first signal has a permanently applied speed limit to help transition into the VMSL section then a speed limit roundel equivalent to the default limit set on the signal (i.e. excluding any reduction for congestion or incident management) must be included with the end of road works sign. Additionally, signing to indicate the start of the VSML section may be needed downstream of the end of works sign. Where signal systems are in use in works the aspect 'END' must not be displayed where there is a reduced mandatory speed limit in place as this terminates all restrictions, including the reduced speed limit.

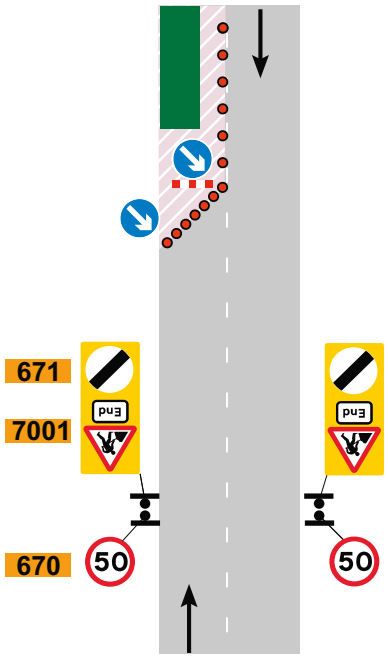


Figure 4.26 Start and end of temporary mandatory speed limit on a single carriageway road (TTM layout is generic)

4.8.25. Designers should consider where to site the signs to ensure clear visibility (see **Section 5.3**). The resulting location of the signs may alter the distance from the works given **4.8.16** but must be accurately referred to in the TTRO.

4.8.26. In general, a temporary speed limit should not be introduced where the length of restriction would be less than 800 m on dual carriageways and 400 m on single carriageways, as measured between the initial speed limit sign and the sign indicating the end of restrictions. Shorter sections of signed reduced speed limits (e.g. at crossovers) may be acceptable if the limit is likely to be self-enforcing.

4.8.27. Other than for short lengths of reduced mandatory speed limits, the use of repeater signs placed along the length of the works is an essential requirement. See **Tables 4.4** and **4.5** for details of the size and spacing of these repeater signs.

Table 4.4 Size of signs for the temporary speed limit

Type of road	Size of terminal signs	Size of repeater signs
Dual carriageway road (national speed limit)	1500 mm	900 mm
Dual carriageway road with a permanent speed limit of 50 mph or 60 mph	1200 mm	750 mm
Single carriageway road with a permanent speed limit of 50 mph or more	900 mm	600 mm
Other roads with a permanent speed limit of 40 mph	750 mm	600 mm
Other roads with a permanent speed limit of 30 mph or less	600 mm	450 mm

Table 4.5 Spacing of repeater signs for the temporary speed limit

Type of road and temporary speed limit	Maximum average spacing between signs	Maximum spacing between adjacent signs without the need for additional risk assessment	Maximum spacing between adjacent offside signs on dual carriageways
Dual carriageways 50/60 mph	500 m	600 m	1 km
Single carriageways 50+ mph	450 m	540 m	900 m
40 mph (all roads)	350 m	420 m	700 m
30 mph (unlit all-purpose roads)	250 m	300 m	500 m

NOTES:

1. Terminal signs must be provided on both sides of the road or carriageway. Where there are space constraints, one of the terminal signs may be one size smaller.

2. The size of terminal signs on a side road should be as identified in **Table 4.4**. For complicated junctions, and where the side roads are subject to either a 20 or 40 mph zone signs, one size larger than that recommended in Chapter 3, Table 8.3 should be used.

3. Except where required for signing enforcement cameras, see 5.16.5 or where required to achieve the required clear visibility in **Table A1.1**, the spacing of the repeater signs should not normally be reduced from that specified in **Table 4.5**, except where the signs are installed on a vertical post system.

4. If the police or other enforcement body request additional signs or reduced repeater spacing, the designer should confirm with the body that a risk assessment has been carried out to understand the effect of the requested signs on road worker safety.

5. Where there are space constraints, repeater signs, when mounted vertically, may be one size smaller (the sign face material would need to complying to class R3B-UK in the National Annex to BS EN 12899-1 ‘Fixed, vertical road traffic signs’).

6. The spacing between adjacent signs can be varied to ensure the required clear visibility is achieved as long as the average spacing meets the requirements of **Table 4.5**. Where the spacing between any two signs is over 20% greater than the identified average spacing, the designer should consider whether an additional sign is justified.

7. Sign spacing for temporary reduced mandatory speed limits using variable signs should meet the requirements for the lowest signed limit. Specific guidance is given in **4.8.24** to **4.8.31**.

8. When signed with fixed diagram 670 signs the lowest enforceable speed limit on Motorways in Great Britain is 40 mph. A speed limit of 30 mph may be applied for distances of up to 300 m e.g. at crossovers, where this aligns with the design speed, but this is not enforceable. Designing works on motorways that would require longer lengths of 30 mph mandatory speed limit presents significant

practical, operational and enforcement issues and would not meet the minimum requirements for the safe design of schemes.

9. Where carriageway lighting is present it is not lawful to use speed limit repeaters for 30 mph limits (20mph in Wales). The use of repeater signs in this situation would impact the enforcement of any limit other than for the national speed limit (including where the permanent limit is lower than the national speed limit).

10. For special roads not subject to motorway restrictions, where one or more classes of vehicle are subject to a maximum speed limit of 70 mph, diagram 671 will need to be used to indicate the speed limit.

4.8.28. When using fixed plate signs, terminal signs must be provided on both sides of the road or carriageway. If this is not possible then an alternative location should be identified for the change in speed limit where signs can be placed on both sides of the road. It is considered reasonably practicable to design roads that permit terminal signs to be placed on both sides of the road or carriageway.

4.8.29. When using fixed plate signing, repeater signs must be provided on both sides of a carriageway. Details on maximum average spacing between repeater signs are shown in **Table 4.5** in **4.8.27**. Where this is not possible, it is acceptable to provide a single vertical sign on one side of the road and road markings to diagram 1065 (S10-2-9) in each lane, see **Figure 4.27**. This option is normally only suitable for temporary layouts or where resurfacing work is expected before the works are complete. Where the road surface is not to be replaced, any temporary marking material used for diagram 1065 must be able to be removed without any visible evidence of its use.

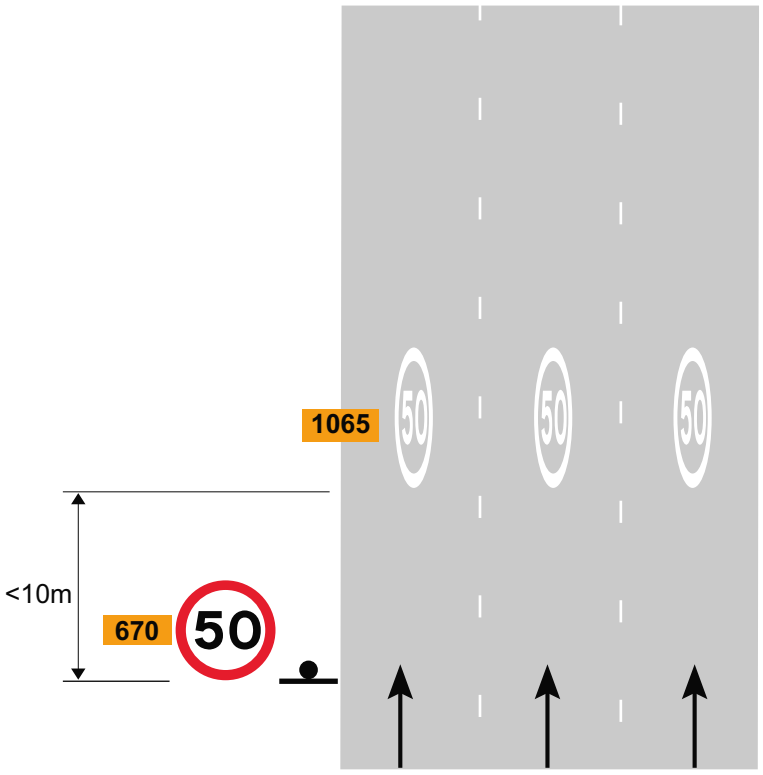


Figure 4.27 Diagram 670 (S10-2-1) Maximum speed limit repeater sign in combination with road markings to diagram 1065 (S10-2-9) showing the maximum speed limit

4.8.30. Speed limits can only be enforced where the speed limit signs are correctly placed and conform to the requirements of TSRGD and where the extent and value of any limit is consistent with the requirements of this document. Temporary mandatory speed limits should be checked against the temporary order to ensure the limits of the restriction do not exceed those permitted by the order.

4.8.31. Temporary speed limit signs should comply with **Table 4.4**. The initial speed limit signing must be placed on both sides of the carriageway, for both dual and single carriageway roads. If the termination signing includes signs to diagram 670 (S10-2-1; **Figure 4.28**) or 671 (S10-2-2; **Figure 4.29**) then it must also be placed on both sides of the carriageway, for both dual and single carriageway roads.



Figure 4.28 Diagram 670 (S10-2-1) Maximum speed limit in mph



Figure 4.29 Diagram 671 (S10-2-2) National speed limit applies

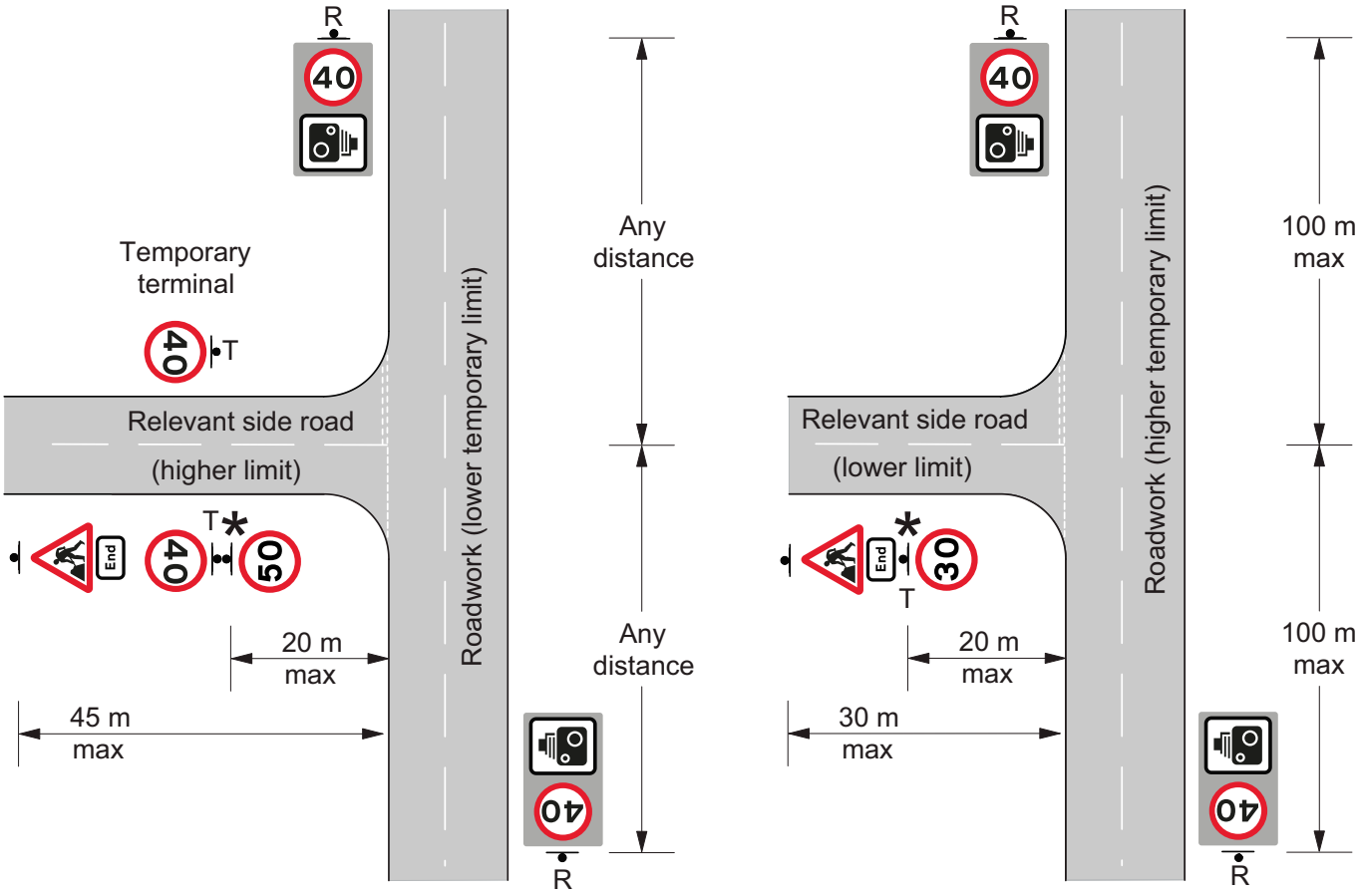
4.8.32. The recommended position of the start of any mandatory reduced speed limit should be suitable for changes of up to 30 mph. Stepped speed limits on the approach to works should only be used where the change is more than 30 mph. The recommended position of the speed limit terminal signs (along with clear visibility distance from **Table A1.1**) allows traffic to safely change speed in the approach and lane change zones while maintaining an acceptable capacity. Mandatory reduced speed limits should not be applied to longer lengths of the approach zone by default (other than to ensure sign visibility). Only if a problem arises with traffic speed or flow once works are in place should relocating the start of a speed limit be considered.

4.8.33. The choice and application of any enforcement must not.

- require a speed limit to be applied that is not recommended in this document.
- require speed limits to be applied for longer lengths than stated in this document, nor
- require the retention of a speed limit where short- or medium-term changes in layout would justify a change in the position or value of a reduced speed limit.

4.8.34. Where side roads join the road works and are subject to a different speed limit from that imposed through the works, temporary speed limit signs must be provided for traffic entering the road works site. Any existing speed limit signs for traffic leaving the side road must be fully covered with opaque material or removed. Where the limit through the works is:

- Lower than the speed limit on the side road – a temporary speed limit sign must be placed on each side of the carriageway of the side road. Where there are no works on the side road this should be placed no more than 20 m from the junction and plainly visible to traffic about to enter the works.
- Higher than the speed limit on the side road – repeater signs on the main road may be used as an alternative to terminal speed limit signs placed on each side of the side road. The repeater sign should be no more than 100 m from the junction for traffic travelling in each direction. If the sign is more than 100 m from the junction, a terminal sign showing the temporary speed limit must be placed on each side of the carriageway of the side road. Where there are no works on the side road this terminal sign must be no more than 20 m from the junction unless any traffic order allows for a long length to be subject to a higher limit. See **Figure 4.30**.



Key
* Existing permanent terminal sign

Temporary Signs
T Terminal sign
R Repeater sign

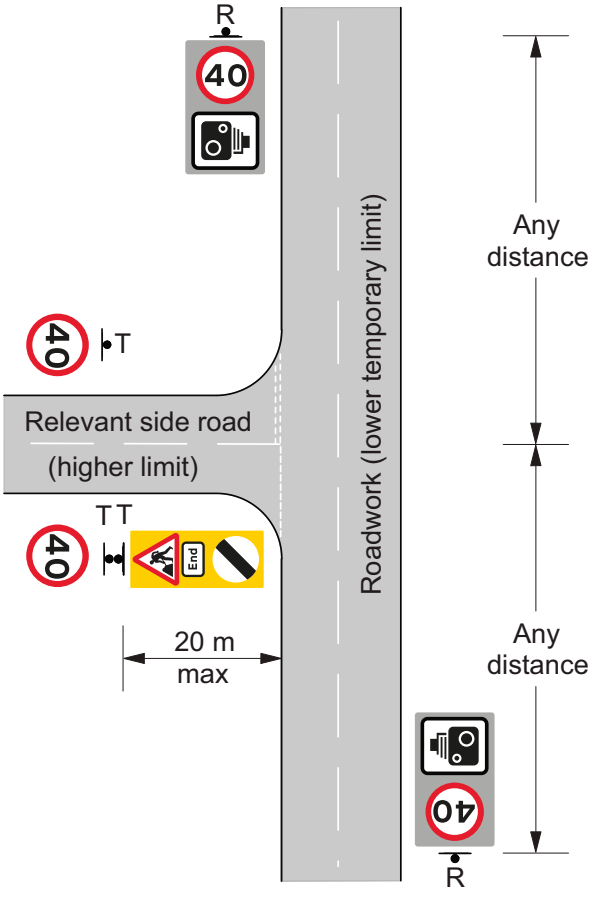


Figure 4.30 Side roads adjacent to roadworks subject to a different speed limit

4.8.35. The requirements outlined **4.8.34** also applies at signal-controlled and unsignalised junctions, at crossroads, and at all roundabouts.

4.8.36. If the permanent speed limit on the side road is the same as that on the road where works are being conducted, there will be no existing speed limit signs at the junction. Therefore, a sign to diagram 7001 in combination with an 'End' plate (S13-2-9) or a speed limit sign to diagram 670 (S10-2-1) which shows the speed limit on the side road must be used. Where there are no works on the side road this should be placed on the nearside of the side road not more than 20 m from the junction. If the limit is the national limit, a sign to diagram 671 (S10-2-2) must be used instead of diagram 670.

4.8.37. Where a scheme includes the start of a motorway, the speed limit will be as per the relevant motorway regulations (e.g. 70 mph for cars) from the sign to diagram 2901 (S9-4-13; **Figure 4.31**) onwards. Where a mandatory reduced speed limit is needed at the start of the motorway, signs to diagram 670 (S10-2-1) must be positioned on both sides of the carriageway at or immediately downstream of the sign to diagram 2901, irrespective of any signed limit on the section of a scheme before the start of the motorway. Where a scheme includes an end of motorway regulation sign, signs to diagram 2931 (S9-4-15; **Figure 4.32**) and where any temporary mandatory reduced speed limit needs to continue downstream of the end of the motorway, signs to diagram 670 (S10-2-1) must be positioned on both sides of the carriageway at, or immediately downstream of, the diagram 2931 signs. See **Figure 4.33**. It is not possible to use average speed enforcement for temporary limits where there is a start or end of motorway regulation sign between the relevant cameras.



Figure 4.31 Diagram 2901 (S9-4-13)



Figure 4.32 Diagram 2931 (S9-4-15)

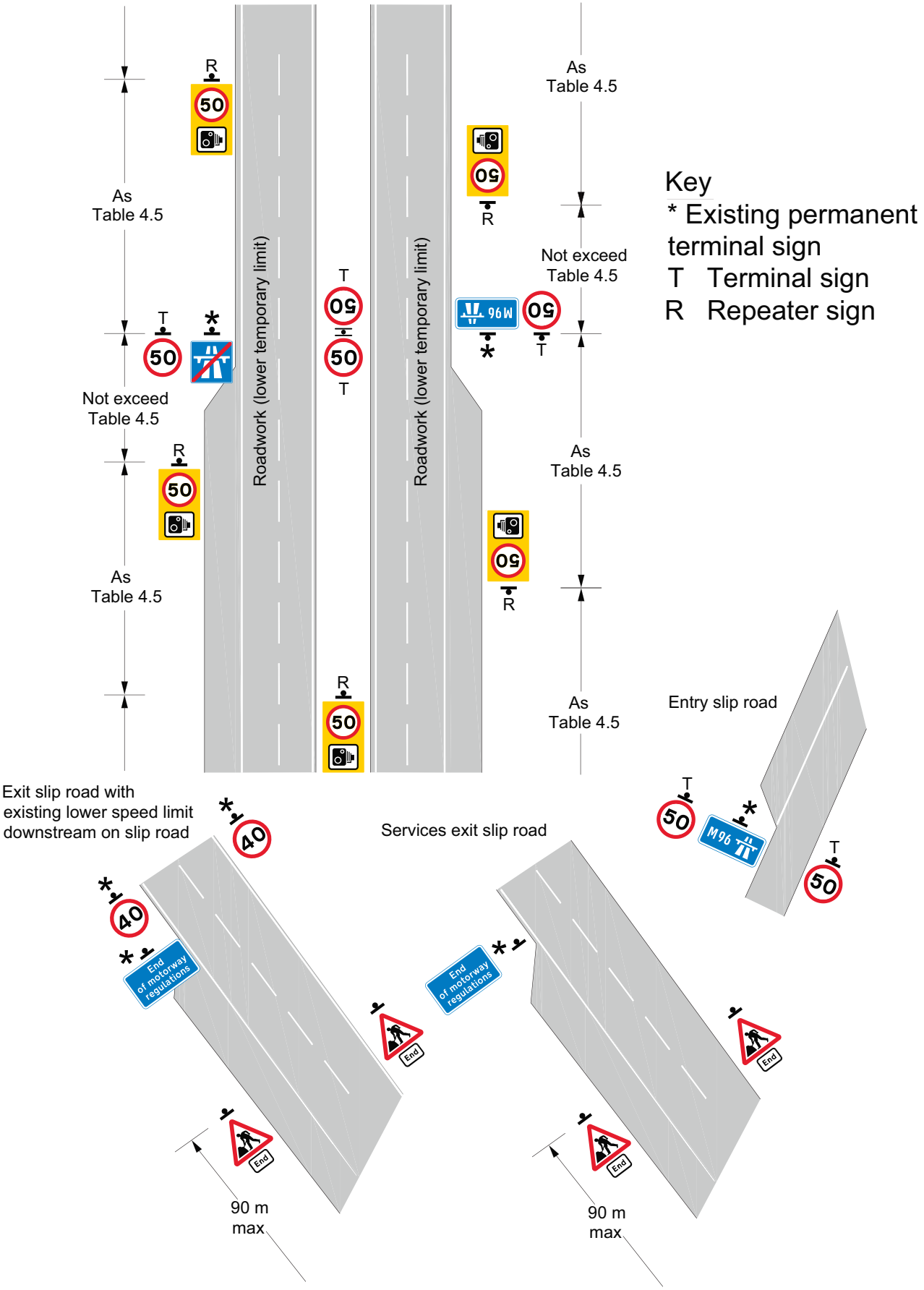


Figure 4.33 Signage at the commencement and termination of a motorway (Main carriageway and slip roads

4.8.38. All terminal signs must be directly lit (not merely reflectorised) throughout the hours of darkness if they are on a trunk or principal road within 50 m of a lit streetlamp. All signs (including repeaters) not required to be directly lit must be reflectorised.

4.8.39. Any existing speed limit signs will be required to be removed or covered during works, they must be fully covered with opaque material, bagged, or removed. When obscuring diagram 670 (S10-2-1) and 671 (S10-2-2) the whole roundel must be obscured (including the numerals and red border). When obscuring diagram 1065 (S10-2-9) markings, any masking material must not cover just the numerals as in some conditions the numerals could still be readable. Existing signs to diagrams 880 (S11-2-64), 880.1 (S11-2-68) and 880.2 (S11-2-64A) – the latter in Wales only, see **Figure 4.34**, must be fully obscured, if not removed. Obscuring just the roundel element is not sufficient.

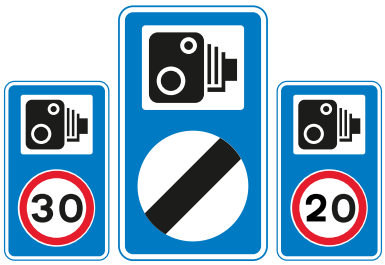


Figure 4.34 Diagrams 880 (S11-2-64), 880.1 (S11-2-68) and 880.2 (S11-2-64A)

4.8.40. Where the permanent limit is to be enforced on a road without carriageway lighting and is subject to the national speed limit diagram 880 (S11-2-64) may be used. Where the permanent speed limit on a restricted road is to be enforced diagram 880.1 (S11-2-68), may be used. Where the speed limit for a restricted road is not 30 mph i.e. in Wales, diagram 880.2 (S11-2-64A) should be substituted where this is prescribed. All three signs constitute a prescribed sign (i.e. not two signs on a shared backing board), the limit indication cannot be changed.

4.8.41. Speed camera repeater signs to diagram 880 (S11-2-64) should be placed approximately 1 km downstream of the initial speed camera sign to diagram 878 (S11-2-63, see **Figure 4.35**) and then at 1 km intervals on alternating sides of the carriageway.



Figure 4.35 Diagram 878 (S11-2-63) Area in which enforcement cameras are in use (Alternative types)

4.8.42. Speed camera repeaters to diagram 878 (S11-2-63) should be co-located with the speed limit repeaters where possible, preferably on a common backing board (TSM Chapter 3 figure 8-19). The signs and the speed camera must be placed so that both are visible to the driver in the same view. Additional signs may be used to achieve this.

4.8.43. For a road subject to a National Speed Limit, combined use of diagrams 878 (S11-2-63) and 671 (S10-2-2) is limited to sections with carriageway lighting. Otherwise, diagram 880.1 (S11-2-68) should be used.

4.8.44. Where it is impracticable to obtain agreement for a mandatory reduced speed limit, consideration should be given to the application of an advisory speed using the bottom panel or the free-standing sign to diagram 7294 (S13-6-41; **Figure 4.36**). VMS or matrix signals may also be used to show the maximum speed advised. The method for assessing the appropriate speed is the same for advisory speeds as for mandatory limits.

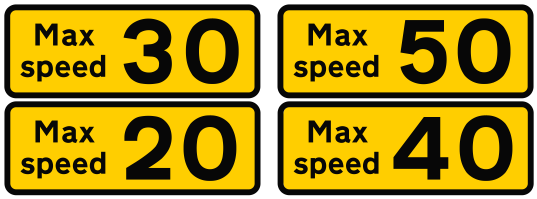


Figure 4.36 Diagram 7294 (S13-6-41) Advisory maximum speed limit in mph (Alternative types)

4.9 Speed control/temporary speed limits on high-speed roads

4.9.1. The need for temporary mandatory reduced speed limits should be considered for all planned standard schemes. A temporary traffic regulation order is required to establish a temporary reduced mandatory speed limit for a given site. Temporary mandatory speed limits are enforceable and provide better compliance than advisory speed limits. Relaxation schemes must be designed to be safe at the permanent speed limit; applying a reduced mandatory speed limit would preclude a scheme being a relaxation scheme.

4.9.2. It is not acceptable to apply a temporary reduced mandatory speed limit on the assumption that by default it increases safety, mitigates a minor risk, or improves traffic flow. The designer (or any other organisation) will need to be able to provide documented evidence of specific risks or hazards which justify the imposition of a temporary speed limit. **Table 4.6** provides guidance on the types of hazard risks which are likely to justify the implementation of a temporary mandatory speed limit.

4.9.3. Where it is not possible to design schemes to be safe at the permanent speed limit then they must be designed to be safe with the least reduction in speed, also known as ‘highest safe speed’. Reduced speed limits are often assumed to result in improved safety; however, they do not fully mitigate risk from a lower design standard of TTM. Therefore, designing schemes with a lower design speed than reasonably practicable is not acceptable. Applying speed limits lower than the design speed (or underlying nature of the works) for the TTM has shown to have no reliable safety benefit and has been shown to potentially increase poor driving behaviours such as reduced headways, poor lateral positioning within lanes and increases variation in speeds (yo-yoing).

4.9.4. Unless accompanied by physical measures to control traffic e.g. convoy control; chicanes etc, a reduced mandatory speed limit, even when enforced, is not sufficiently reliable to enable a feature to be used in a scheme which is not safe or effective at recommended design speed (or default reduced limit) e.g. portable pedestrian crossing where the 85% percentile speed is above 35 mph.

4.9.5. Temporary barrier systems will need to provide the required level of restraint at the recommended design speed or default limit. While not recommended, an enforced limit may be reduced to a maximum of 20 mph below the permanent limit to enable the working width (or setback) of a barrier system to be limited for road worker safety reasons. This applies only to road workers safety, any further reduction in speed limit to maintain road user safety with respect to a temporary barrier system is not acceptable.

4.9.6. The designer must consider all aspect of the scheme which may have an impact of the highest safe speed and identify any changes needed which provide for a higher safe speed. For example at works accesses, it is expected that these would not require a lower limit than otherwise identified in this document. This may result in an amended design, improved signing, or the use of mobile carriageway or lane closures techniques for large or slow vehicles.

4.9.7. There may be situations where it is not possible to consistently meet the requirements of this section for either the design speed of works for major roads, or the recommended default reduction for other roads. In which case the designer must clearly identify the physical features which prevent a higher safe speed being adopted (this will need to be to provided, via the authority, on request by the public). Other than for physical restrictions such as convoy control, the greater the reduction in mandatory speed limit the less safe it is for road users. Where a scheme is designed which cannot meet the identified highest safe design speed or default reduction, then for road user safety to be maintained the assumption must be to enforce the reduced speed limit.

Table 4.6 Criteria for identification of design speed for standard schemes

TTM Feature		Design criteria for major roads (motorway, primary roads and other high speed roads)	Recommended default reduction in speed limit (Other Roads)
Restricted Visibility	restricted driver forward visibility	Achievable Stopping Sight Distance; derived from CD 109 'Highway link design'	20 mph
Loss of Hard Shoulder	used as a running lane (without remarking)	See **Section 4.10**	20 mph
	closure of hard shoulder refuge		Zero
Loss of vehicle restraint barrier	without protection	Use CD 377 to check if barrier would be justified for a specific design speed.	20 mph
	with protection		Zero
Lane merge	other than light traffic flow	Design speed for 'x' heights of signs and clear visibility distance	20 mph
	light traffic flow		Zero
Narrow lane width	HGV lanes less than 3.3 m and other lanes subject to width restrictions less than 3.0 m	See **Section 4.10**	20 mph
Contraflow traffic management	with or without narrow lanes	Design Speed for 'x' heights of signs and clear visibility distance. See **Section 4.10**	20 mph
Crossovers and changeovers	determined by design speed	Geometry requirements can be interpolated from CD 192 'The design of crossovers and changeovers'.	See CD 192

NOTES

1. Existing vehicle restraint barriers may have been installed prior to the current risk-based approach in CD 377 'Requirements for road restraint systems' (also known as Road Restraint Risk Assessment Process (RRRAP)). If a barrier is removed and not temporarily replaced, the design speed should be taken to be the highest speed where the provision of a vehicle restraint barrier is not required by CD 377 for that location. If the resultant design speed is not within 20 mph of the permanent speed limit, this does not apply, and a temporary replacement barrier would be needed. The specification of this barrier should result in a design speed within 20 mph of the permanent speed limit. Where a temporary barrier is provided to protect a substandard barrier then the design speed will need to be within 20 mph of the permanent limit; if this is not possible the permanent barrier will need to be removed and, if necessary, a temporary barrier installed as identified above.

2. Stopping Sight Distance (SSD) is measured to a low point (0.26m above the ground) and high point (2.0m above the ground). In general, if visibility to the high point is maintained then the designer may, depending on the individual parameters, identify a reduced SSD to the low point an acceptable relaxation. When considering the measurement of SSD, visibility over TTM equipment and through safety zones may be considered acceptable when identifying any design speed. This is unlikely to apply to visibility through active working spaces and works areas.

3. The reference to using the hard shoulder as a running lane only applies where the original markings are still in place. If the markings have been replaced with normal lane and nearside edge lines then no reduction is design speed would be justified as long as the lane widths meets the desirable minimum widths identified in this document for the relevant road type. A hard shoulder with a nearside edge line, particularly if 150mm wide and/or specified to at least class RL3 to BS EN 1436 'Road marking performance' may permit a higher design speed than on a normal hard shoulder.

4. A lack of nearside refuge, either from a closed continuous hard shoulder or closed emergency refuge areas would not normally justify a reduced design speed unless there are other co-existent hazards – a recovery service provided as part of the scheme would need to be considered irrespective of any reduced speed limit.

5. It is not acceptable to implement a reduced mandatory speed limit to facilitate the omission of a recommended temporary recovery service.

4.9.8. On high-speed roads (≥50 mph), the greatest required speed reduction (as applicable from **Table 4.6**) should normally be used throughout the site. The designer may need to weigh the risks associated with the chosen TTM features to determine whether a greater speed reduction is appropriate. There are two exceptions to this:

- where the crossover speed limit is lower than at other areas.
- to prevent overly long lengths of road with overly restrictive speed restrictions. That is where road works exceed 4 km in length, and the speed limit to be imposed on the most restrictive length of the scheme (normally 1 km or greater) is lower than that required for the majority of the road works.

4.9.9. The minimum distance between changes in speed limit is normally 800 m. This may need to be increased if there are several changes in speed limit through a set of works.

4.9.10. Speed reduction should be considered on a case-by-case basis and should involve a site-specific risk assessment. For motorways, the lowest enforceable temporary speed limit is 40 mph. For dual carriageways normally subject to the national speed limit, a temporary mandatory speed limit should not be less than 40 mph. For other high-speed roads, where carriageway lighting is in place and in use a temporary mandatory limit of 40 mph should be used. Where there is no carriageway lighting, or the lighting is turned off, it should not be less than 30 mph. The application of a limit lower than this would indicate an unacceptable residual risk to road users unless the limit is self-enforcing e.g. crossovers, or speed is physically limited e.g. convoy control.

4.9.11. Temporary reduced mandatory speed limits are not used when works activities, construction, maintenance, inspection etc, are undertaken during relaxation schemes. Any risk justifying a reduced mandatory speed limit during the works would preclude works being undertaken as a relaxation scheme. Where signalling systems are used for the setting out, removing or modifying of TTM, temporary reduced mandatory speed limits may be used as specified in this document.

4.9.12. For roads with variable mandatory speed limit systems (VMSL), temporary reduced mandatory speed limits may be used during the installation, repair and removal of TTM for

both standard and relaxation schemes (depending on the provisions of the relevant Statutory Instrument or order) where works vehicles and/or IPVs are stationary in the live carriageway. Their use should conform to the principles of ALARP for both road users and road workers and used in conjunction with a safe method of working, even when such systems are designed to the principles of GALE.

4.9.13. Where variable mandatory speed limit systems are used during the installation, repair and removal of TTM, the principles of this section should be followed when applying temporary reduced mandatory speed limits.

4.9.14. Other potential concerns than identified in **Table 4.6** (e.g. queuing traffic, missing barrier systems, or inoperable matrix signals) are unlikely to justify a reduced speed limit. An exception to this is where these concerns are coexistent with relevant substandard or non-standard features (e.g. insufficient SSD, inactive tidal lane control). Where there is sufficient justification for imposing a speed limit in these situations, signs to diagram 7005 (S13-6-43; **Figure 4.37**) should be used to inform drivers of the nature of the hazard. Other relevant signs such as queuing traffic, diagram 584 (S2-2-50) may be required.



Figure 4.37 Diagram 7005 (S13-6-43) Information for drivers of the nature of the hazard ahead (Alternative type examples)

Identification of relevant reduced speed limits for high-speed roads

4.9.15. Unless accompanying physical measures to reduce road worker risk, mandatory reduced speed limits are applied to mitigate the risk to road users of the temporary layout and TTM equipment. Designers must identify sufficient potential hazard to road users from the TTM design to justify their use.

4.9.16. It is possible to design TTM to be adequately safe at the permanent speed limit for a significant percentage of standard schemes. There would need to be an assessment as to whether the permanent speed limit would be enforced. Where this in not the case the identification of what is the highest safe speed is the first stage in identifying if a mandatory reduced speed limit is justified.

4.9.17. Designers should identify an initial suitable design speed for each scheme, checking if it is achievable for the features listed in **Table 4.6**. The design speed may have to be reduced on some (or all) of the scheme if it is not possible to meet the required highest safe design speed. Designers may accept minor relaxations in road geometry where there are pinch points. Authorities may provide advice on the design speed (highest safe speed) it expects for different types of works, as an example for all trunk roads in England subject to the national speed limit it would be 60 mph. Contractors should confirm if that is achievable or inform the authority if a higher or lower limit is achievable. It is expected that alternative methods of undertaking works (e.g. narrow lanes vs lane closures) would be considered by the contractor when assessing whether a highest safe speed can be achieved.

4.9.18. A combination of factors listed in **Table 4.6** within a scheme would not normally justify a design speed of more than 20 mph lower than the permanent limit unless the combination creates a significant increased risk to road users. In this case, if there is not another reasonably

practicable design option which is compliant, the physical properties or performance classes or some (or all) of the TTM and equipment will also need to be enhanced, which may include mounting sign vertically (as identified in **Table 4.6**).

4.9.19. For a road where the permanent speed limit is lower than the national speed limit. The same process of identifying a default reduction in mandatory speed limit should be used (i.e. **Table 4.6**). Some hazards may require further assessment to determine if a reduction is justified, see **4.9.23**.

4.9.20. A speed limit reduction of 20 mph or more may be justified at crossovers and at structures with pre-existing reduced set backs. There may be other hazards which may also justify a lower design speed. In such instances, the designer must identify and quantify the nature of these hazards on a location-by-location basis. The designer must then demonstrate that the hazards cannot reasonably be mitigated by changing the method of working or enforcing the recommended limit.

4.9.21. It is not acceptable to reduce the speed limit further than the recommended reduced speed to enable an alternative method of working to be considered as safe to adopt. Working widths of barrier systems adjacent to the working space cannot be taken to be less than that identified in **4.9.5**.

4.9.22. Enforcement will need to be used where a lower limit than that identified in **Table 4.6** is applied (except at a crossover). Schemes should normally be designed (or altered) so that enforcement or a higher limit can be applied. This requirement is not applicable where physical measures are provided to limit speed (e.g. convoy control, traffic calming).

4.9.23. Where a road has a permanent speed limit lower than the national speed limit, the designer must identify and quantify any safety issues (including any substandard design features) which could justify a further reduction in speed limit. Enforcing the permanent speed limit may sufficiently reduce the risk of the TTM to road users, unless due to the nature of the works this creates additional risk to road users.

4.9.24. Where a road has carriageway lighting, and it is in use during works, it is not now possible to consistently sign a 30 mph limit across the UK. Therefore, unless using physical measures e.g. convoy control, (with a 10 mph speed limit) the works in these situations must be designed to be safe at a minimum mandatory limit of 40 mph. Where the designer has identified that the carriageway lighting needs to be turned off to enable the works to be undertaken, then a temporary mandatory speed limit of 30 mph can be applied. In this case repeaters must be provided as on as an unlit road along with signs under Schedule 13.9, **Figure 4.38**, indicating that the street lighting is turned off will need to be provided. Given that this is related due to works being carried out, the sign should be black on yellow.



Figure 4.38 (S13-9) Street lighting not in use

4.10 Identification of relevant reduced speed limits for other roads

4.10.1. For roads with a permanent speed limit of 40 mph or less, the designer should consider if the identified method of working would, or could, be arranged to naturally reduce the speed of traffic through the works. This is normally the case for designs meeting the requirements of this

document. A temporary reduced speed limit may still be justified, but designers should be aware that unless the reduced speed limit is accompanied with physical measures, it will not provide any reliable reduction in risk to road users.

4.10.2. Other than when convoy working etc, is used (and a 10 mph limit applied) roads subject to permanent 20 mph and 30 mph limits will need to be designed to be safe for both road users and road workers at their permanent speed limit. This includes restricted roads, 20mph zones and signed 20 mph limits.

4.10.3. Where a 40 mph all-purpose road does not have carriageway lighting it is possible to consistently sign a 30 mph limits across the UK; repeaters, to the spacing in **Table 4.5** in **4.8.27**, must be provided.

4.10.4. It is not possible to consistently sign mandatory reduced speed limits on restricted roads across the UK; therefore, to ensure that road users are provided with clear and unambiguous signing (and therefore enable the speed limit to be enforceable), where carriageway lighting is to be kept illuminated during works, then roads with a permanent limit of 40 mph works should designed to be safe at no lower than the permanent limit, unless convoy working etc, is utilised.

4.10.5. Repeater signs to diagram 670 (S10-2-1) must not be used on roads with carriageway lighting where a reduced speed limit would be the same as that applying a restricted road (20 mph in Wales and 30 mph elsewhere). Designers may consider the use of diagram 880.1 (S11-2-64; **Figure 4.34**) signs if enforcement is in use. In Wales diagram 880.2 (S11-2-64A) is used instead.

4.10.6. Where the designer has identified that any carriageway lighting needs to be turned off to enable the works to be undertaken, then a temporary mandatory speed limit of 30 mph can be applied. In this case repeaters must be provided as though on as an unlit road along with signs under Schedule 13.9, **Figure 4.38**, indicating that the street lighting is turned off, will need to be provided. Given that this is related due to works being carried out, the sign should be black on yellow. A speed limit order would be required in this situation.

4.10.7. Temporary mandatory 20 mph speed limits are not sufficiently effective, if it is not possible to design schemes to be safe at a limit of 30 mph or above then physical measures to limit speed must be adopted, with a 10 mph limit.

4.11 Additional speed limit information signs

4.11.1. Signs giving information on speed limit changes (both permanent and temporary) must not be used without relevant authorisation. The use of temporary signs, other than diagram 7032 (S13-6-38); **Figure 4.39** and those which are authorised, giving information of speed limit changes (e.g. ‘New speed limit in force’, ‘Speed limit for barrier works’) are likely to affect the enforceability of any speed limit.



Figure 4.39 Diagram 7032 (S13-6-38) Start of newly imposed contiguous 30 mph speed limit (Only used for new 30 mph speed limits)

4.12 Use of variable signs and signals for speed limits at works

4.12.1. The option for use of variable mandatory speed limits (VMSL) covers the setting up, maintenance and removal of TTM at both standard and relaxation schemes and the use for displaying speeds limits during the works for standard scheme. In both situations it is essential for the relevant S.I. or order to be checked to identify if it permits the intended use. Otherwise a separate TTRO is likely to be required.

4.12.2. The use of VMSL in works would depend on the signal technology, method of control, method of powering the systems and the details of the order or Statutory Instrument. The designer would need to assess the capabilities of each system before identifying what variable signs and signals can be used.

4.12.3. There are three basic variations of the technology in use which may be used for variable mandatory speed limits:

- verge-mounted units displaying speed limits.
- gantry-mounted signals over each lane (e.g. Advanced Motorway Indicators, AMI).
- high-level signs which may be located on the verge or partially over the carriageway and which apply to the whole carriageway. They are often combined with other information on MS4 signals.

4.12.4. Where verge-mounted units are provided, the same size and spacing requirements as for fixed signals will apply. For all options it is preferable for these signs to be under the direct control of the contractor when undertaking planned works. If controlled by a third party (e.g. a control centre), then in the event of a power or control failure the signs should continue to display the reduced limit. Alternatively, works should be designed and operated to be safe for road workers at the permanent speed limit. For verge signs this can be done with either rotating plank signs or LED signs with battery backup.

4.12.5. Where gantry mounted signals are provided, a speed limit roundel must only be displayed over a live lane. Where lane(s) are coned off, the signal(s) must be blank. During the set up and removal of TTM there may be occasions where a roundel has to be displayed over a coned-off lane. In this situation the whole width of the lane downstream of the signal is considered part of the safety zone. As such, it cannot be part of the working space or works area. This applies for the whole length of the lane until the next lane signal not displaying a speed limit roundel is reached or an IPV displaying an authorised light arrow or diagram 7403 (S13-6-10) is placed in the closed lane.

4.12.6. The positioning of any taper, changeover, or crossover where lane signals are in use must result in either the full width of the lane being open or closed under any signal. Where a taper is used, the designer should aim to end it no closer than 100 m upstream of the lane signal, or start it no closer than 50 m downstream of the lane signal. It is therefore recommended that fixed taper positions are used.

4.12.7. High-level signs which may be located on the verge or partially over the carriageway and which apply to the whole carriageway have the same requirements as gantry signals for the positioning of tapers, changeovers, and crossovers. Where lanes are coned off in the works zone, the speed limit roundel should be displayed on its own or with the number of lanes open shown by arrows. Lanes which are coned off must not be indicated on signs or signals in the work zone.

4.12.8. As overhead and high level verge signs are unlikely to meet the spacing requirements outlined in **Table 4.5** each MS4 sign or AMI is a terminal speed limit sign. The relevant order

or Statutory Instrument must enable each signal to be considered as a terminal sign. Any automated enforcement must use fixed point technology integrated into the sign control equipment (separate technology as in CD133 'Design of temporary automatic speed cameras at road works' is not sufficient). The manual enforcement of these limits by the Police or Safety Camera Partnerships will need to comply with any requirements or restrictions applied to the road in normal use. Average speed camera systems must only be used with signs at the spacing identified in **Table 4.5** in **4.8.27**. Where signs are LED-based, sufficient evidence is needed to show that the relevant speed limit is being displayed continuously between sign inspections. Where intermediate signals are not terminal signs then the signalling systems must not display more than one consecutive diagram 670 signs showing 30 mph to traffic as they pass though the route where there is one or more carriageway lights near, or between the signals. In addition, where intermediate signals are not terminal signs then the signalling systems must not display more than one consecutive diagram 671 signs to traffic as they pass though the route on motorways or all-purpose roads without carriageway lighting.

4.12.9. Motorway signalling systems can differ on what information they can display. If systems are only able to display either speed limit roundels or lane control information, then it is recommended they display the speed limit roundels. Lane control information should then be provided on a separate sign (either fixed plate, rotating plank or LED-based).

4.12.10. Where the control of signals is via a control centre, the body controlling the setting of the signals must provide sufficient resources to set or change signals at the request of the contractor. Where signs or signals for multiple works may need to be set via a signal control centre, the contractor and authority may consider locating a trained operative in the control centre to support the setting of signals. Where the control centre is notified of the TTM plan for the works in advance, speed limit signals should be set or changed as soon as possible and no later than 10 minutes after being notified. If this is not feasible, then the control centre should notify the contractor. For planned works, the contractor should take account for any other works which would require the relevant control centre to set signals over the same time period.

4.12.11. During the setting up, maintenance and removal of TTM for both relaxation scheme and standard schemes, VMSL systems may be suitable to set reduced mandatory speed limits to mitigate the risk to road users from physical measures e.g. stationary works vehicles, IPV's, in a live lane etc, used to support road worker safety during the changes to the TTM (as well as short term works and mobile works). Use would depend on the signal technology, method of control, and the details of the order or Statutory Instrument. The designer would need to assess the capabilities of each system before identifying what variable signs and signals can be used. The signed limit should normally be the same as the works (or 50mph for installing etc relaxation schemes on roads subject to the national speed limit), but can be 10 mph lower, subject to a scheme specific risk assessment.

4.12.12. VMSL may also be suitable for use during incident management in works where IPVs, other works vehicles, traffic officer and emergency service vehicles pose a risk to road users. Speed limits during these times are not, in isolation, effective at maintaining road workers safety and must not be used instead of providing physical safety measures. To ensure that VMSL do not conflict with the TTM signs the system must only be used in works for incident management that has been included in the contactors TTM, or as especially requested by the contractor. In other situations any incident management aspects would need to be applied upstream of the works.

4.12.13. When used in standard schemes for use during the works period i.e. not limited to setting up, maintenance or removal of TTM, where a speed limit is applied to a section of road immediately upstream or downstream of a section with variable mandatory speed limit

signing, extra care is needed to ensure the signing is consistent and clear. Where the speed limit continues downstream of the section with signals, any fixed or active signs which indicate a change or end to the variable speed limit should be covered. Fixed plate signs should instead be used. Where the speed limit is required to start upstream of the first active sign, then fixed plate signs should be used throughout (unless additional temporary active signs are installed). This would depend on any location-specific arrangements. Displaying a different speed on a VMSL system than on fixed signs at the same location will not provide adequate guidance to road users and only the national speed limit will be enforceable.

4.12.14. The temporary speed limit must be terminated by the display of the relevant default speed limit, normally by a diagram 671 (S10-2-2). This does not apply if the reduced speed limit continues to the end of the section of carriageway subject to the variable mandatory speed limit.

4.12.15. All signals capable of displaying a speed limit roundel between the start and end of the speed limit must display the relevant limit (unless there is a safety need to display another aspect i.e. lane closure information). Where signals are terminal signs, as mentioned above, a blank signal would indicate that the NSL applies. Where there are non-operational VMSL signs within the works the use of VMSL in place of fixed signs would only be acceptable if road users are able to see the next working signal/sign when passing the previous working sign.

4.12.16. Where signalling systems are used in standard schemes in place of fixed signs to implement reduced speed limits throughout the period of the works, signalling systems should allow for a speed limit to be imposed from an appropriate distance upstream of the taper point. In most cases, this is around 850 m before the taper start point.

4.12.17. Permanent equipment used for VMSL may not be suitable where the control systems would not permit speed limits and approach signing to comply with this document. This may include unsuitably low limits, or inappropriate use of red ‘x’ aspects. The designer should check with the authority what lawful aspects can be set before planning the use of permanent VMSL equipment. Where VMSL uses LED based panels and the LEDs are not lit with a constant light output then the aspect must be display with a frequency of at least 90hz. The whole speed limit roundel must be displayed complete, in each refresh cycle.

4.12.18. Reduced speed limits using VMSL equipment may be suitable for use during mobile works where the works vehicles and IPVs used to protect workers pose a risk to road users. This would require a scheme specific risk assessment taking into account the nature of the VMSL equipment and checking with the authority what lawful aspects can be set.

4.13 Enforcement

4.13.1. While the design of schemes, as identified in this document, should lead to traffic speeds aligning with the design speed (or underlying nature) of the TTM layouts there may be a potential safety benefit (as well as capacity benefit) by enforcement of the permanent speed limit, or where specifically identified in this section a reduced mandatory speed limit. However, enforcement does not provide a reliable safety benefit where the speed limit is set below the relevant highest safe speed.

4.13.2. Overall safety is maximised where road users are confident that the design of works is clearly signed, guarded and operated. This leads to driver and rider behaviours (including speed control) being aligned most closely with the underlying nature of the works. Road user confidence is reduced in all works where a reduced speed limit in a scheme, or the enforcement of the limit, is not generally seen as fair.

4.13.3. The threshold for enforcement should follow national guidance. The design requirements for TTM, particularly speed limits and enforcement signing should normally lead to a speed profile which leads to a limited number of roads users exceeding the enforcement threshold.

4.13.4. It is recommended that enforcement be considered for all standard schemes on motorways and dual carriageways, and particularly all schemes which include a reduced mandatory speed limit. In most cases traffic speeds will have less variation (leading to reduced risk and greater capacity) when the limit is enforced and particularly so with average speed systems.

4.13.5. Where the nature of the works requires a lower higher safe speed than recommended (or a temporary limit lower than the default recommended for other roads) then speed enforcement will need to be incorporated into the scheme for the lower limit to be sufficiently effective at maintaining safety. This does not apply where speeds are physically limited e.g. convoy control, or are applied over short lengths e.g. crossovers.

4.13.6. The need for any reduced speed limits, and any associated enforcement, must be considered as part of the initial design of the scheme. The incorporation of any element in the design of any works which would likely require TTM to be designed with a mandatory reduced speed limit lower than the recommended highest safe speed (e.g. 60 mph for dual carriageways in England) would only be acceptable where the funding for any enforcement is provided for in the scheme.

4.13.7. Enforcement bodies should be aware that they are required to undertake their activities in accordance with the requirements and guidance in this document. The legal requirement is for the scheme designer to identify the relevant design speed for the works, based on their risk assessment. While an enforcement agency may ask for evidence that any reduced limit has been identified in accordance with this document, they must not take on designer liability by requiring a speed limit not in accordance with this document to be applied. The enforcement agency may, however, require improvement to signing (including removal or obscuration of permanent signing related to speed limits) and other aspects of schemes e.g. clear visibility distances, to support the integrity of enforcement.

4.13.8. Where an enforcement body is not prepared to enforce the permanent limit, or recommended highest safe speed (as identified in this document) then it is preferable to omit enforcement than to artificially lower the limit to one the enforcement body will enforce. This does not apply where design features have justified a lower highest safe speed e.g. a 50 mph limit due to limited space to install a VRS with the required setback and/or working width. In this case enforcement is likely to be needed.

4.13.9. It is important that there is national consistency in the setting, signing and enforcement of reduced speed limits. While local councils or elected mayors etc, may have a policy role (formal, or informal) for permanent speed limits, the signing at works schemes is the legal responsibility of the contractor. The signing of enforcement (diagrams 878, 880, 880.1, 880.2, 880.2A as appropriate) is integral to the requirement for the limit to be adequately signed, as well as the enforceability of any temporary reduced mandatory speed limits and must not be omitted.

4.13.10. The locations of cameras should be designed to accommodate any changes to the length of any speed limit, or changes in limit value, between phases of a scheme. It is not acceptable to extend, or keep, a reduced limit for a longer distance than this document identifies to fit in with the existing position of cameras.

4.13.11. To reduce the likelihood of drivers making sharp braking manoeuvres the first camera should not be located between the initial terminal speed limit signing and the first repeater sign. Also, enforcement between the last repeater sign and the next terminal signs should generally be avoided.

4.13.12. Where a significant number of road users exceed the enforcement threshold then a design review would be required which may result in improvements in signing being needed. If this is not accompanied by an escalation in accidents or near misses then it may mean that the speed limit is set lower than the underlying design speed of the works and should also be reviewed.

4.13.13. The use of average speed camera systems rather than cameras at fixed points is recommended for longer schemes (more than 1 or 2 km) unless there are pinch points (e.g. bridges with reduced cross section) where controlling speed at a specific point is a priority.

4.13.14. Designers should not rely on an enforced speed limit over a distance of 10km to be sufficient to mitigate risk to road users of aspects such as reduced delineation, reduced lane widths etc.

4.13.15. An average speed enforcement zone must not straddle a change in speed limit or a transition between an all-purpose road and a motorway.

4.13.16. As part of any works or temporary situation there is a requirement to inspect and record the TTM used. This will need to include recording that any temporary speed limit signs comply with the requirements of this document (as well as showing the correct limit). In addition, there is a need to record that all signs relating to the permanent speed limit remains fully obscured. The frequency for inspecting and recording the condition and state of the signing related to speed limits will need to be agreed with the enforcement body. If an inspection identifies that temporary speed limits signs are not compliant e.g. a terminal or repeater sign has been displaced, or that the obscuration of a permanent sign is degraded, then the enforceability of the limit may be affected for the period since the previous inspection of the speed limit signing. Therefore, the frequency of these inspections may need to be more often than for any general monitoring of the condition of the TTM. The requirements relating to the data about variable speed limit systems will have to be determined based on which option is adopted and in association with the enforcement body.

4.14 Delineation and use of delineators

4.14.1. It is essential that everyone who uses the highway should clearly see the lateral limits of the works and traffic lanes that they are required to use, from all directions of approach, at all times.

4.14.2. The boundaries of all road works must be clearly delineated to indicate the limits of the carriageway, and to protect the works and personnel. This should be done by using traffic cones, cylinders, barriers and prescribed or authorised signs, markings and studs in accordance with the Regulations. Warning lights must be used after dark in many situations and should be used at times of poor visibility. The aim should be to guide approaching vehicles gradually into a lane past the works. The devices used may be supplemented by temporary edge of carriageway markings. The overall appearance should allow drivers to easily judge the limits of the lane.

4.14.3. Existing road markings may need to be removed or masked to avoid driver confusion. If traffic is confined to a single lane delineated by cones on each side, existing road markings may not need to be removed or masked; however, the design of the scheme will need to ensure that

road users are given clear information on the route to take and that there is no increase in risk when overrunning a marking.

4.14.4. Non-approved proprietary barrier type systems (e.g. timber baulks) must not be used as a means of delineation of works areas. Their use on roads for other purposes should be agreed with the Authority. In these situations, their use is likely to be accepted providing that:

- they are securely fastened together and that each one is securely fastened to the ground.
- they are painted in alternate red and white bands, each approximately 600 mm wide.

4.14.5. Oil drums, barrels, or other containers must not be used to delineate road works.

4.14.6. Providing adequate guidance by using road markings, studs, cones, and barriers is vital for road users to navigate safely through works. For longer schemes, those with narrow lanes or other similar restricted design features, the level of delineation needs to be improved to reduce fatigue in road users.

4.15 Traffic cones, cylinders, and flat delineators

4.15.1. Traffic cones to diagram 7101.1 (S13-6-4), delineators to diagram 7102 (S13-6-5), and traffic cylinders to diagram 7103 (S13-6-6) are prescribed traffic signs, see **Figure 4.40**. Traffic cones and cylinders must conform to BS EN 13422:2019 'Traffic Cones and cylinders' and must comply with S13-8-2.440.

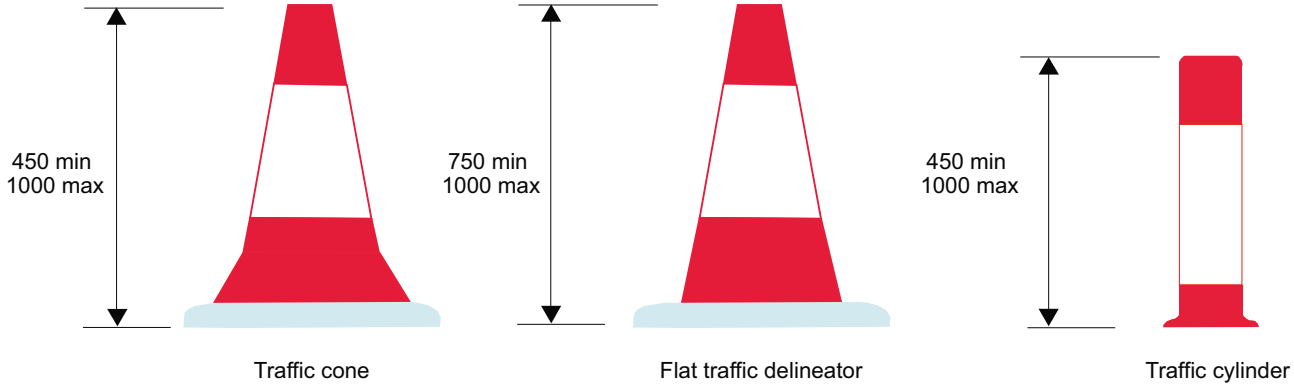


Figure 4.40 Diagram 7101.1 (S13-6-4) Traffic cone; diagram 7102 (S13-6-5) Flat traffic delineator; diagram 7103 (S13-6-6) Traffic cylinder

4.15.2. For cones and cylinders, details on the performance requirements needed in different schemes and road environments can be found in **Table 4.7**.

Table 4.7 Cones and cylinders – requirements for UK roads

Characteristics	Cones		Cylinders		Comments
	Minimum	Optional	Minimum	Optional	
Shape	Class S1 or S2	N/a	N/A	N/A	Both shapes allowed in the Regulations
Weight	W3	None	N/A	N/A	
Category	Category B	Category A	Category B	Category A	Category A and B are defined in clause 3.4 and 3.5 of BS EN 13422:2019
Wet conditions	WT1	None	WT1	None	
Visual Performance (Retroreflectivity) Luminance Factor	R1B LA or LB	R2, R2B, R3 LAB or LB	R1B LA or LB	R2, R2B, R3 LA or LB	

NOTES:

1. Classes, categories, luminance factors, etc refer to those given in BS EN 13422 ‘Traffic Cones and cylinders’.

2. Cones to Class R1B and R2B to BS EN 13422:2004 may still lawfully be placed on a road. Cones to Classes R1, R1A and R2A to BS EN 13422:2019 are not lawful in Great Britain. Cones to Class R2 to BS EN 13422:2019 comply with the minimum requirements for Class R1B and may be placed on a road. They can be used in place of R2B cones where this document identifies the need to use this class, except for crossovers and changeovers where the design speed is less than the signed speed limit.

3. Cones and cylinders must have a relevant CE/UKCA mark for the characteristics and classes given above and be tested to meet the requirements of BS EN 13422 for the characteristics and classes given above. Cones and cylinders will need to be marked with the relevant performance characteristic and classes as identified in the National Annex to BS EN 13422:2019.

4.15.3. Traffic cones should be placed close enough together to give an impression of continuity and an appearance of substance. **Table A1.3** (**Appendix A1**) gives the size of cone, the rate of taper, and the cone spacing required depending on their location in a layout and the type of works involved.

4.15.4. In adverse weather conditions, especially fog, traffic cone spacing may need to be reduced to continue to give drivers adequate guidance past the obstruction. On roads subject to the national speed limit, cone spacing should be no greater than 9 m when used in adverse weather conditions, see **Figure 4.41**.

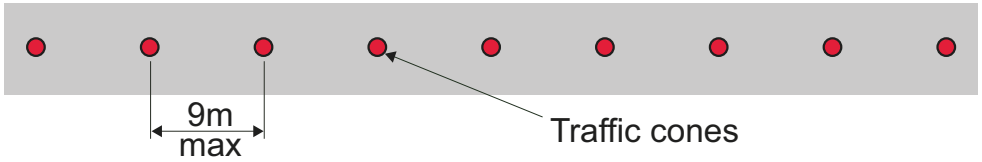


Figure 4.41 Longitudinal cone spacing (9 m maximum) which should be used in adverse weather conditions on roads subject to the national speed limit

4.15.5. For works on motorways and all-purpose dual carriageway roads with hard shoulders, the longitudinal traffic cone spacing may be relaxed to 18 m (from 9 m), see **Figure 4.42**. Such a relaxation is only appropriate where there are long straight sections of road where there is good visibility. The spacing of warning lights on the traffic cones should also be 18 m under these circumstances, see **Table A1.3** (**Appendix A1**).

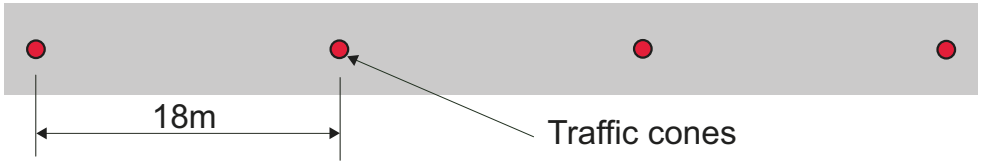


Figure 4.42 18 m cone spacing which may be used on all-purpose dual carriageway roads with hard shoulders on straight runs with good visibility

4.15.6. For works of short length a minimum of two traffic cones should be placed between the entry and exit tapers.

4.15.7. Special arrangements for traffic cones at builders' skips are described in **Section 4.30**.

4.15.8. Where a filter drain (or other soft material) is adjacent to the edge of a hard shoulder being used as a running lane, and there is no kerbed protection, it should be hardened whenever possible as part of the preliminary works. When this is not done, traffic cones should be placed on top of the filter drain with their bases touching the edge of the hard shoulder. These cones should be spaced at approximately 18 m intervals. The back edge of the hard shoulder running lane should be marked with a 100 mm or 150mm wide marking to diagram 1012.1 (S11-4-11). Where there is a dished drainage channel adjacent to the edge of a live lane, an edge line and traffic cones should also be provided.

4.15.9. Traffic cylinders are used to separate opposing flows of traffic where one carriageway of a dual carriageway road is required to carry two-way traffic, or to separate two lanes which are to become segregated or to be rejoined. The traffic cylinders can be fixed into the bases of existing depressible road studs or into purpose-made bases.

4.15.10. Flat traffic delineators to diagram 7102 (S13-6-5) are blades which are fixed to heavy bases. They have the same elevation as conventional traffic cones and may be used as an alternative on dual carriageway roads. For further details on flat traffic delineators see CD132 'Flat traffic delineators' and BS 8442: 2022.

4.15.11. The edge of carriageway road marking which is normally placed on the road surface 500 mm from the centre line of the cones may be placed on the edge of the base of a flat traffic delineator, so long as the following conditions are met:

- the flat traffic delineators are placed so that their bases touch and they form a continuous smooth line (bases which have built-in white lines used in other circumstances should be oriented so that the white line is at the back so that it is less visible to drivers of approaching vehicles).
- the marking is a white line comprised of a white reflective strip 100 mm wide firmly adhered to the base.
- the edge of the base where the white line is to be attached is a sloping surface. The slope angle to the road surface should be no more than 60° and is of such dimensions either to accommodate the 100 mm wide white line fully, or, where the angle between the road surface and the sloping surface exceeds 30°, to accommodate at least 80 mm of the width of the white line, the excess (maximum of 20 mm) being returned on to the top surface of the base, see **Figure 4.43**.
- the material that the base is made from allows proper adhesion of the white reflective strip.

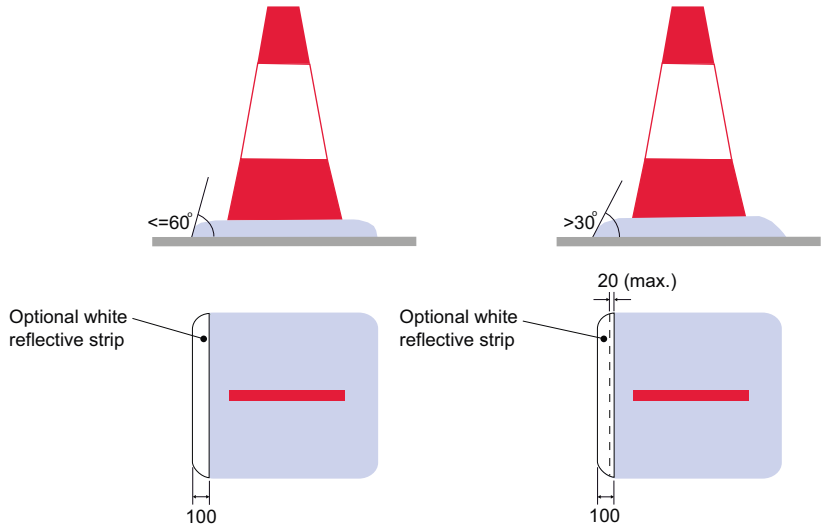


Figure 4.43 White line marking attached to base of flat traffic delineator (permitted options)

4.15.12. Flat traffic delineators have a retroreflective surface. The retroreflective surfaces may be placed at 90° to the approaching traffic to improve visibility during darkness hours. For flat traffic delineators, the reflective surfaces are only visible when angled appropriately towards the traffic. It is therefore recommended that the following conditions are met whenever they are placed at road works:

- flat traffic delineators should be used only where they may be placed with the white retroreflective surface facing the approaching traffic, so that the angle between the sign face and the direction of approaching traffic is as close to 90° as possible. Under no circumstances should the angle be less than 50°.
- flat traffic delineators should not be used within 50 m of ‘at grade’ entry junctions on all-purpose dual carriageway trunk roads.
- Flat traffic delineators should not be used on single carriageway roads. They should be stored separately from ordinary traffic cones to prevent accidental use on single carriageway roads.

4.15.13. When selecting the height of the flat traffic delineator to be used, refer to **Table A1.3** (**Appendix A1**).

4.15.14. Rotating reflector delineators are mechanisms complying with S13-8-7. They have either red (non-retroreflective) or amber (retroreflective) reflectors (complying with size and shape to diagram 560 or its variants (S2-6-2); **Figure 4.44**); to be displayed intermittently whilst rotating and constantly whilst static. They do not constitute warning lights to BS EN 12352 ‘Warning and safety light devices’. Rotating reflector delineators must always be mounted on top of traffic cones to diagram 7101.1 (S13-6-4). Static reflectors to diagram 560 must not be mounted on traffic cones. Rotating reflector delineators may be used only in conjunction with traffic cones that delineate the outer edge of a safety zone that runs parallel with the traffic lane.

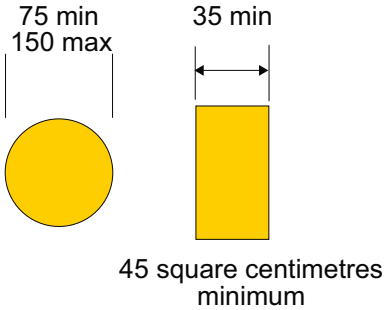


Figure 4.44 Diagram 560 (S2-6-2) Amber rotating reflector shape and size for delineator

4.15.15. Rotating reflector delineators are not suitable for use in lead-in tapers. Elsewhere, if rotating reflector delineators are used, they may be mounted on the top of existing traffic cones provided they do not mask any of the retroreflective material, obscure the cone or affect its stability, see **Figure 4.45**.

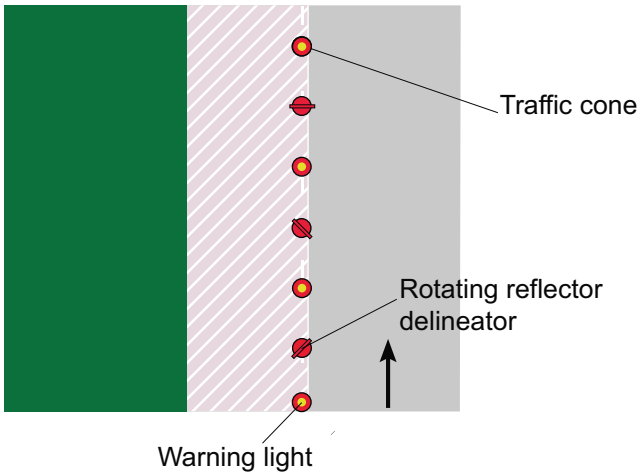


Figure 4.45 Use of rotating reflector delineators to increase the spacing of warning lights by up to 100%

4.16 Use of safety barriers

4.16.1. Obstructions and excavations should always be adequately guarded. Safety barriers may be used to protect all persons from roadside hazards, obstructions, excavations, and/or for the protection of the workforce.

4.16.2. Safety barriers should be visible by day and night. Safety barriers (excluding vehicle restraint barriers) that are adjacent to traffic running lanes should be guarded by a line of traffic cones and augmented by warning lights at night.

4.16.3. Safety barriers should be stable under adverse weather conditions. They should not cause excessive damage to a vehicle should they be struck. Horizontal safety barriers must not project towards oncoming traffic. Wooden or tubular steel poles must not be used as horizontal barriers due to the hazard they present in a vehicle collision. Mounds of soil are also not acceptable as a barrier.

4.16.4. There are four basic types of safety barrier that may be used:

- pedestrian barriers.
- traffic barriers for guiding vehicles and indicating that a traffic lane or part of a traffic lane is closed.
- lightweight barriers for delineating the inner edge of safety zones.
- vehicle restraint safety barriers.

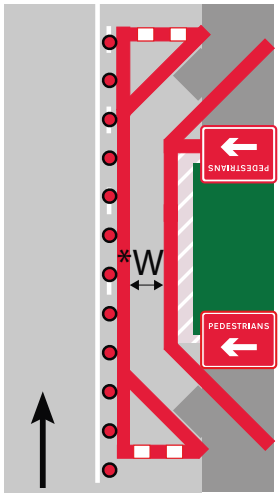
4.16.5. In order to avoid a haphazard appearance, different kinds of safety barrier should not be mixed.

4.17 Pedestrian barriers

4.17.1. A pedestrian barrier should be provided around an obstruction to restrict pedestrian flow and access. Requirements for maintaining pedestrian mobility are set out in **Section 4.32**. Particular attention should be paid to the needs of people with mobility and visual impairments.

4.17.2. Pedestrian barriers and rails may be coloured red and white as to diagram 7105 (S13-6-8) with vertical posts coloured red. Base supports should not protrude more than 300 mm into

the path of pedestrians with vertical edges no more than 25 mm high. Temporary pedestrian routes should be at least 1.5 m wide and must never be less than 1 m wide (see **Figure 4.46**).



*W (width of pedestrian footway)
>1.5m desirable
1.0m absolute minimum

Figure 4.46 Width of temporary pedestrian footway

4.17.3. Pedestrian barriers alongside excavations should be subject to a risk-based assessment. Barriers alongside excavations greater than 300 mm in depth, in busy areas with high pedestrian flows, should be able to withstand crowd pressure. They should also be at least 300 mm clear of the edge of the excavation. These barriers should comply with BS 7818:1995 ‘Specification for pedestrian restraint systems in metal’. Other approved pedestrian barrier systems may be used on footways with less pedestrian traffic, providing that the barriers are rigid enough to guard pedestrians from traffic, excavations, plant, and materials, and withstand wind pressures.

4.17.4. Alternatively, where manhole covers are to be temporarily removed and the site is continuously manned, pedestrians may be protected by barriers sufficient enough to enclose both the opening and its cover. In this case, the handrail must be fixed at a minimum height of 0.95 m (Work at Height Regulations 2005). The barrier should be continuous between supports and fixed so that it cannot be accidentally dislodged.

4.17.5. To guide the blind and partially sighted, pedestrian barriers (see **Figure 4.47**) should:

- be of a sufficiently solid construction.
- have a robust tapping rail fixed at a height of approximately 150 mm above ground level (measured to the underside of the rail).
- have a robust handrail at a height of between 1 m and 1.2 m (measured to the top of the rail).
- both rails should be at least 150 mm deep. The thickness and/or width will depend on the material and construction and needs to be of sufficient strength.

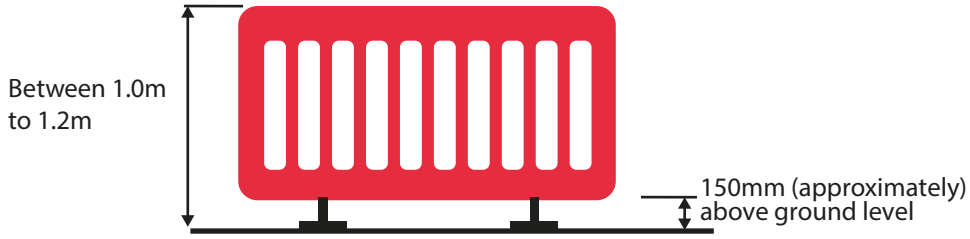


Figure 4.47 Pedestrian barrier with lower rail to assist users with visual impairment

4.18 Traffic barriers

4.18.1. Traffic barriers for guiding vehicles past obstructions should be placed on the traffic side of the obstruction and should be red and white to diagram 7105 (S13-6-8; see **Figure 4.48**).

Where a driver is required to alter direction sharply, a chevron sign to diagram 7104 (S13-6-7; see **Figure 4.49**) should be used. These barriers must be reflectorised or illuminated (either internally or externally) during the hours of darkness. Examples of the use of both types of barrier are shown in the plans in **Sections 6** and **7**.



Figure 4.48 Diagram 7105 (S13-6-8) Position of barrier to mark length of road closed to traffic or to guide traffic past an obstruction – Minimum length of 1250mm, red panel at each end



Figure 4.49 Diagram 7104 (S13-6-7) Sharp deviation of route at or near road works or other temporary obstructions – Minimum length as working drawing

4.18.2. For barriers to diagram 7105 (S13-6-8), vertical posts may be a single colour or as-finished. Where the road geometry has a relaxation or is otherwise substandard, the use of higher performing retroreflective material should be considered. Where diagram 7105 is incorporated into a barrier (not just for pedestrians) in an urban setting, it is recommended that the barrier should be non-reflecting red.

4.18.3. During the hours of darkness, any barriers to diagram 7105 (S13-6-8) provided to delineate the edge of the works must be either illuminated or reflectorised. If reflectorised, then they must be in accordance with Regulation 8 and individual schedules of TSRGD. If illuminated, then this may be by external lighting and may be marked by warning lights showing an amber light.

4.18.4. Vertical posts must be supported at the base to avoid any part of the structure projecting more than 300 mm towards the carriageway beyond the face of the barrier, see **Figure 4.50**.

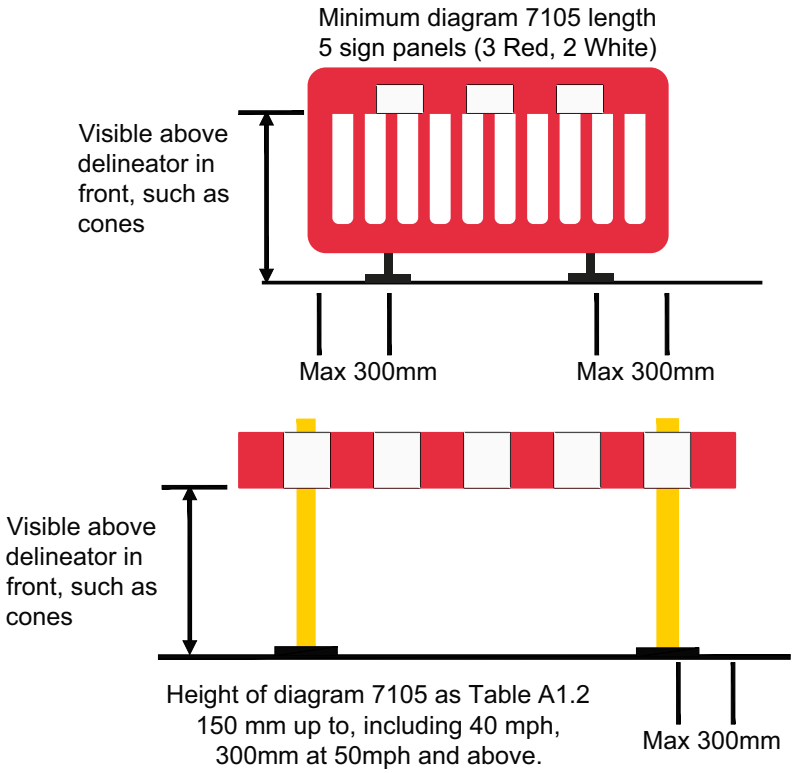


Figure 4.50 Mounting and support of traffic barriers

4.19 Lightweight barriers

4.19.1. Lightweight barriers may be used where there is no risk of pedestrians encountering the works or where there is a need to delineate the inner boundary of a safety zone.

4.19.2. All elements of lightweight barriers should be sufficiently stable to withstand wind buffeting from passing traffic and to prevent any part being blown into the live carriageway or presenting a hazard to traffic. Expanding barriers and mesh barriers (steel, plastic, or other material) are acceptable, providing they are placed continuously. Specially adapted cord or tape systems may also be used. Lightweight barriers may be reflectorised.

4.20 Vehicle restraint safety barriers

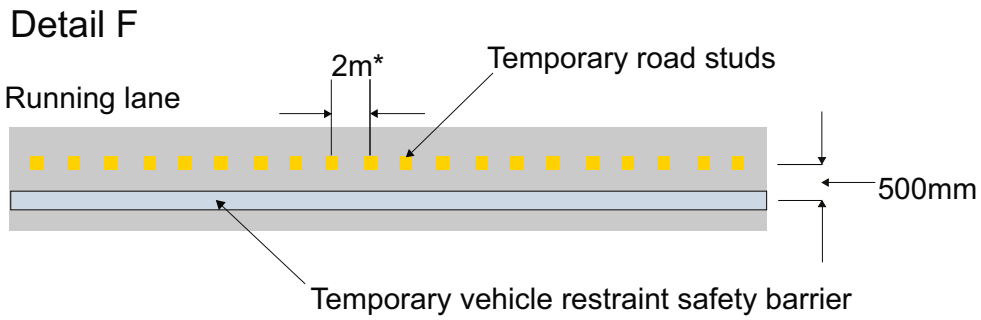
4.20.1. Temporary vehicle restraint safety barriers, which are compliant with BS EN 1317 Parts 1 and 2 ‘Road restraint systems’, may take the form of either permanent type vehicle restraint safety barriers (erected temporarily) or purpose made temporary safety barriers. For further guidance on the use of vehicle restraint safety barriers, refer to CD 377 ‘Requirements for road restraint systems’.

4.20.2. The use of a temporary vehicle restraint safety barrier should be specified as part of the design, providing it is evident at the design stage that they will be used. The type and length that is needed will be based on the risk assessment and the requirements and guidance given in CD 377. Other factors that should be considered are:

- the time taken and means of installation.
- maintenance and removal of the safety barrier.
- implications arising from its use on works accesses and exits.
- the emergency services.
- wide loads.
- the duration of the works.
- the provision of a vehicle recovery service.

4.20.3. Designers also need to account for speed limits and the degree of deflection of the safety barrier which may occur in the event of an impact. CD 377 cannot be taken to recommend or justify a mandatory lower speed limit than identified in this document.

4.20.4. Where a temporary vehicle restraint safety barrier is provided, the temporary road markings or studs used adjacent to the barrier should be to detail E, F, or H, see **Figure 4.51**, as specified in **Table A1.5** (**Appendix A1**).



*Detail E (single line of temporary road studs): 1m

*Detail H (two rows of temporary road studs): 1.5m max.

Figure 4.51 Temporary road studs to detail F adjacent to temporary vehicle restraint safety barrier

4.20.5. Temporary vehicle restraint barriers should not normally need to be visually highlighted. Where they are highlighted, road markings to Detail F would also need to be enhanced (Detail F2 would not be suitable in these situations). The edge line delineation must be more conspicuous than any visual highlighting of the vehicle restraint barrier.

4.20.6. To aid conspicuity, the face of the temporary vehicle restraint barrier may be marked in accordance with diagram 7105 (S13-6-8) or signs to diagram 560 may be used (see **4.22.14**). Alternatively, a traffic barrier may be provided behind the temporary vehicle restraint barrier and outside its working width. Contractors should consider the use of higher performing material for barriers to Diagram 7105 where the underlying road geometry has a relaxation, departure from standard or is otherwise substandard.

4.21 Road markings and road studs

4.21.1. Road markings and studs are used at road works mainly to delineate the carriageway edge or to divide the carriageway into traffic lanes. During road works operations, if dangerous conditions are likely to occur through the absence of road markings, temporary markings must be provided.

4.21.2. Unless traffic is to be confined to a single lane delineated by cones on each side, it is important that existing road markings and reflective road studs are appropriately masked or removed when they might give misleading information to drivers or be hazardous in themselves. Where a single lane is delineated by cones on both sides and markings are not masked or removed the design of the scheme may need to be amended to ensure that road users are given clear information on the route to take and that there is no increase in risk when overrunning a marking. Where a raised rib hard shoulder marking etc, is to be retained and traffic is required to drive over the line e.g. at a changeover, the raised ribs must be removed over the length of the marking where traffic is required to cross the marking. This applies to all schemes, including relaxation schemes.

4.21.3. Drivers must be given a clear indication of the path they should take. Temporary delineation in the form of traffic cones, cylinders and barriers should be used for this purpose. Where practicable, these can be augmented by temporary carriageway markings and/or temporary reflective road studs to indicate the edge of the route to be followed.

4.21.4. The following factors should be considered by the designer when designing a TTM system which incorporates temporary road markings:

- time of year the work will be executed, and the likely weather and climatic conditions throughout the duration of the works.
- the nature of the existing and proposed road surface – locations of road surfaces which may require special treatment, both for the application of temporary markings and the removal of existing ones, should be identified.
- suitable methods for removal or masking of existing road markings – some methods can be time consuming and the possibility of an advance works phase prior to contract commencement may need to be considered.

4.21.5. Temporary road markings materials are suitable for use for up to 3 months, although if not regularly overrun e.g. edge markings, they may last longer. Marking tapes are often preferred as many can be removed while not leaving noticeable marks on the road surface. In-situ temporary markings may be suitable for use for periods of less than three months; however, where works will require markings to be in place for more than 3 months then the use of permanent marking materials, which would likely last the whole works (or phase) without

re-marking should be considered subject to any need to limit the marking of any permanent running surface (see PD CEN/TR 16958:2017). Where permanent marking products are used they will need to be periodically checked. The relevant characteristics, methods of measurement and thresholds for this monitoring can be found in CS 126 ‘Inspection and assessment of road markings and road studs’. In addition to maintaining the required levels of daytime and night time visibility, the level of wear of all markings within works will need to be monitored; any marking which has worn to the road surface for more than 30% of the markings surface ceases to be a lawful contiguous marking and must be replaced.

4.21.6. Preformed markings (e.g. tapes) must conform to BS EN 1790 ‘Preformed road markings’. Also compliance to relevant Standards shown below should be to the relevant classes in **Table 4.8**:

- BS EN 1436 ‘Road marking performance’ for physical and optical performance requirements.
- BS EN 1871 ‘Road marking materials. Paint, thermoplastic and cold plastic’.
- BS EN 1824 ‘Road marking materials. Road trials’.

Table 4.8 Recommended minimum classes for temporary road markings in the UK

Road type	Enhanced performance required	Street lighting status	Recommended minimum performance class(es) from BS EN 1436		
			Qdor β[4]	R_L	RW
Any	Temporary markings (up to 3 months), other than narrow lanes.	Unlit / partially lit / dimmed[2]	Q3 or B2	R3	See Note 1
		Lit	Q3 or B2	R2	
	Higher performing markings may be required to maintain safety. The following classes should be specified in place of any recommended above. The assumption is that permanent marking materials will be needed to meet these requirements.				
	Schemes over 4km in length.	Unlit / partially lit / dimmed	Q4 or B3	R4	RW2 or RW3
		Lit	Q4 or B3	R3	
	Lane widths less than desirable minimum.	Any	Q4 or B3	R4 or R5	RW3
4 Lane & wider carriageways including Smart, Managed or Controlled Motorways		Any	Q4 or B3	R4 or R5	RW3

NOTES:

1 It is recommended that class RW2 or above products be considered. However, these may not be suitable for removal without unacceptably marking the road surface.

2 The above is based on the use of 150mm lane and edge lines (except for detail F3) for roads with a permanent speed limit of 50 mph and above. If only 100mm wide lines are used on these roads, products one class higher than identified above will need to be used.

3. Skid resistance to Class SRT1 is a minimum requirement. Only where a lack of skid resistance has been identified as a safety issue should a higher class be specified.

4. Where a temporary mandatory speed limit above 50 mph is applied and at any point lane widths are less that the desirable minimum then markings with a performance class of R4 (200 mcd/m2/lx) or greater will need to be used over the length of the reduced lane widths.

5. In addition for lighter coloured road surfaces it is recommended that the benefit of specifying markings with one class higher than that recommended in **Table 4.8** of luminance factor (Qd or β) be assessed. For concrete road surfaces it should be assumed that a higher class is justified.'

For the purpose of this table street lighting is defined as follows:

Lit – Permanently lit during the hours of darkness

Partially lit – When lighting is switched off for set periods during the hours of darkness

Dimmed – When the light level is reduced for a period(s) during the hours of darkness

Designers and procurers need to be aware that it may not be possible to achieve simultaneously the enhanced levels of performance for all characteristics. Consequently, enhanced performance requirements may need to be prioritised.

4.21.7. Contractors should note that the nature of temporary marking materials whether tapes to BS EN 1790 'Preformed road markings' or in-situ material to BS EN 1871 'Road marking materials. Paint, thermoplastic and cold plastic' means it may not be possible to simultaneously provide all the higher (or the highest) performance classes while providing a sufficiently durable marking or requires a marking of a type which would be difficult to remove without damaging the road surface. Before setting any performance criteria it is recommended that contractors check for issues of this type with either the material supplier or road marking sub-contractor.

4.21.8. When additional thermoplastic or paint material is used for covering or reinstating existing road markings, care must be taken to ensure that the total thickness of the marking does not exceed 6 mm (see Regulation 10 and individual schedules in TSRGD).

4.21.9. Detailed guidance on operational issues related to the installation and removal of temporary road markings and studs is given in the document 'Temporary Road Markings: Working Group Findings'; see References (**Appendix B**).

4.21.10. The standards listed in **4.21.6** do not apply to black masking materials used to cover white markings.

4.21.11. Black masking materials (including temporary tape and thermoplastic) are specified in the British Standard BS 7962: 2000 'Black materials for masking existing road markings specification'. Only black paint complying with BS 7962 can be used as uncertified products, but may not provide the necessary skid resistance and low-gloss finish. It is essential that wear of the masking material should not expose the original white material below it. It is not acceptable to use black masking material to mask markings post the completion of works.

4.21.12. Masking materials complying with BS 7962:2000 are not suitable for the permanent masking of markings and will need to be removed when works are completed.

4.21.13. Road markings and particularly edge markings should be cleaned in order to maintain their effectiveness e.g. by a road sweeper. Rejuvenating markings via water jetting etc., may be a suitable option for in-situ markings to BS EN 1871, but unlikely to be suitable for marking tapes to BS EN 1790. Where Detail F1, F2 or F3 are used with barrier systems, recommendations for markings can be found in **Table A1.5** (**Appendix A1**).

4.21.14. Prior to reverting to the normal carriageway configuration, any temporary road marking should be totally removed. Any road markings or road studs that have been removed should be replaced.

4.21.15. Road markings should be renewed or re-laid as soon as possible after resurfacing or on the completion of road works which may have interfered with them. Where it is not possible to restore them immediately in permanent materials, a temporary marking should be used. This

is particularly important at sites such as road junctions where the absence of markings is likely to create dangerous conditions.

4.21.16. To avoid driver confusion, before the carriageway is remarked to the new configuration, it is essential that original road markings which are not to be retained as part of the temporary lane markings are thoroughly removed. Where 'ghost' markings are still visible on any temporary surface, they must have a sufficiently lower level of conspicuity than the replacement road marking.

4.21.17. Ideally there should be no difference in the surface characteristics between any parts of the carriageway.

4.21.18. Any temporary road marking material used should be able to be removed without significantly affecting the road surface, so that 'ghost' markings are not clearly visible to road users. Technical Report PD CEN/TR 16958:2017 covers the removal or masking of road markings and studs. Not all the options identified in this Technical Report may be acceptable and should be checked with the relevant authority.

4.21.19. A specification for measuring the impact of removal of markings is in CC 130 'Construction of temporary traffic signs, road markings and road studs'. For roads where this does apply it is recommended that on roads with a permanent speed limit of 50mph or greater, that a requirement for removal of markings should be to Class 1 for the following characteristics – Texture Depth (X1) and Grooving (D1); where relevant Profile Depth should be to Class Y1. The use of temporary markings on road surfaces which will continue to be used after the works are completed may be restricted; also limits may be placed on the methods of removal or on the impact on the road surface of any removal process.

4.21.20. Chemical marking removers applied through a low-pressure water system may be used, providing all waste material (including the chemical used) are compliant with applicable environmental regulations and best practice. Performance class requirements for the use of temporary road studs can be seen in **Table 4.8**.

4.21.21. The edge of a carriageway without raised kerbs should be indicated by a 100 mm or 150 mm wide line to diagram 1012.1 (S11-4-11) with its nearside edge placed approximately 200 mm from the actual edge of the carriageway, see **Figure 4.52**. Where flush kerbs are provided, the edge line should be superimposed on the kerb.

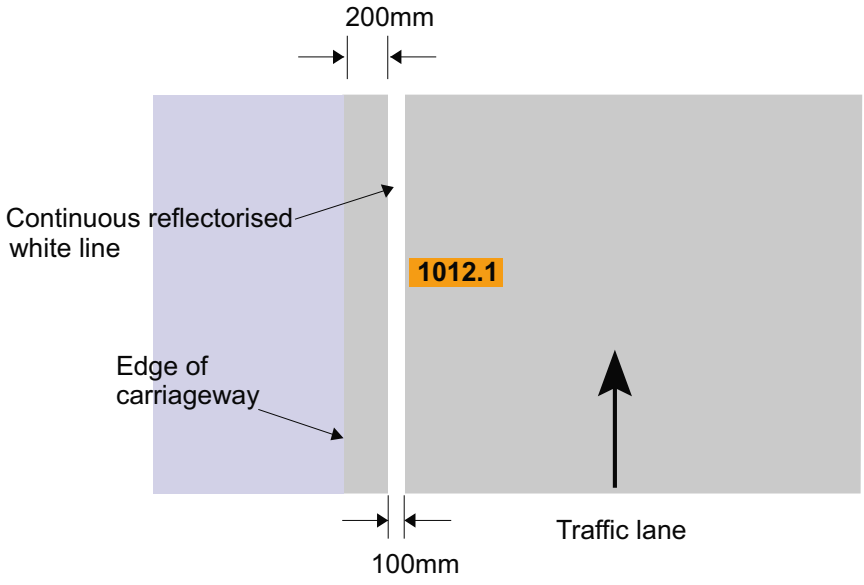


Figure 4.52 Dimension and position of continuous edge of carriageway reflectorised white line marking to diagram 1012.1 (S11-4-11)

4.21.22. Normally the use of 150 mm lane and edge lines is justified where the permanent speed limit to 50 mph or above, irrespective of lane width or length of works. Also, on lower speed roads 150 mm lane line should be used where poor delineation is considered to be a problem.

4.21.23. Where it is not possible to provide temporary road markings, drivers should be informed of their absence by means of advance warning signs. On lengths of road where lane lines or centre of carriageway lines have been removed, the sign 'NO ROAD MARKINGS FOR X MILES' (S13-9; **Figure 4.53**) should be used with the appropriate distance inserted. At junctions where all, or any part, of the 'STOP' or 'GIVE WAY' markings have been removed and temporary markings cannot be provided, the signs 'NO STOP MARKINGS' (S13-9; **Figure 4.54**) or 'NO GIVE WAY MARKINGS' (S13-9) should be placed at or near the junction. Ideally, the sign should be placed about 5-10 m from the edge of the main road carriageway. These signs may considered for used where permanent markings have failed (i.e. disintegrated) and it is not possible to make an immediate repair; they are not suitable for use where permanent markings are simply worn and not being subject to timely maintenance.



Figure 4.53 Working drawing 7012 (S13-9) Temporary hazard advance warning (Variant examples)



Figure 4.54 Working drawing 7012 (S13-9) Temporary hazard advance warning (Variants)

4.21.24. All temporary studs certified to BS EN 1463-1:2009 'Retroreflecting road studs' must be to class PRT1. When used in the following situations stud complying to a minimum of Class R2 in BS EN 1463-2:2000 'Retroreflecting road studs. Road test performance', should be used:

- temporary studs are used to form Details G2, G3, and J2 where the lane width is at the desirable minimum.
- any detail where lane widths are at the absolute minimum.
- works are longer than 4 km irrespective of lane width.
- temporary studs are used to form Details E2, F2, F3, G1, H, and K where higher performance cones and cylinders are used.

4.21.25. Temporary studs to class R1 should be considered, subject to availability of products in this class, where works are both over 4 km and lane widths are narrower than the desirable minimum.

4.21.26. For compliance with the Construction Products Regulations (CPR) temporary road stud products were removed from BS EN 1463-1:2021 'Retroreflecting road studs'. The requirements relating to new temporary roads studs which are not certified for compliance to the 2009 standard are now in CD 131 'Design of temporary retroreflecting road studs'; also the

National Annex to BS EN 1463-1:2021 contains data on requirements in the TSRGD Direction 7(3) relating to temporary road studs.

4.21.27. Where traffic crosses over the line of the hard shoulder, the red studs and the edge line should be removed on standard schemes. There is no requirement to remove the red studs throughout the length of hard shoulder running.

4.21.28. When narrow lanes are used as part of the traffic management layout, the reconfiguration of the carriageway may place the longitudinal joints or the original road stud bases within the new lanes or in line with the vehicle wheel tracks. As such, the inserts and reflectors must be removed. Road stud bases should also be removed if they are likely to present a hazard to motorists, and the carriageway should be reinstated before introducing traffic to the narrow lane layout.

4.21.29. Temporary reflective road studs are intended to be removed without undue damage to the road surface. The adhesive used should be of the correct quality to achieve this. The manufacturer's recommendations for installation and removal should be carefully observed.

4.21.30. Road studs should be protected during surface dressing operations.

4.21.31. At sites with temporary layouts, where temporary road studs are a viable option (e.g. Detail J2, see **Table A1.5** (**Appendix A1**), consideration should be given to their use in place of temporary road markings. These can be easier to install in poor weather. Detail J2 is for use only in works and requires authorisation.

4.21.32. Temporary studs to BS EN 1463-1:2009 'Retroreflecting road studs' are not recommended for use for periods much longer than three months. In addition, temporary studs to BS EN 1463-1:2009 must not be utilised for more than one application. The applicable life expectancy and limitation on reuse of products certified in accordance with CD 131 should be ascertained from the test certificate. Due to the possibility of stud loss associated with the use of temporary products, 'Details' specified in Appendix A1.5 which use studs wholly in place of markings, should generally be limited to schemes of up to 4 km. They may still be used in short sections e.g. changeovers and crossovers, short term resurfacing and other interim situations on schemes which are longer than 4 km.

4.22 Warning lights (Road danger lamps)

4.22.1. Warning lights should be used both to highlight a hazard as well as to help delineate an obstruction during the hours of darkness. Warning lights enable road users to pass safely through the works but also minimise fatigue and stress thereby reducing the risk of accidents downstream of the works. The following requirements from S13-11 must be complied with:

- the height of the centre of each lens of the warning light from the surface of the road in the immediate vicinity of the lamp must not exceed 1500 mm where the speed limit on the road is 40 mph or less, or 1200 mm where the speed limit on the road is more than 40 mph.
- warning lights must be powered separately from any other object or device.
- warning lights must show a steady or intermittent amber light.
- the whole of the warning light must conform to BS EN 12352.
- the external surface of the parts of the warning light which are not the lenses and are visible to road users must be of a colour having the colorimetric values of reference 355 Lemon, or reference 356 Golden yellow from BS 381C:1996.

4.22.2. For certain situations the provision of warning lamps is mandatory, in others it is recommended. The spacing of lights on longitudinal coning and cone tapers is given in

Table A1.3 (**Appendix A1**). High intensity warning lights (beacons) are defined as warning light types WL5 and WL6 in the National Annex to BS EN 12352 'Warning and safety light devices'. If high intensity warning lights or cones to Class R2/R2B are used, the spacing of the lamps may then be increased as long as the level of delineation is similar.

4.22.3. Warning lights may not be needed to achieve the required level of delineation for relaxation schemes at night when Class R2/R2B cones are used. Omitting warning lights however should be considered on a case-by-case basis and supported by a risk assessment which ensures that permanent road markings and studs are sufficient to provide the required delineation. This may be confirmed by visual and/or machine survey data, including that taken within the preceding 12 months which is held by the maintaining organisation.

4.22.4. For warning lamps to be considered to be omitted for relaxation schemes, permanent road marking and studs according to **Figure 4.55** will need to be present. At least nine out of any ten passive or active road studs working effectively would need to be retained, unless street lighting is present. The road markings will need to be in good condition i.e. they should also not have been identified as either a 'critical defect' or 'Non-critical defect' as defined in CS 126 'Inspection and assessment of road markings and road studs'.

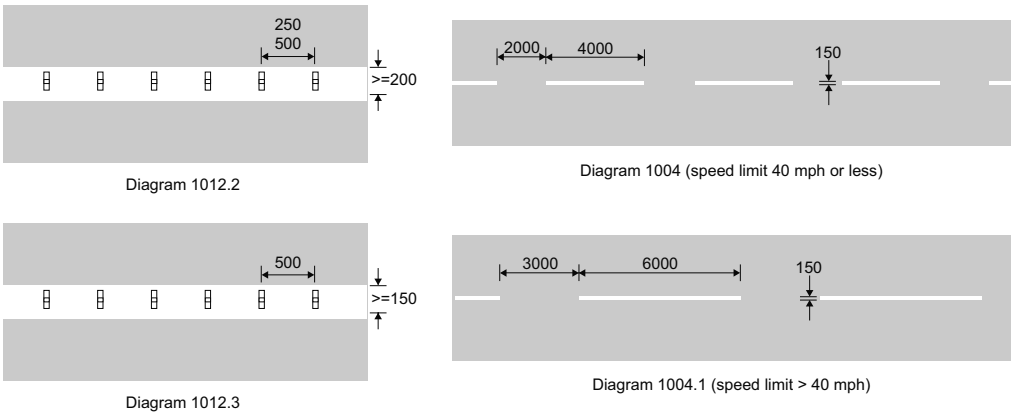


Figure 4.55 Road studs to diagram 1012.2 (S11-4-12), diagram 1012.3 (S11-4-13), and road markings to diagram 1004 (S11-4-2), 1004.1 (S11-4-3) used for delineation when warning lamps are omitted

4.22.5. Road markings should be visible for 100 m (corrected for the age of the assessor using CS 126). When warning lamps are omitted, traffic cones should be set-back from the road markings; the recommended minimum is 0.5 m. More general guidance on set-backs can be found in Section 2 of CD 127 'Cross-sections and headrooms'.

4.22.6. Traffic cones should be sufficiently visible. When placed alongside lane lines their retroreflective performance should be class R2/R2B according to BS EN 13422 'Traffic Cones and cylinders'. Use of class R2/R2B cones is recommended along edge lines, but class R1B cones may be adequate for 200 mm wide edge lines. All cones should be checked for cleanliness before or during installation. Where warning lamps are omitted the visibility of the markings, studs and cones should be checked as part of the drive through survey.

4.22.7. When omitting warning lamps contractors should monitor and record accidents, near misses and collisions which may be related to poor or reduced delineation.

4.22.8. Backlit Sequential flashing taper lamps are now device type WL7 in the National Annex to BS EN 12352 'Warning and safety light devices' and should be considered to highlight taper coning in both daylight and darkness. They are required to be used on trunk roads in Great Britain and relevant roads specified in Northern Ireland; the existing authorisations for each country may identify specific requirements for their use (for more information contact the relevant Overseeing Organisation and national authority). The use on other roads should be

agreed with the relevant authority. The use of these lights should be used only for lead-in and intermediate stepped tapers involving a lane drop and should not be used when a lane or lanes are narrowed, at a changeover, or a crossover. High intensity flashing lights should not be used within the taper when using these lights.

4.22.9. The outer boundary of the works site, temporary fences, barriers etc. should always be marked by the addition of warning lights during the hours of darkness. The full width and length of the obstruction should be clearly indicated by warning lights and the lenses on all lights should face oncoming traffic.

4.22.10. On dual carriageway roads, warning lights could distract drivers on the opposite carriageway. If this is likely to occur, then uni-directional warning lights should be used instead of bi-directional or omni-directional lights.

4.22.11. Where safety barriers (to diagram 7105 (S13-6-8)) are used to delineate the works area, during the hours of darkness a warning light showing a steady light should be placed at each corner of the obstruction and at 3 m intervals along each side which is accessible to pedestrians. In some situations this provision is mandatory.

4.22.12. It is essential to ensure that any warning lights are not misleading to rail, water or air traffic. In case of doubt the railway, tram, harbour, port, river, or airfield authority should be consulted.

4.22.13. Warning lights using flammable substances (e.g. paraffin) should not be used.

4.22.14. When a vehicle restraint barrier is used and warning lights are not in use, reflectors placed on barriers are an option (although the use of Detail F3 is preferred). When placed on barriers they may give a misleading message as to the edge of the carriageway; therefore the performance of the nearside edge line or road studs will need to be enhanced where reflectors are used on barriers. The dimensions and colour of these reflectors must conform to diagram 560 (S2-6-2; **Figure 4.56**). Reflectors should be cleaned frequently in order to maintain their effectiveness.

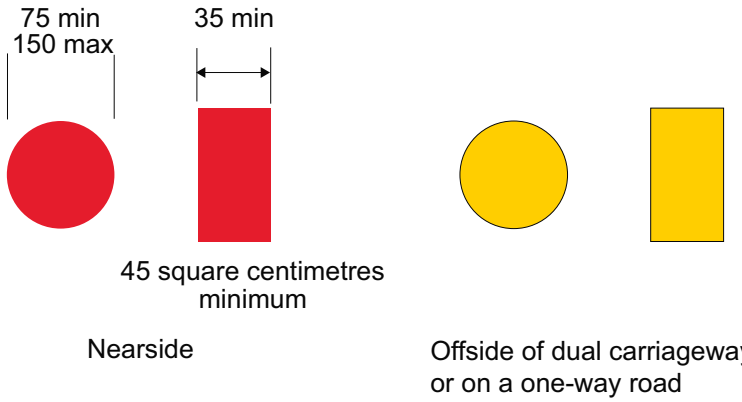


Figure 4.56 Diagram 560 (S2-6-2) Coloured red or amber reflectors located at the edge of the carriageway, shape and size

4.22.15. Warning lights should be installed on stands or cones, and not at road level (except when used for ETM).

4.22.16. Warning lights must not obscure the retroreflective cone sleeves. If this is likely to occur, then the lights should be placed on separate stands midway between traffic cones, and not on the cones themselves.

4.22.17. Warning lights should be switched on in a place of safety before being put into position.

4.22.18. Reflectorised cones and markers should not be used instead of warning lights on standard schemes.

4.22.19. Flashing warning lights (within cone lines) must not be used on an unlit road unless specifically authorised. Lights flashing at 55-150 flashes per minute may be used on roads with a speed limit less than 40 mph so long as they are within 50 m of an illuminated streetlight.

4.22.20. Warning lights that show a steady light can be used on any road.

4.22.21. Manufacturers specifications should be followed with respect to the intervals at which bulbs and batteries are changed, and the type of replacement used.

4.22.22. High intensity flashing warning lights (with a peak intensity greater than 100 candelas) showing an intermittent light are prescribed by S13-11. They are used only to draw attention to the hazard existing at a particular site and they warn drivers to take special care. These flashing warning lights may be used only in combination with prescribed traffic signs and not as a means of delineating the works.

4.22.23. High intensity flashing warning lights of the uni-directional type may be used to supplement signs indicating road works, or the beginning of a temporary traffic diversion. They may also be used in association with police or weather condition signs to warn drivers to take special care. Excessive use of these lights on any one site will reduce their effectiveness and care should be taken to use them only to draw attention to signs indicating particularly hazardous situations. It should be noted that several unsynchronised flashing warning lights situated close together produce a confusing appearance.

4.22.24. High intensity flashing warning lights may be used to supplement signs to diagrams:

- 606 (S3-2-1) ‘Traffic may only proceed in the direction indicated by the arrow’.
- 609 (S3-2-2) ‘Traffic must turn in the direction indicated by the arrow’.
- 610 (S3-2-3) ‘Keep left/keep right’.
- 616 (S3-2-10) ‘No entry’.
- 633 (S13-6-17) ‘Stop Police’.
- 829.1 (S13-6-23) ‘Police slow’.
- 829.2 (S13-6-24) ‘Police accident’.
- 829.3 (S13-6-25) ‘Police use hard shoulder’.
- 829.4 (S13-6-26) ‘Police rejoin main carriageway’.
- 7101.1 (S13-6-4) ‘Traffic cone’.
- 7102 (S13-6-5) ‘Flat traffic delineator’, or
- 7105 (S13-6-8; **Figure 4.57**) ‘Traffic Barrier to mark closed length of road’.



Figure 4.57 Diagram 7105 (S13-6-8) Traffic barrier with high intensity flashing warning lights

4.22.25. When warning lights are placed by the police in accordance with S13-10, the light emitted by them must be blue. It must be amber in all other cases.

4.23 Rotating reflector delineators

4.23.1. Rotating reflector delineators are mechanisms complying with S13-8-7. They have red body with amber (retroreflective) reflectors (complying with size and shape to diagram 560 or its variants (S2-6-2)); to be displayed intermittently whilst rotating and constantly whilst static. They do not constitute warning lights to BS EN 12352 ‘Warning and safety light devices’.

4.23.2. Rotating reflector delineators must always be mounted on top of traffic cones to diagram 7101.1 (S13-6-4). Static reflectors to diagram 560 must not be mounted on traffic cones. Rotating reflector delineators may be used only in conjunction with traffic cones that delineate the outer edge of a safety zone that runs parallel with the traffic lane. They must not be used in tapers.

4.24 Diversions/road closures

4.24.1. The contractor should discuss road closure options for any planned works with the police and the appropriate highway authorities early in the planning stage. This should include discussion for both the road intended to be closed and any diversion route. For diversions from primary routes, trunk roads, and any non-trunk motorways, designers should include in the consultation:

- the expected increase in mileage as a result of the diversion based on expected flows.
- the environmental impact.
- the change in risk posed to road users. This may include the increased exposure to risk due to an increase in distance travelled or by travelling on routes with higher accident or casualty rates.

4.24.2. Diversions may be necessary in order to close a road for maintenance, due to an accident, incident or because of continuing congestion and may be needed for traffic proceeding in one direction or for both. Temporary orders under Section 14 of the Road Traffic Regulation Act 1984 for the road diversion must be acquired where necessary.

4.24.3. Diversions from motorways to all-purpose roads should be put into effect only when absolutely necessary, in order to avoid lengthy delays. For all trunk roads, the existing route should be maintained where possible. However, where there is an agreed diversion route, or it is likely that a suitable diversion route can be found and agreed, the designer should consider this diversion option in the risk assessment.

4.24.4. Diversions from motorways and dual carriageways, trunk roads and primary routes are likely to result in the greatest increase in road user risk as the diversion would likely be longer and be over on roads with a higher accident rate. A risk assessment should be supplied to the road authority as part of the request to undertake a carriageway closure. The risk assessment should detail the impact on road users and any increase in risk exposure from using the diversion route.

4.24.5. It is not acceptable to implement a carriageway closure on the sole basis of convenience for the contractor. Work activities should only be undertaken using a carriageway closure if a lane closure is not suitable. For a carriageway closure to normally be considered acceptable it would need to either enable multiple maintenance activities to be undertaken, to reduce the number of closures, or enable the works to be undertaken more quickly. The reduction in time would need to result in no net increase in road user risk of using a longer and/or less safe route.

4.24.6. Diversions for planned works or temporary layouts normally increase both journey distance and time, and for non-urban roads often require the use of routes with higher accident rates than the closed road. Additionally, any diversion introduces new traffic movements, which may introduce confusion and additional hazards may result. Diversions will need to be planned with the authority taking account of the suitability of the diversionary route for the expected traffic flows, additional comprehensive directional informatory signing (see **Figure 4.58**), the existing traffic priority at junctions, the presence of railway level crossings and low bridges and the effect of diverted traffic on the environment. For motorised road users the requirement is that the diversion route must not have any extra restrictions (including weight, height, width, emissions, or vehicle type) or pass through any additional tolls or charge zone.

4.24.7. There is no requirement to limit diversion routes to a road of similar or higher classification than the closed road. Normally the shortest route with the capacity to accommodate the diverted traffic should be utilised (relevant change in signal timings – e.g. through MOVA or SCOOT systems (see Chapter 6), to align capacity to the changed flows is recommended for all schemes and expected for longer schemes e.g. weekend closures). If there are two or more potential routes with a similar length of diversion then it is acceptable to prioritise one with the least disruption to local residents. Utilising a significantly longer signed diversion route where there are shorter routes which have the capacity for the diverted traffic is not recommended as it is likely that a significant number of diverted users will stop following the diversion and potentially use even less suitable routes. If there are concerns about the impact on local communities on otherwise suitable diversion routes then the primary option is not to allow the road or carriageway closure or find an alternative method of working with an acceptable diversion route. The diversion of traffic from the all-purpose network via a motorway is not acceptable.

4.24.8. Designers of diversion routes must consider the needs of all road users including cyclists and other non-motorised users. These users are less likely to tolerate lengthy detours or long delays and may ignore diversion signs and/or use the footway. In urban areas a suitable alternative for non-motorised users and those who have limited mobility should be designed. Further guidance on catering for the needs of cyclists and other non-motorised users at work sites is given in **Section 4.31**.

4.24.9. In some cases, a single diversion route that is suitable for all expected road users may actually increase overall delay, congestion, and risk. In this case signing two diversion routes may be acceptable. This is acceptable as long as:

- one of the two diversion routes is shorter, less disruptive, and/or safer for at least half of the diverted traffic.
- the diversion does not introduce additional charges for the road users.
- it is possible to provide clear and effective signing at the decision point so that all users understand which routes they can take.

4.24.10. Temporary diversions may be needed where the works interfere with existing public or private roads or other routes over which there is a public or private right of way for any traffic.

4.24.11. If the works cause continuing congestion on the diversion route that is unacceptable to the Authority, then the designer should take steps to re-route traffic.

4.24.12. When re-routing traffic, and signing a diversion, the needs of all types of vehicles, including public service vehicles, should be kept in mind. Where a bus stop is temporarily removed or relocated, the position of the nearest alternative bus stops should be indicated at the stop affected.

4.24.13. Temporary diversions should be maintained in a satisfactory condition throughout the period that the diversion is in place. This does not apply to routes for site vehicles solely for the execution of the works.

4.24.14. The accident rate on all-purpose roads is higher than that for works-affected motorways. As such, diversions from motorways to all-purpose roads should be put into effect only when absolutely necessary to avoid lengthy delays. These diversions should be done only after consultation with the police and the Authorities for both the road intended to be closed and the diversion route(s). For short-term works however, closure of a carriageway overnight may be appropriate.

Diversion signing

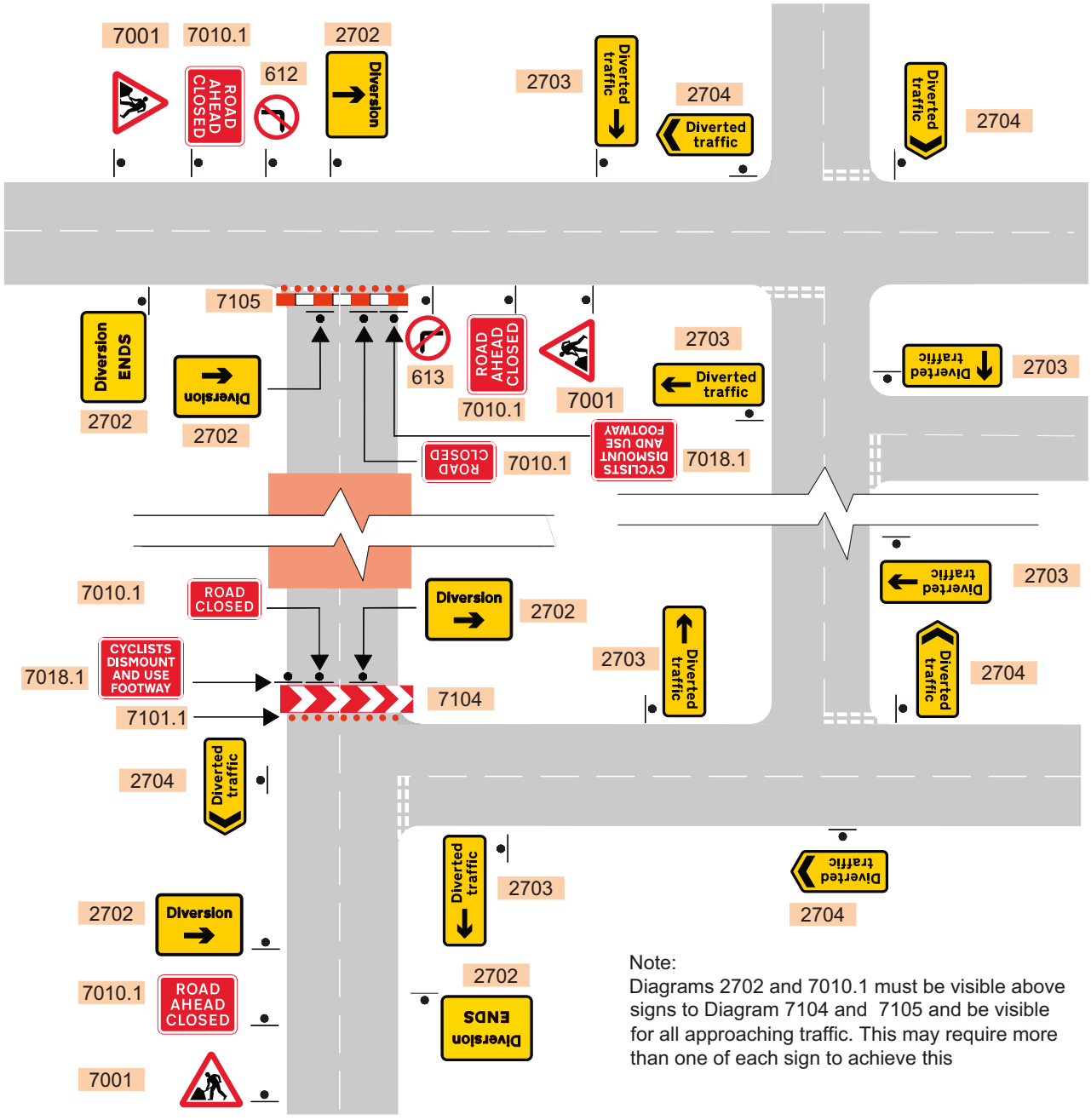


Figure 4.58 Layout of signs for road works on single carriageway roads with diversions

NOTES:

1. Signs and cones (where applicable) should be of the sizes shown in **Table A1.2** and **Table A1.3** (**Appendix A1**).
2. Chevrons, diversion, and road works warning signs should be provided at the positions shown.

3. The signing is for simple, short, local diversions. Longer diversions would likely require additional signs at intermediate junctions where traffic would need confirmation as to the need to carry on or turn off.

4.24.15. The 'Diverted Traffic' sign to working drawing 2703 (S13-9, **Figure 4.59**) is used in advance of a junction to indicate the direction the diverted traffic should take at the junction ahead.

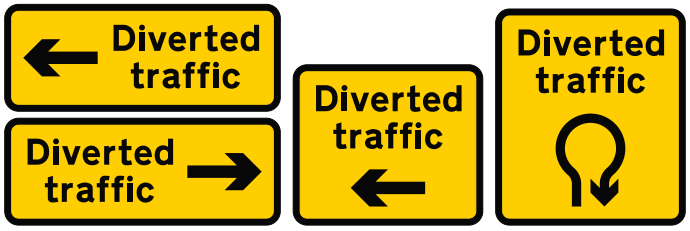


Figure 4.59 Working drawing 2703 (S13-9) Route for diverted traffic at junction (Variant examples)

4.24.16. The 'Diverted traffic' sign to working drawing 2704 (S13-9; **Figure 4.60**) is used to indicate the direction of the temporary diversion route, usually at crossroads and T-junctions.



Figure 4.60 Working drawing 2704 (S13-9) Temporary diversion route for diverted traffic left and right.

4.24.17. A variant of 'Diverted Traffic' sign shown in Figure 4.60 may be used on both local and trunk roads and should be used at all appropriate junctions along the route. Permitted variants of the sign allow a route number, road name or place name to be used. Flexibility is permitted in the description of the route and the use of symbolic diversion route signing. Routes signed with a symbol should always have a worded sign at the start of the route indicating to drivers the symbol to follow.

4.24.18. The legend 'Diversion' should be used at the start of the diversion route rather than being encountered along the diversion route.

4.24.19. Where a side road is closed and traffic cannot turn into it, traffic should be diverted by travelling ahead. In these cases, the 'no right turn' or 'no left turn' sign to diagram 612 (S3-2-7) or 613 (S3-2-8), **Figure 4.61** in conjunction with the necessary Traffic Order should be used. **Section 6.14** deals with works at or near junctions on single carriageway roads.



Figure 4.61 Diagram 613 (S3-2-8) No left turn and 612 (S3-2-7) No right turn

4.24.20. The designer should ensure that the diversion route is correctly signed throughout its length using appropriate directional informatory signs to working drawings 2703 (S13-9, see **Figure 4.59**), 2704 (S13-9; **Figure 4.60**), and 2706 (S13-9, see **Figure 4.62**).



Figure 4.62 Working drawing 2706 (S13-9) Map type advance direction sign indicating temporary diversion (Variant examples)

4.24.21. Some road works may cause an increase in traffic on otherwise lightly-trafficked roads. The authority should keep the roads in the vicinity of the works under observation and ensure that appropriate signs are provided. An example of enhanced signing as a result of increased traffic flow is given in **Figure 4.63**. Temporary waiting restrictions on the diversion route should be considered if parking is likely to cause an increase in traffic delay.

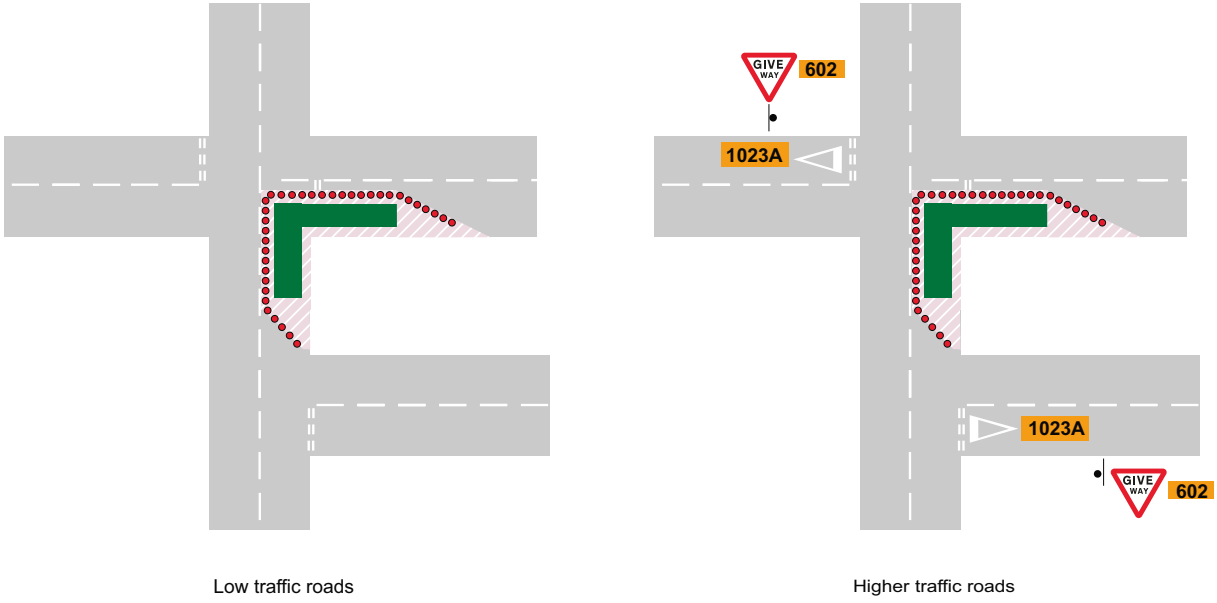


Figure 4.63 Give way signing and enhanced give way road markings on roads with higher traffic resulting from road works

4.24.22. Police temporary signs to diagram 636 (S13-6-19) and 636.1 (S13-6-20) can be used without the need for a Traffic Order if the restrictions are to be imposed for less than seven days. The railway authorities must be notified if road traffic over a railway level crossing is increased.

4.24.23. The 'ROAD CLOSED' information sign to working drawing 7010.1 (S13-9; **Figure 4.64**) is placed to indicate that the road beyond that point is closed. This sign does not have any regulatory meaning, any closure must be implemented using relevant cones and barriers to prohibit use of the closed road. The sign (and relevant cones and barriers) must be positioned so that traffic can divert and still access the wider road network (if necessary space to turn round will need to be provided). If this is not met then the enforceability of any closure is likely to be affected. Where the intended location of a road closure would prevent access to the wider road network then the road affected will need to be closed as well as an alternative access arrangement provided as indicated in this document.



Figure 4.64 Signs to working drawing 7010.1 (S13-9) information on road closure sign (variant examples)

4.24.24. The shortest diversion route of adequate capacity, width and available height should be signed with the appropriate diversion signing (S13-9). Additional signing might still be needed within the closed section of a highway or road as there are likely to be exemptions to the closure order (e.g. emergency services, frontage requiring vehicular, or pedestrian access).

4.24.25. The 'ROAD AHEAD CLOSED' information sign to working drawing 7010.1 (S13-9; **Figure 4.65**) is used on the approach to the entrance to a side road to provide warning that the road is closed. This sign is not suitable for giving advanced warning of a closure where traffic needs to consider using a different route, this should be a relevant black on yellow sign. Similar consideration of black on yellow signs is required for the need for additional signs for diverting traffic when the 'ROAD CLOSED' sign is used.



Figure 4.65 Signs to working drawing 7010.1 (S13-9) information road ahead that is closed (variant examples)

4.24.26. Advance warning of a diversion is given by the 'Diversion' sign working drawing 2702 (S13-9). Distances up to but not exceeding 400 yards may be shown on the sign, to the nearest 10 yards, in place of the arrow.

4.24.27. Signs on the approach to, and at the start or end of a diversion route on low speed roads may be on a standard 1050 x 750 mm plate (see (**Appendix A4**).

4.24.28. The 'Diversion' sign to working drawing 2702 (S13-9; **Figure 4.67**) is used in conjunction with 'ROAD CLOSED' and 'ROAD AHEAD CLOSED' signs to working drawings 7010.1 (S13-9) to direct drivers to a diversionary route, where it is the only one possible. This sign is not suitable on high speed roads and should only be used at the start of where traffic is diverted.



Figure 4.66 Sign to working drawing 2702 (S13-9) Diversion start, used in conjunction with signs to Diagram 7010.1 (S13-9)

4.24.29. Diverted traffic signs to working drawing 2703, 2704, or 2706 (S13-9) should be used to indicate changes in direction (or confirmation of the need to carry straight on) and to improve driver confidence along the route where all traffic must continue to follow the diversion. This includes where named destinations need to be indicated and in advance of junctions.

4.24.30. A diversionary route should be clearly and consistently signed throughout its length and the end of the diversion shown by the 'Diversion ENDS' sign variant to working drawing 2702 (S13-9; **Figure 4.67**). The purpose of this sign is to mark the end of the diversion, and to indicate to drivers that the special temporary signs terminate at this point and that permanent signs should be followed from this point onwards.



Figure 4.67 Sign to working drawing 2702 (S13-9) Diversion ends (variant)

4.24.31. Diversion signs for motorised road users have black legends on yellow backgrounds to distinguish them from permanent directional informatory signs and attract drivers' attention. The 'Diversion' sign to working drawing 2702 (S13-9) is not used to indicate a change of direction within the works themselves. For these circumstances, a sharp deviation of route sign to diagram 7104 (S13-6-7) should be used.

4.24.32. Signs to diagrams 612 (S3-2-7) 'No right turn', 613 (S3-2-8) 'No left turn', and 616 (S3-2-10; **Figure 4.68**) 'No entry' may be required to prohibit entry to a road from one direction. These signs must only be used only to indicate the effect of a Traffic Regulation Order. Diagram 616 (S3-2-10) must only be used to supplement other signs, cones and barriers when used to sign a complete road or carriageway closure.

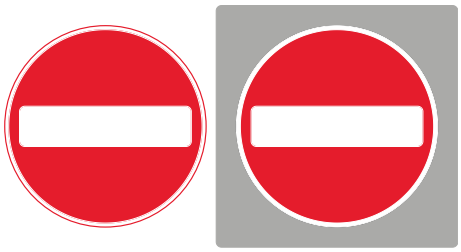


Figure 4.68 Diagram 616 (S3-2-10) No entry with and without backing board

4.24.33. Symbolic diversion signing may be used on extended diversions, for both motorways and all-purpose roads, to advise drivers to follow the diversion route by following the specified symbols until the intended route is re-joined.

4.24.34. The design of the symbols to be used for symbolic diversion route signing are prescribed in S12-28-15. At the start of a diversion, a directional informatory sign to working drawing 2716 (S13-9; **Figure 4.69**) indicating the junction ahead and the direction leading to a temporary diversion route should be placed. If a pre-established diversion route is used then the flap-type signs which can be opened to display the message in an emergency can be used, otherwise the signs used will be of the standard type. It may be possible in some cases to show this information on a variable message sign. All equipment used in connection with variable message signs requires type approval under the terms of direction 46 in Schedule 14.

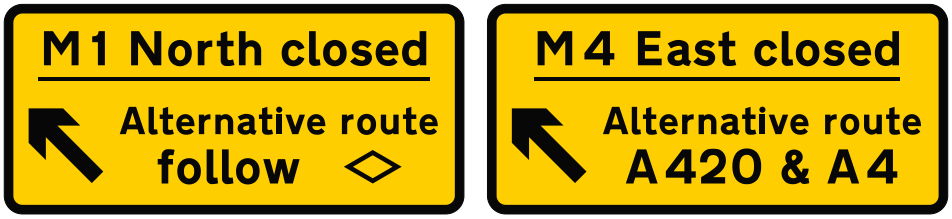


Figure 4.69 Sign to working drawing 2716 (S13-9) Diversion route ahead (Variant examples))

4.24.35. Symbolic signing along pre-agreed diversion routes for use in an emergency may be incorporated into existing directional informatory signing, following the design rules set out in Chapter 7 (Section 11.2). When temporary patches are used, they should be able to be removed without damaging the sign face and they should be removed at the end of the works.

4.24.36. Diversionary route symbols may be provided on permanent signs as part of an emergency diversion route. These symbols may be suitable to adopt for planned diversions however this may not always be the case as there may be factors which would only be acceptable in an emergency (e.g. signalised junctions where there is insufficient capacity and it is not possible to adjust timings). If the emergency route is to be adopted for a planned diversion, the designer must consult with all authorities on the predefined route.

4.24.37. It is not acceptable to solely rely on emergency diversion route symbols on permanent signs for planned diversions. Additional signs may be required including where turning movements for diverted traffic are made. These should show either the destination being signed (e.g. The NORTH, Leeds) or the route from which traffic is diverted (e.g. M6 North) in addition to the diversion symbol.

4.24.38. If emergency diversions are likely to be a rare occurrence, the cost of permanent symbolic signing along diversion routes may not be justified. If permanent symbolic signing is not in place, diversion routes will need to be comprehensively signed to working drawings 2703, 2704, or 2706 (S13-9), as appropriate.

4.24.39. The directional informatory sign variants to working drawing 2716 (S13-9) that are placed at the start of the diversion to indicate the junction ahead and directions towards the temporary diversion route may give route numbers with, or in place, of a symbol (for example, ‘M6 North closed Alternative route via A123 and B456’). Ensuring consistent signing along the diversion is essential. As such, when route numbers are given at the start of the route ‘Diverted Traffic’ signs to working drawing 2703 (S13-9) or the appropriate variant placed at junctions along the diversion route should give route numbers also (for example, ‘M6 diverted traffic’). The legend ‘Alternative route’ is only used when a symbol or route number is included. The use of ‘Find alternative route’, ‘Use alternative route’ or similar is not lawful.

4.24.40. Designers should note that, the contractor must obtain permission (under Section 65 of the Road Traffic Regulation Act 1984) from each authority that the diversion route passes through to place signs on their roads. Sufficient advance notice must be given to these authorities to obtain this permission. Any agreement which relates to placing of diversion symbols, directional informatory signs, or signs for emergency traffic management reasons (see **Section 5.13**) is not relevant to gaining permission for placing signs for planned works.

4.24.41. Diversion routes will need to be checked before they are brought into use to ensure they are still suitable and that there is no conflicting signing, including other temporary road or street works signs.

4.24.42. In situations where diversion routes of two or more different works interact (either crossing or sharing some of the same route) then both sets of signs should include the destination or route being signed.

4.24.43. The duration for which diversion route signing is present before the initiation of the closure should be limited where possible, and sufficient resources should be made available to achieve this. Signs indicating that a road or carriageway is physically closed should only be displayed immediately before the closure is initiated. Where traffic is diverted upstream of the closure point the relevant signs should not be placed on the road while the traffic could still be reasonably able to traverse the section of road before it is closed. Also, this must not be before

the time indicated on any signs for the start of a closure, nor the time identified in the relevant order.

4.25 Restricted headroom/working overhead

4.25.1. Where the works temporarily impose a lower height restriction, signing as per **4.2.28** should be used. Details of signing at bridges and other structures is given in Chapter 4, Section 7.

4.25.2. Works may temporarily impose a lower height restriction at a structure that already has a permanent headroom restriction signing due to the permanent headroom being lower than 16'-6' (5.03 m). In this case, drivers might not notice the reduced dimensions from the standard signing. Consideration should be given to providing an additional sign to diagram 7014.1 (S13-6-39; **Figure 4.70**).



Figure 4.70 Diagram 7014.1 (S13-6-39) Temporary or permanent reduction in bridge headroom height ahead (Dual units must be shown)

4.25.3. At all sites where works are being carried out above public roads, vehicles and pedestrians must be protected adequately from falling objects by nets, platforms, or other devices. Before any reduction in working height is carried out, the authority must be consulted so that hauliers and bus operators can be advised of the changed circumstances. The authority may require a licence and an indemnity for devices etc. placed over the highway.

4.25.4. Bridge heights must be checked each time the road is resurfaced or reconstructed, and signs erected or altered as necessary. Detailed guidance can be found in Chapter 4 (Section 7).

4.25.5. Where the work involves a reduction in height clearance at a structure an 'OVERHEIGHT VEHICLE DIVERT' sign (S16-2-3; **Figure 4.71**) may be erected before the preceding junction. Amber lamps flash when this sign is activated by an overheight vehicle detector. The sign otherwise shows a blank face.

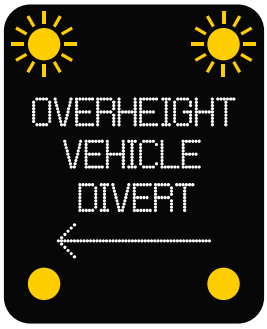


Figure 4.71 Diagram (S16-2-3) Overheight vehicle divert

4.26 Works access and exit

4.26.1. Access to and exit from the works area should be considered at the design stage. Consideration should include the following elements:

- conflict with other movements.

- location.
- width.
- sight lines.
- signing.
- swept path.
- slowing down/acceleration space.
- separation of slowing down/acceleration space from works area.
- cleanliness/mud on road.

4.26.2. Traffic entering or leaving works accesses on a single carriageway road should behave in the same manner as traffic entering or leaving any side road. 'Side road ahead' signs to diagram 506.1 (S2-2-3) should be provided before the works access on the public road. The signs may carry an additional plate with the legend 'WORKS ACCESS', see **Figure 4.72**. Right turns into sites on single carriageway roads should be avoided unless traffic control is used. The responsibility rests with drivers of emerging vehicles to manoeuvre safely.

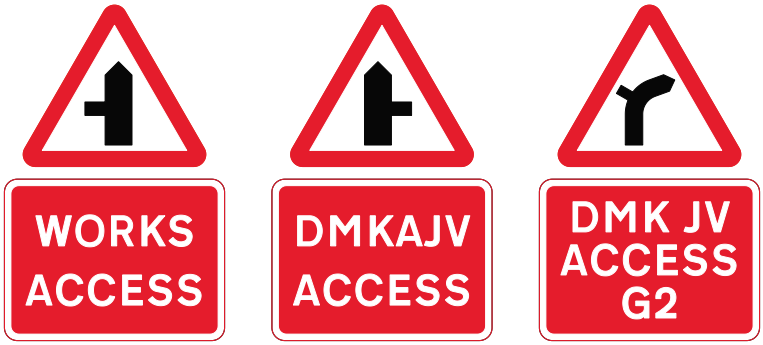


Figure 4.72 Diagram 506.1 (S2-2-3) Side road ahead and diagram 512.1 (S2-2-9) Junction on the outside of a bend ahead, combined with a sign to working drawing 7301 (S13-9) Works access (Examples of alternative types)

4.26.3. The 'WORKS TRAFFIC' signs to working drawings 7301, 7303, 7304, 7305, and 7306 (S13-9: **Figure 4.73** to **Figure 4.77**) may also be used to direct traffic at or near a works access. The appropriate signs may be used prior to a road junction, at a junction, or at the works access to indicate the appropriate direction to be taken to the works site access. The contract number of the access may be added to this sign in order to identify a particular access.



Figure 4.73 Sign to working drawing 7301 (S13-9) Access for works traffic only and variant for no access for works traffic

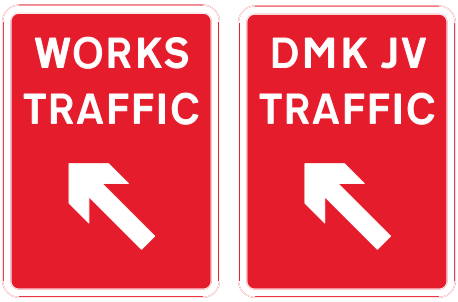


Figure 4.74 Sign to working drawing 7303 (S13-9) Route for works traffic at junction ahead (Examples of alternative types)



Figure 4.75 Sign to working drawing 7304 (S13-9) Route for works traffic at junction ahead (Examples of alternative types)



Figure 4.76 Sign to working drawing 7305 (S13-9) Direction of route for works traffic (Examples of alternative types)

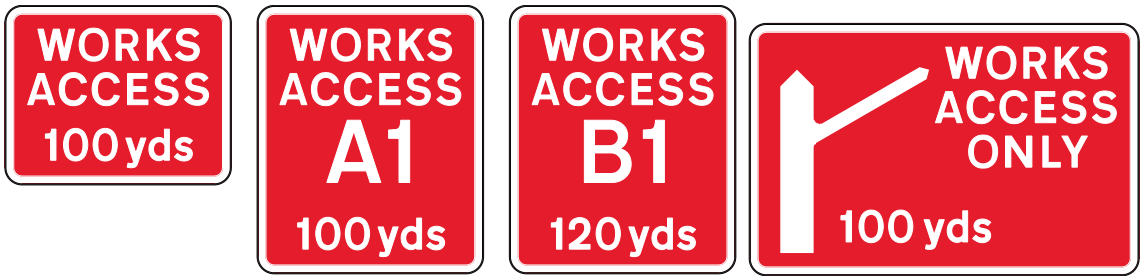


Figure 4.77 Sign to working drawing 7306 (S13-9) Access to works area in 100 yards (Examples of alternative types)

4.26.4. Road works will often necessitate the construction of new accesses to the public road for contractors' vehicles and plant, for example, earth-moving equipment. Some accesses will be on both sides of the road, forming crossroads. Accesses and exits for works vehicles should be located and designed to ensure that vehicles can enter and leave the site in safety. Entrances should always be kept clear of plant and vehicles to ensure that entering vehicles do not have to slow or stop partially in the entrance. Such accesses will function as side roads and need to be treated accordingly in relation to traffic safety needs.

4.26.5. The volume of works traffic entering and leaving works accesses may be in excess of the volume of road users. In these cases works accesses should therefore be designed and signed so that drivers on the public road have adequate warning of their presence. A 'WORKS TRAFFIC ONLY' sign to working drawing 7301 (S13-9; **Figure 4.73**) should be provided at these accesses, which should have adequate sight lines.

4.26.6. On a motorway or dual carriageway road on which the national speed limit applies, advance direction signs to the works including a 'WORKS ACCESS ONLY xxx yds' sign to working drawing 7306 (S13-9) should be provided. Alternative versions of the works access sign are shown in **Figure 4.78**.



Figure 4.78 Sign to working drawing 7306 (S13-9) Works access only, reversable (Examples of alternative types)

4.26.7. Access to and exit from the works areas should have signing for the purposes of directing works traffic and alerting other road users to the likelihood of works vehicles making unexpected manoeuvres. Care needs to be taken to ensure that these signs do not obstruct sight lines, obstruct other signs, or are not obstructed themselves.

4.26.8. For works vehicles to gain access to a site, cones and barriers may have to be removed. It is possible that other vehicles may follow the works vehicles into the site and in built-up areas visually impaired pedestrians may stray on to the site if these cones and barriers are not replaced immediately.

4.26.9. Where construction traffic, especially heavy earth-moving equipment, regularly crosses an existing public road, the location should be signed as for crossroads and a 'HEAVY PLANT CROSSING' plate variant to diagram 511 (S13-4-1) should be provided below a 'crossroads ahead' sign to diagram 504.1 (S2-2-1), see **Figure 4.79**. The normal road works signing, including portable traffic signal control, will also be required on the public road. For more information on haul routes see **Section 4.27**.



Figure 4.79 Diagram 504.1 (S2-2-1) Crossroads ahead combined with diagram 511 (S13-4-1) Heavy plant crossing

4.26.10. The 'NO WORKS TRAFFIC' sign to working drawing 7301 (S13-9; **Figure 4.73**) may be displayed in order to prevent the use of selected routes by works traffic seeking to gain access to a nearby site.

4.26.11. To improve the conspicuity of the access point to approaching works vehicles, close-spaced cones to Detail B (**Figure 4.80**) may be used over a distance of approximately 20 m before and after the access point.

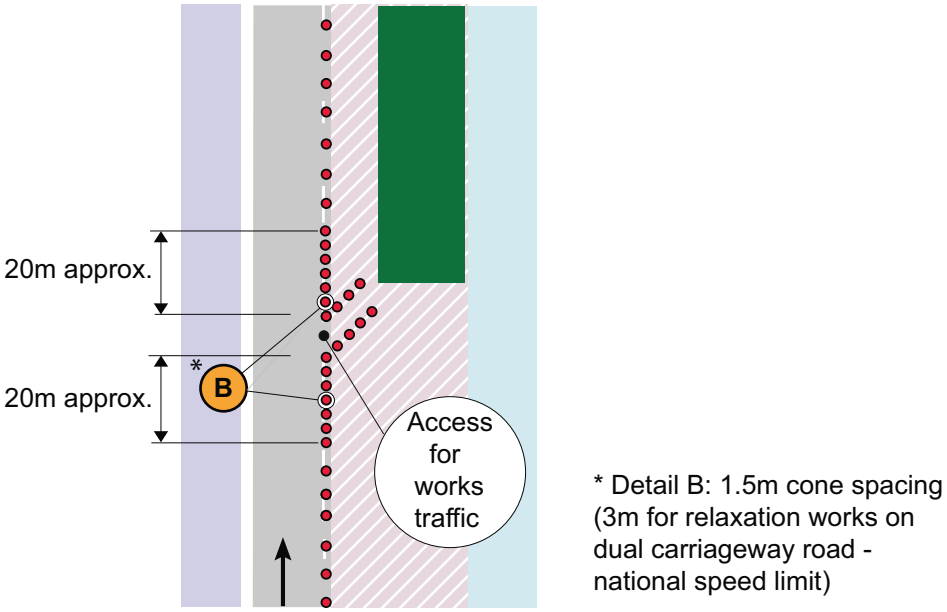


Figure 4.80 Closely spaced cones to improve the conspicuousness of works access point for works traffic

4.26.12. When works are in progress on motorways and other dual carriageway roads, emergency crossing points within the length of the road works should be closed. Works vehicles should not cross from one carriageway to the other by means of the emergency crossings or the central reservation. For routine maintenance, vehicles should always reach the other carriageway by means of the nearest junction.

4.26.13. The presence of slow-moving and/or large works vehicles, particularly in the right-hand lane of a carriageway, is potentially dangerous. Where it is necessary during road works for these types of works vehicles to enter the works or access the central reservation a suitable method of working would need to be adopted e.g. MLC or MCC (or EMCC). A reduced mandatory speed limit is unlikely to be sufficiently effective at maintaining the required level of safety without physical safety measures.

4.27 Routes for site vehicles

4.27.1. Access to, and routes through, the works are required for works vehicles and plant, delivery vehicles and site staff vehicles. How these vehicles access the site can have a significant impact on the adjoining network. On high-speed roads, site access should be considered at the design process. In particular, the following should be considered:

- any points arising from the consultation process.
- decisions on permitted/prohibited routes and sign design.
- provision of adequate signing.
- imposition of site speed limits.
- access to works from adjoining network.
- conflict with local land-use patterns and timing of works.
- the need to eliminate mud and debris left on road surfaces.
- consultation with adjoining highway authorities.
- possible need for heavy/light vehicles to follow different routes/arrangements from those for heavy/wide/high loads.
- impact on local businesses.

4.28 Haul routes

4.28.1. Traffic signal control should be considered when moving contractors' vehicles, site equipment or materials across a public highway between sites or within a site. Traffic on these haul routes should approach the public highway in a defined line and on a level gradient. Priority should be given to the public highway, not to the haul route.

4.28.2. The need for traffic signal control should be considered at the design stage. The authority should be contacted for advice and for arranging site approval when a contract is let. It may be advisable to relocate the proposed crossing if approach visibility is reduced by a bend or obstruction. If the crossing is not signal-controlled, the variant of diagram 511 'HEAVY PLANT CROSSING' (S13-4-1) should be placed in advance of the crossing place.

4.28.3. All equipment used to control traffic for a haul route must be approved for use by the authority prior to deployment.

4.28.4. The layout and installation of signals, to diagram 3000 (S14-2-1) need to be the same as that for temporary junction signals (Portable signals to diagram 3000.1 (S14-2-2) are not suitable). However, it is acceptable to use a secondary signal in place of a duplicate offside primary signal.

4.28.5. The public highway approaches to a haul route require the following signing:

- 'road works ahead' sign to diagram 7001 (S13-2-9).
- 'crossroads ahead' sign to diagram 504.1 (S2-2-1).
- 'traffic signals ahead' sign to diagram 543 (S14-2-28) and a supplementary plate to diagram 543.1 (S14-2-29).
- 'crossroads ahead' sign to diagram 504.1 (S2-2-1) is used in conjunction with a supplementary plate 'HEAVY PLANT CROSSING' to diagram 511 (S13-4-1).

Additional signs may be required as appropriate.

4.28.6. A 'part time signals' plate to diagram 543.1 (S14-2-29) should be fixed to each signal pole and also beneath the 'traffic signals ahead' sign to diagram 543 (S14-2-28) in the arrangement shown in **Figure 4.81** below.



Figure 4.81 Diagram 543 (S14-2-28) Traffic signals ahead combined with diagram 543.1 (S14-2-29) Part time signals

4.28.7. Where a stop line to diagram 1001 (S14-2-46) is provided, lane and/or centre line road markings are required for a distance of at least 50 m in advance of the stop line, see **Figure 4.82**. If existing carriageway markings do not exist, lane and/or centre line road markings should be provided, but only if the public road is wide enough to have a centre line placed upon it.

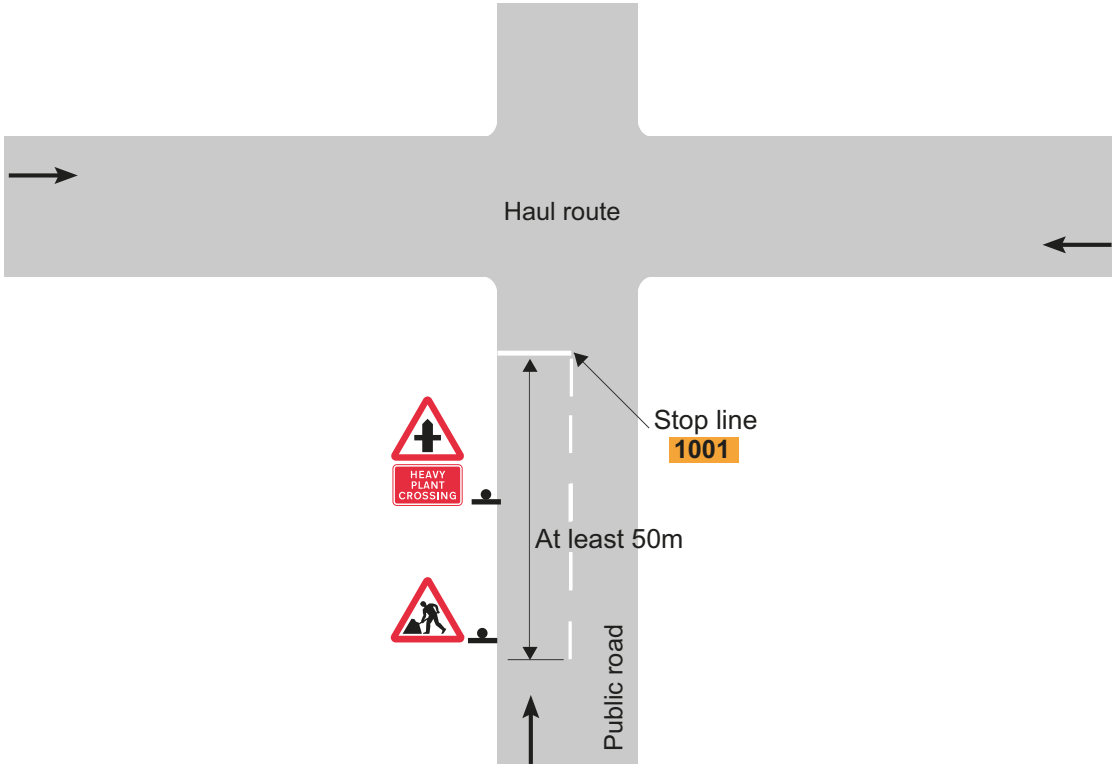


Figure 4.82 Road marking requirements for stop line where existing carriageway markings do not exist

4.28.8. Road markings are not required where a temporary traffic signals stop sign to diagram 7011 (S14-2-58; **Figure 4.83**) is used instead of the stop line to diagram 1001.



Figure 4.83 Diagram 7011 (S14-2-58) Point beyond which traffic must not proceed when required to stop

4.28.9. If the haul route crossing is required to be more readily identifiable by drivers, posts or markers coloured yellow may be implanted to demarcate the corners of the crossing. The recommended sequence of signing for each approach is shown in **Figure 4.84**.

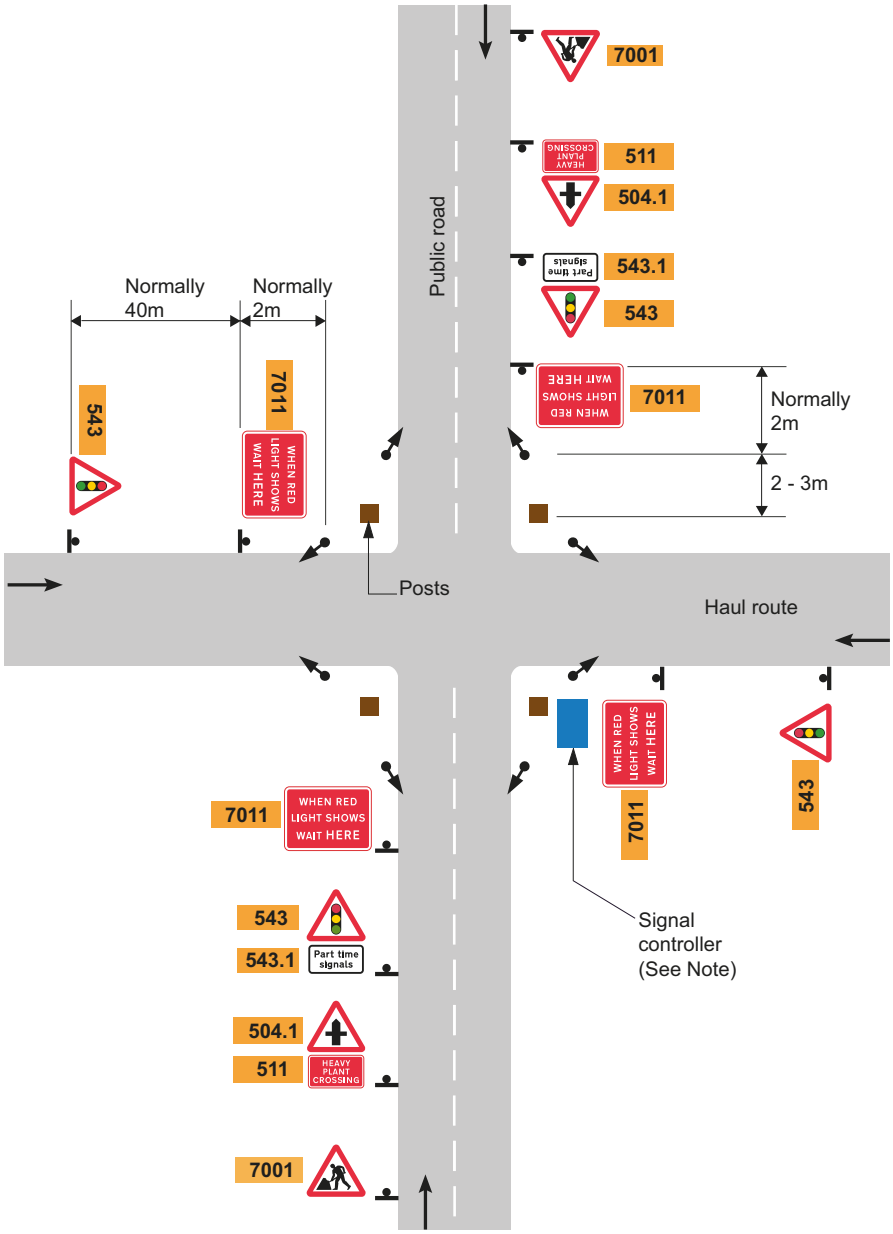


Figure 4.84 Approach signing for a haul route

NOTE: The controller should be sited to provide clear visibility of the site when under manual control.

4.29 Material storage

4.29.1. The issue of material storage and deliveries should form part of the works plan and risk assessment. For works sites with restricted space, the design must consider how materials are safely delivered, stored, and accessed without encroaching into safety zones.

4.29.2. Constraints on the timing of deliveries may need to be considered at the design stage to ensure that materials can be safely delivered. Particular attention must be given to the storage of hazardous materials through The Control of Substances Hazardous to Health Regulations 2002 (as amended) (COSHH) assessments.

4.29.3. Road working materials should not be stored on the central reservation of a dual carriageway. However, if there is an obstruction on the central reservation it should be kept as far from the edges of the carriageway as possible. It should also be in such a position that sight lines are not obstructed, and that any safety fence is not interfered with. Any signs stored in the central reservation should be laid down with legs pointing away from traffic flow.

4.29.4. Obstructions should be lit and marked with signs, unless they have more than the required lateral clearance from the carriageway and/or safety fence. If signs and/or cones are required, it should be remembered that traffic in the adjacent lane will require the appropriate warnings. A coned taper should also be provided (see **Table A1.1** (**Appendix A1**).

Loading and unloading of materials

4.29.5. As part of a works scheme, vehicles may be on the carriageway for the loading and unloading of materials. The number of occasions where this is required should be kept to a minimum as this can create a hazard. Wherever possible, vehicles should not stop on any part of the live carriageway, except where it is a designated stopping, waiting or loading area. If this is not practicable, they should stop within the limits of a properly signed and delineated area. An allowance for waiting space for works vehicles should be made when setting out TTM.

4.30 Builders' skips

4.30.1. Builders' skips should comply with the requirements of this section. Prior written approval from the local authority (or roads authority in Scotland) must be obtained before a skip can be placed on the highway.

4.30.2. The Builders' Skips (Markings) Regulations 1984 require that any skip placed on the highway must be fitted with vertical red fluorescent and yellow reflective markings on each end. This is not required if the skip is placed entirely on a footway or verge. The design and fitting of these markings are detailed in Schedules 1 and 2 of these regulations.

4.30.3. Where a skip is to be placed on the footway, verge or shared space, provision should be made for pedestrians (and any other permitted users e.g. cyclist) and particularly those with a disability, or other relevant protected characteristics.

4.30.4. A skip must be lit by warning lights at each corner during the hours of darkness. Skips may also be guarded by a line of cones at 1.2 m centres (Detail B) on the approach side, set at 45° to the edge of the carriageway. Warning lights must be placed on each cone during the hours of darkness (see **Section 4.22**).

Specification for builders' skips

4.30.5. Specifications for builder's skips can be found in:

- Highways Act 1980 – Section 139.
- Road Traffic Regulation (NI) Order 1997.
- Roads (Scotland) Act 1984: Sections 85 and 86.

4.30.6. Bulk containers used on the highway for disposing of materials and rubbish will need to comply with the appropriate Motor Vehicles (Construction and Use) Regulations (1986) when carried on a vehicle.

4.30.7. Acceptable container dimensions for placement on the highway need to be approved by the local authority and should not exceed 5 m in length by 2 m in width.

4.30.8. The ends of containers should be marked as follows:

- the ends of skips should be painted yellow.
- markings must be provided adjacent to the outer edge of each end of the container in accordance with the following, as appropriate:
  - the Builders' Skips (Markings) Regulations 1984 (SI 1984 No.1933).

- the Statutory Rules Roads (Control of Builders Skips) Regulations (Northern Ireland) 1979.
- the Builders' Skips (Markings) (Scotland Regulations 1986 (SI 1986 No.642)).
- Specification BS AU 152: 1970.

4.30.9. At least four lamps (one at each corner) should be fixed securely to the container or suspended from the corners, or as specified by the local authority.

4.30.10. The container should be clearly and permanently marked with the owner's name and telephone number or address.

4.31 Non-motorised road users

4.31.1. Where non-motorised road users are affected by road works, the designer should consider how to minimise impact on them and ensure suitable alternatives exist. This consideration should include the following:

- review length and advance signing of diversions.
- safety implications of temporary surfaces, obstructions, ramps, and diversions.
- impact on landowners.
- standard of surface, gradients, and lighting.
- adequacy of lane widths for cyclists past works and/or on diversion routes (see Traffic Advisory Leaflet 15/99).
- adequacy of crossings for pedestrians.
- the needs of children, particularly if schools or play areas are nearby.
- the impact on bus stops.
- closing off of unsafe access across works.

In all situations the relative impact on old users, the disabled (particularly those with limited mobility), or other relevant protected characteristic must be considered. If needed those who are statistically more likely to be disabled etc, may be given preference to those types of non-motorised users that are statically less likely to have a relevant protected characteristic i.e. pedestrians over cyclists or equation users.

4.31.2. The process of deploying and removing TTM should be designed in such a way that they are only deployed just before works start and removed as soon as works finish. TTM should not be stored on the street in a way that creates an obstruction.

4.32 Pedestrians

4.32.1. Pedestrians must not be forced into dangerous situations. They should be protected from the works and vehicular traffic by continuous barriers. Barriers should clearly delineate the works and warn pedestrians of their presence. Continuous barriers surrounding the site must be erected where the works are unattended (see **Sections 4.16** and **4.17**). Any obstructions on the footway should be well-guarded by a continuous barrier or fence, including when the pedestrian route is diverted onto the carriageway. Warning lights should be added to barriers or fences at night.

4.32.2. If barriers are to be placed across existing pedestrian crossing points, consideration must be given to the provision of nearby drop kerb arrangements to avoid issues for mobility impaired users, pedestrians with pushchairs etc.

4.32.3. When a pedestrian route is diverted into the carriageway, ramps must be provided for wheelchair and scooter users. Ramps should have a slip resistant surface and a gentle slope.

The maximum gradient should be 1 in 20. When possible, the layout should include a platform at kerb level which would allow wheelchair and scooter users to turn through 90° before descending.

4.32.4. Where ramps, raised footways or boards are provided, they should be fit for purpose in accordance with 'Safety at Street Works and Road Works – A Code of Practice' (2013) (see **Appendix B**).

4.32.5. Where possible, apart from in exceptional circumstances, temporary pedestrian ways should be at least 1.5 m wide. They must never be less than 1 m wide. Where the normal pedestrian route is severely interrupted, 'route for pedestrians' signs to working drawing 7018 (S13-9; **Figure 4.85**) should be provided.



Figure 4.85 Sign to working drawing 7018 (S13-9) Route for pedestrians and other non motorised users (Alternative types)

4.32.6. The designer should consider if barriers are necessary to restrict crossing points and if additional signing is necessary to warn pedestrians of changed traffic movements. The 'RIGHT' or 'LEFT' sign to working drawing 7017 (S13-9; **Figure 4.86**) is used at road works to warn pedestrians of the direction which one-way traffic is approaching from. A double-faced sign with 'LEFT' on one side and 'RIGHT' on the other should be provided at the edge of the carriageway facing across the road. This sign may also be varied to read 'BOTH WAYS'.



Figure 4.86 Sign to working drawing 7017 (S13-9) Pedestrians look left, or right, or both ways

4.32.7. The 'route for pedestrians' sign to working drawing 7018 (S13-9; **Figure 4.85**) is used where the normal pedestrian route is diverted and the alignment of the new route is not obvious. Signs to diagram 606 (S3-2-1) and 610 (S3-2-3) should not be used to direct pedestrians.

4.32.8. The 'CROSSING NOT IN USE' sign to working drawing 7016 (S13-9, **Figure 4.87**) should be attached to each post of any type of pedestrian crossing which is temporarily taken out of use. In this case, the need for an alternative crossing should be considered.



Figure 4.87 Sign to working drawing 7016 (S13-9) Crossing not in use

4.32.9. Where the footway is diverted into the carriageway, a safety zone must be provided between the outer pedestrian barrier and the live traffic. If the works themselves are next to or in the carriageway, a safety zone must be provided as described in **Section 4.2**.

4.32.10. Where the conditions for working off the carriageway cannot be met, pedestrians will need to occupy part of the carriageway. As such, safety measures similar to those needed for works in the carriageway should be adopted (see **Section 4.2**).

4.32.11. Where a contraflow is to be introduced on an all-purpose dual carriageway, particularly in an urban area, the need for signing and guarding for pedestrians should be considered.

4.32.12. Traffic cones must not be used as a pedestrian barrier system. When placed in the carriageway, pedestrian barriers must be separated from the adjacent traffic lane by traffic cones or temporary vehicle safety barriers. Pedestrians and vehicular traffic must never be separated by only a pedestrian barrier.

4.32.13. Footways should be of a suitable width for the volume of pedestrian traffic. If sufficient width cannot be maintained on existing footways, then alternative measures should be put in place. The measure chosen should be based on a site-specific risk assessment. Options include:

- placing a temporary footway in the carriageway.
- diverting the footway onto a verge or across the road, or
- escorting pedestrians through the works using signing and staff.

4.32.14. The needs of people with visual or mobility impairments, wheelchair or scooter users, and people with prams should be considered. Sites should be guarded on those sides accessible to pedestrians to protect the visually impaired. This is not necessarily restricted to the footway side of the works. Provision may need to be made for people crossing the road. There must be a pedestrian barrier which may be readily detected by a visually impaired person using a stick (see **Section 4.17**).

4.32.15. When temporary pedestrian routes need to be placed in the carriageway, the signing and guarding should be placed before the footway is blocked.

4.32.16. The colour on the back of signs is detailed in S13-12-8. The sign frame/post may be any colour, ideally one that is conspicuous (e.g. yellow).

4.32.17. The surface of a temporary footway must be of an adequate standard. Acceptable options include:

- well-secured timber planking (free of projections).
- compact fine-grained material, or
- tarmacadam.

4.32.18. Unacceptable materials include:

- unbedded flagstones.
- loose hardcore.

4.32.19. Ramps must be provided where temporary footways are diverted across a kerb. A temporary alternative facility may also be provided to replace any ramped access way which is broken up or obstructed.

4.32.20. Hazards on the footway (e.g. open chambers, excavations) must always be adequately guarded. They must never be left unattended unless the covers are replaced, plated over, or protected by barriers.

4.32.21. When a cable or pipe is pulled from a drum or coil, care must be taken to avoid injury to workers or pedestrians and to avoid creating an obstruction on the footway or carriageway.

4.32.22. Footways must always be kept clear of mud and other loose materials.

4.33 Cyclists and equestrians

4.33.1. The safety of cyclists needs be considered on all-purpose roads. Where it is not possible to maintain safety for cyclists on the main carriageway, especially when narrow lane techniques are applied, then alternative provision will need to be provided. This may require cyclists to dismount.

4.33.2. Certain types of layout can cause difficulties for cyclists, including longer lengths of traffic control on single carriageways and narrow lanes. In such situations, it is recommended for an alternative cycle route to be provided or require cyclists to dismount and use the footway. Widths of between 2.75 m and 3.25 m for nearside lanes should be avoided. If there are limiting physical factors which would justify the use of lane widths less than the desirable minimum, then consideration must be given to minimise the risk to road users and road works. Guidance on lane widths is given in **Section 4.3**.

4.33.3. The design of works must permit cyclists to safely travel through works at up to the relevant speed limit identified in **Section 4.8**.

4.33.4. Cyclists are particularly vulnerable to rough surfaces and gullies at the edge of the carriageway. The designer should ensure that surfaces are kept level and in good condition where there is known cycling demand. Guidance on surface condition is given in **Section 4.46**.

4.33.5. Where traffic is subject to traffic control on single carriageways, the design of the works will need to take into account that controls apply to all vehicles (including cyclists). The time required of cyclists to travel through sections of traffic control must be considered as part of the design of the works. This is critical where traffic signals are in use. Guidance on the use of portable traffic signs is given in **Section 13.9**. Where possible, segregated cycle lanes or routes away from the carriageway should be provided, particularly on dual carriageways or multi-lane roads. If this is not possible then consideration of the need for cyclist to potential dismount, and use a shared space with pedestrians, will be required.

4.33.6. Partial contraflow schemes must be of adequate width to allow wider vehicles to safely pass cyclists.

4.33.7. Equestrians are less likely to be present but must still be considered with much of the advice above being equally relevant.

4.34 Free vehicle recovery facilities

4.34.1. When works are likely to cause congestion, accidents or breakdowns can result in stationary traffic and hazardous situations. Therefore it may be appropriate to have recovery vehicles on site or available on immediate call out. It is essential to have an efficient recovery service and a well-defined operational procedure in the event of an incident.

4.34.2. On dual carriageways where the hard shoulder is utilised as a running lane, there may be no refuge for a broken-down vehicle. In such case, the provision of a recovery vehicle service is recommended for the duration of the hard shoulder usage. Recovery vehicles should be located on the approach to the affected length of road works so that recovery can be completed as quickly as possible.

4.34.3. Issues which need to be considered include:

- the number and siting of recovery vehicles.
- communication systems.
- the siting of drop-off points.
- facilities provided (e.g. toilets, lighting).
- the system for identifying vehicles in need of recovery (e.g. CCTV, patrols).
- specifying a regime to ensure compliance with contractual requirements.
- the needs of vulnerable vehicle occupants.

Any provision of free recovery facilities must be designed to be safe for road workers at the permanent limit and for road users at the identified highest safe speed in **Section 4.8**. There may be situations where this level of safety will need to be maintained by physical measures e.g. IPVs or MCC/EMCC.

4.34.4. The role of police and communication details (particularly with regard to procedures for dealing with abandoned vehicles) should be agreed with the police and appropriate control centres at an early stage of the design process.

4.34.5. The provision of a free recovery service should be considered whenever works are likely to involve the following:

- reduction in the number of lanes.
- narrow lane widths.
- sections of motorway without hard shoulders.
- hard shoulder running.
- known congestion sites.
- decommissioning of emergency telephones over a significant length of carriageway.

4.34.6. When a free recovery service is implemented at a works site, 'Free recovery Await rescue' signs to diagram 7291 (S13-6-40; **Figure 4.88**) should be placed at intervals throughout the site. The 'Free recovery End' (see **Figure 4.89**) should be used at the end of the section of carriageway served by the free recovery service. Further information on these signs is given in **5.12.21** to **5.12.23**.



Figure 4.88 Diagram 7291 (S13-6-40) Information on recovery provision during road works



Figure 4.89 Diagram 7291 (S13-6-40) Information on end of recovery provision during road works

Liaison and planning issues for free vehicle recovery facilities

4.34.7. Early planning and consideration of the available options is essential to ensure the right level of service is provided and the cost minimised. The police and (where appropriate) traffic officers should be involved. They can provide advice on the need and specification of recovery services which are appropriate to the affected area of the network.

4.34.8. The designer should note that local police forces are likely to have their own contracted recovery operators. They may be able to provide advice and guidance on the performance and capabilities of local operators.

4.34.9. The highway maintaining agent should be consulted for advice on the proposed locations of recovery stations and setting down points. These should also be checked to ensure they do not conflict with proposed works.

4.34.10. Where it is proposed to implement temporary facilities for recovery operators outside the highway boundary, the local authority will need to be consulted over planning consent issues, waste arrangements and statutory charges.

4.34.11. Siting of recovery operations on the local road network (i.e. off the dual carriageway) should be discussed with the local authority. A written agreement of proposals should be obtained.

4.34.12. The procedure for dealing with abandoned vehicles should be agreed at an early stage of the design process.

Monitoring the site for free vehicle recovery facilities

4.34.13. To achieve the rapid removal of broken-down vehicles, it is essential that an efficient system is set up to monitor the affected network. This can be achieved using one of the following:

- Closed Circuit Television (CCTV) – These allow for 24-hour monitoring and recording of the affected network. They are reliable but relatively expensive to install and maintain. CCTV systems can be linked to the recovery contractor's office or to a dedicated monitoring station. Monitoring stations should be manned for the duration of any restrictions imposed by the works. They should also be provided with appropriate communication systems.
- Dedicated roving patrols – these offer a cheaper alternative in terms of set-up costs. Recovery or contractor's staff drive through the works area looking for broken-down vehicles and report any to the recovery base. Dedicated roving patrol vehicles should not be used to protect broken-down vehicles, unless they are fitted with a crash cushion. Dedicated roving patrols are not recommended for larger sites where congestion is likely to be a major problem.
- Watcher – This requires contractor's staff within the site area acting as lookouts for broken-down vehicles. This is the cheapest of the options and can be very effective within small sites. However, they have limited value on larger sites but can be useful when used alongside dedicated roving patrols.
- Temporary systems which monitor connectivity of devices traveling through the works and/or stopped vehicle detection etc, are becoming available and should be considered. These systems may be part of the permanent infrastructure, and may be used, if considered still to be reliable. Permanent systems will need to effective at the highest safe speed, see **Section 4.8**, otherwise temporary systems must be used which are effective at the indicated highest safe speed.

Level of service for free vehicle recovery facilities

4.34.14. The level of recovery service employed should be appropriate to the risk of accident and/or the scale of congestion likely to develop.

- Dedicated on-site recovery equipment – this is a costly option as the recovery vehicles and staff are based on site permanently for the duration of the works. Responses times are usually quicker than other arrangements but will depend on the size of the site and number of bases.
- Local arrangements – this system relies on there being local recovery services available. The contractor should arrange with a local service provider for a priority call-out system. The chosen local recovery operator needs to be either supervised while in the works or be given regular training/briefing. The designer should specify the required service level, including response times and minimum equipment levels.

Location of dedicated recovery services

4.34.15. The designer should ensure there are suitable locations for a recovery base station by consulting with emergency services and adjacent Highway Authorities. The final choice should be left to the contractor unless particular safety implications limit the number of suitable locations.

4.34.16. When choosing the location of the base, designers and contractors should consider the safety of recovery operators and road users. Recovery vehicles should not be required to make dangerous manoeuvres on the network to enter or exit their base. If located next to the carriageway they should be suitably protected from accidents involving errant vehicles or debris by using cones or safety barriers. Where appropriate, base stations may be protected by location (e.g. behind bridge abutments/piers) provided visibility for access and exit is not compromised.

4.34.17. The likelihood of congestions and/or accidents will influence the level of recovery service and response time required. This should be considered earlier in the pre-contract planning process.

4.34.18. The designer and contractor should carry out a risk assessment of the proposals before implementation. The authority should be satisfied that this risk assessment is adequate before agreeing to a location.

4.34.19. When choosing the location of the base, the designer and contractor should consider use of the following:

- Motorway service areas – if convenient for the works, they offer an ideal and safe location. Local permission from the operators must be obtained.
- Local garages located off network – these are not appropriate where traffic congestion is likely preventing rapid access. Response times will be dependent on distance from site.
- Hard shoulder and slip roads – sufficient width should be provided to ensure good accessibility. If there is insufficient width, the back of the hard shoulder may be temporarily widened. Adequate protection is essential. Consideration must also be given to arrangements for recovery vehicles to turn around before returning to base.
- Access roads – where access roads are provided for emergency access or gritting purposes, these can offer a useful location for the recovery base provided there is sufficient width to accommodate their intended use.

- Verge hardstandings – where there is sufficient highway land, a temporary hardstanding behind the hard shoulder or verge may be constructed to accommodate the base station. Temporary hardstandings should be removed once works are completed to prevent their use as general stopping points.
- Abnormal load lay-bys – if conveniently located near the works, these can offer a low-cost option. Prior to their use, the police must be consulted regarding likely abnormal load movements during the works period. Appropriate protection should be provided, including signing used to deter illegal parking (e.g. parking place sign (S4-4-2) varied to 'abnormal loads only').
- Emergency refuges – these should be avoided if possible unless the works prevent their use by road users.
- Service provider's depots and compounds – local maintenance depots and winter maintenance compounds may be used providing there is sufficient space and easy access to the network. The designer should seek the client's permission for use at a very early stage of planning so that issues of safety and security can be addressed.
- Surplus land – land located within junctions or owned by the authority may be used providing their use does not cause safety concerns.

4.34.20. The designer and contractor should consider the following when deciding upon a setting-down location:

- Safety – recovered motorists should be protected from involvement in road traffic accidents as far as reasonably practicable. Hence, the setting-down point should not be located on a high-speed road. Physical barriers should be provided to give some protection from traffic.
- Security – it is important that recovered occupants are safe from criminal threat or activity. In remote locations it may be necessary to provide staff or CCTV and lighting to safeguard them.
- Facilities – all locations should have telephone facilities so recovered occupants can arrange further assistance. Where dedicated telephone facilities are not available, the recovery service should include making telephone contact on behalf of the recovered motorist.

4.34.21. In addition to the above requirement, the following items are deemed desirable but not essential:

- toilet facilities.
- drinking water facilities.
- shelter with heat, light, and seating.

Where these are not present the recovery service will need to check for any relevant protected characteristic e.g. disability or age, where the lack of facilities would have a disproportionate impact. In these cases recovering them to a location which does have these facilities may be required.

4.34.22. The following are typical locations that may be considered for use as setting-down locations for recovered vehicles and occupants:

- Motorway service areas – service areas provide the facilities listed above. Setting down recovered vehicles and passengers at a service area should be considered whenever it is near a works site. Service area operators should be consulted at the planning stage to ensure there are no problems.
- Local services or garages – checks should be made to ensure facilities are 24 hour and the local police should be consulted to ensure there are no security issues.

- Contractors' compound/Winter maintenance compounds – where they are located close to the works site and have enough land for parking and facilities, contractors' compounds may be considered for a setting-down location. For safety and security, it will generally be necessary to fence off the setting-down area from plant, materials, and any potential hazards in the compound. For winter maintenance compounds, operational times may not coincide with site times causing problems for access/security.
- Temporary lay-by – where there is sufficient highway land, a temporary lay-by behind the hard shoulder may be constructed to accommodate recovered vehicles and passengers. Construction may not be feasible where limited by the landscape and land ownership factors. Temporary lay-bys should be removed once works are completed. Where providing a temporary lay-by would involve substantial costs, more cost-effective alternatives should be considered.
- Off-route lay-bys – where works are near a suitable junction, a lay-by on an adjoining road may provide a good location for setting down recovered vehicles and occupants.

Recovering organisations should normally be advised of the location if further recovery or repair is needed. Additionally, any access arrangements may be provided to operators. Recovery operators will need to undertake any further recovery and repair as though the location was part of the road or highway. This is required to maximise cooperation from recovered road users.

4.34.23. The list given in **4.34.22** is not exhaustive. There may be circumstances where a combination of these locations on a day/night basis may be most appropriate. The police may be able to provide local knowledge and advise on unique locations which meet the requirements for setting down recovered vehicles and occupants.

Vehicles and equipment for free vehicle recovery facilities

4.34.24. The Specification for Highway Works provides a generic specification for basic types of recovery vehicles, equipment, and inspection requirements. This is likely to be suitable for similar local authority roads.

4.34.25. The designer should note that the list of equipment represents only guidance. Therefore, they should consult with a recognised recovery industry association for detailed guidance on the latest equipment and vehicle capabilities. Alternative equipment specifications should be agreed with the authority.

4.34.26. An effective recovery system relies on good communication between relevant parties. The contractor should provide an effective two-way communication system. Local communication black spots or low signal areas should be considered. Secondary 'back-up' communication systems should also be provided to ensure continued service.

4.34.27. The use of an IPV (see **Section 14.9**) should be considered where vehicle speeds are greater than 30 mph. An IPV can protect the scene of the recovery both at the incident site and at the setting-down point.

4.34.28. The breakdown/recovery contractor entering the coned-off area to assist a broken-down vehicle need be aware of the current nature of the works to consider how their actions may affect others in accordance with the relevant Health and Safety at Work Act (Health and Safety at Work etc. Act 1974, the Health and Safety at Work (NI) Order 1978). Third party breakdown/recovery operators must not enter a coned-off area unless instructed that they may do so by the main contractor directly, or their recovery contractor where present.

4.34.29. A dedicated landline, IP based phone system, or other system which can provide a sufficient reliable connection should be provided between the recovery base station/CCTV monitoring station, the appropriate control centre, and the police for use in emergencies.

4.34.30. The recovery operator must have appropriate insurance which covers damage to broken-down vehicles during recovery as well as third-party liability insurance.

4.34.31. Vehicle recovery operatives should have appropriate competency certificates for the tasks they are performing. They must also hold a current driving licence for the appropriate vehicle being operated.

4.34.32. All recovery operators working within National Highways construction sites must be accredited to the relevant competency based training requirements; this is the Sector Scheme for Vehicle Recovery at Highway Construction Sites (NHSS13). Details of the scheme can be found on the LANTRA website (LANTRA; https://www.lantra.co.uk/national-highway-sector-schemes-nhss/schedule-of-suppliers). Other authorities may also require compliance with this competency scheme.

4.34.33. The company employing vehicle recovery operatives should ensure that each individual is vetted in respect of any right to work requirements which may include a Disclosure and Barring Service check. This may be audited under the competency based training scheme.

4.34.34. A sample of the leaflet which should be handed out to drivers/riders of recovered vehicles can be found in the Specification for Highway Works. The leaflets should include telephone numbers and an email address from which motorists can obtain further assistance.

Other vehicle recovery provision

4.34.35. Where recovery vehicles are not immediately available at a works site, consideration should be given to how broken-down vehicles are recovered by road recovery operators.

4.34.36. While any section of road coned-off ceases to be an acceptable place of relative safety/refuge, motorists in difficulty may choose to access a coned-off area. However, signs advising drivers to use a coned-off area in the event of an emergency must not be used (see **Section 7.10**).

4.34.37. A broken-down vehicle not located within the coned-off area must be treated as an emergency. Where the road user has arranged for a third party recovery operator, the operator must always consider their own safety before the safety of the occupants of the casualty vehicle. The operator must carry out a risk assessment to determine how the incident should be dealt with. If the operator considers it too dangerous to attempt a removal without assistance, then they should contact the appropriate control centre or their supervisor. The police or traffic officer service may also be requested to attend to help protect the scene.

4.34.38. If the exact location of the casualty vehicle is not known, the operator may need to drive through the area of road works to determine the most appropriate place to enter the coned-off area. Access to the works area is only to be gained using the approved signed access points if these are present. Where cones are roped together, particular care must be taken. An operator should never create an opening by moving TTM (e.g. cones).

4.34.39. After gaining permission to enter the works, but before entering the works area, the operator should check that any vehicles behind are at a safe distance. Also, approximately 100 m before the access point, the operator should check that it is clear for entry and gradually slow down to an appropriate speed. If the access point is blocked, the operator should not

attempt to enter the works and must continue on the main carriageway. The operator should never stop in a running lane without physical protection e.g. IPVs.

4.34.40. The speed limit within a works area should be complied with and seatbelts must always be worn. The operator should exercise extreme caution when driving within a works area.

4.34.41. Where workers are on site, the operator should contact the works manager and inform them of their intentions. The guidance and/or assistance of workers should be requested in both accessing the casualty vehicle and when leaving the works area.

4.34.42. Wherever possible, operators should only access casualty vehicles from the side furthest from live traffic. Walking or working in between the casualty vehicle and running lanes should be avoided wherever possible.

4.34.43. Extreme caution must be applied where the operator is required to reposition their vehicle to carry out the removal of the casualty vehicle. If workers are present, they should be asked to provide assistance.

4.34.44. Operators should be aware of any overhead cables that may be present and comply with any overhead safety signage instructions.

4.34.45. Operators should only exit an area of road works using the approved signed exit points if these are present. An exit should never be created by moving any TTM (e.g. cones). When leaving a works area, an operator should only re-join the main carriageway once their vehicle has reached a speed that allows them to do so safely.

4.34.46. Where the casualty vehicle has been repaired, the operator should advise the driver of the correct procedure for re-joining the main carriageway.

4.34.47. Operators should carry out their duties in accordance with the requirements of:

- PAS 43:2018 Safe working of vehicle breakdown, recovery, and removal operations Management system specification (available from the British Standards Institution).
- 'SURVIVE Best Practice Guidelines v4/18' (available on the SURVIVE website – www.survivegroup.org).

4.35 Emergency access

4.35.1. Emergency access to works zones may be necessary in the event a carriageway is blocked and queuing occurs. Consideration should be given to emergency access to all parts of the works area and highway which are subject to TTM.

4.36 Emergency route

4.36.1. If an incident blocks the running lanes, the site access lane may be requested, by police or traffic officers, to be used by general traffic. Site personnel should take particular care during such periods. For a full contraflow, a continuous, well-defined emergency route must always be available on the primary carriageway. This does not have to be part of the normal site access.

4.36.2. A tidal layout with bounded single lane (and other layouts with a single lane with VRS on both sides) is particularly vulnerable in the event of an incident. In an emergency, the tidal lane could be closed and cleared to allow services to access the incident. Alternatively, to allow operation in the reverse direction should an incident cause a blockage on an opposing lane (see **Section 7.25**).

4.36.3. Where continuous lengths of temporary vehicle restraint barriers are used in narrow lane running, the police may request openings to allow access to and from the open carriageway. Such openings require special consideration and enhancement at the downstream end of the opening to deter encroachment by public traffic.

4.37 Surveillance/use of CCTV

4.37.1. At any incident, to reduce incident duration, good communications and effective surveillance must be in place to coordinate recovery and emergency services.

4.37.2. Where permanent CCTV, Stopped Vehicles Detection (SVD), VMS and traffic information systems are available, consideration should be given to their use, subject to consent by the police or appropriate service operator. These are required to be sufficiently effective without any reduction in speed limit from that identified as being the highest safe speed in **Section 4.8**.

4.37.3. If provided, CCTV, or other detection systems, should be monitored continuously. To be effective, camera locations need to be carefully selected to ensure comprehensive coverage through the site and on approaches. The control centre should be in the site compound if possible. It should serve as the main communications link to recovery, emergency services, and contractor's/resident engineer's staff. Multiple means of communications (e.g. site radios, landline/mobile telephones) should be provided to ensure a continuous communication facility.

4.37.4. Alternative technology options such as temporary/mobile SVD systems and those systems which monitor connectivity e.g. speed of mobile phones, connected vehicles etc, may be considered to augment (but not replace) any CCTV system.

4.38 Incident and accident management systems

4.38.1. The statutory requirement to record and report incidents (RIDDOR 2013 and Section 25 of the Road Traffic Act 1972) must be supported with a management system created to record all site incidents. In particular, those which are TTM related.

4.38.2. The incident management system must incorporate a feature which identifies unexpected levels or categories of incidents. This will allow risks to be mitigated proactively. In England, for works on the trunk road network, appointing a dedicated Traffic Safety Supervisor (TSS) provides a first line of reporting to assist in this procedure. The appropriate authority should be consulted for works on other roads.

4.38.3. The Traffic Safety Supervisor (TSS) is also commonly referred to as a Traffic Safety and Control Officer (TSCO), See DMRB GC106 'Working on Highways' and Supply Chain Safety Leadership Group document 'Raising the Bar 39 - Traffic Safety and Control at Roadworks'.

4.38.4. The incident management system should include:

- formal reporting.
- review meetings.
- an individual responsible for record keeping.
- an operational structure.
- contingency plans.

4.38.5. Further issues concerning incident management are considered in Appendix C of 'Guidance for Safer Temporary Traffic Management' (CSS/HA/HSE 2013); see References (**Appendix B**).

4.39 Temporary variable message signs

4.39.1. Variable message signs (VMS) have the potential to provide dynamic and high visual impact messages to road users. The use of temporary VMS (typically trailer-mounted) may be considered as an addition to fixed signs. Any messages displayed on these signs must comply with TSRGD or be authorised. In Great Britain VMS legends must be white or yellow; white has a longer potential reading distance but is less effective in poor weather conditions. Information on the use of portable VMS is given in the National Highways document ‘Guidance for the use of variable signs and signals’.

4.39.2. VMS can be particularly useful at the following locations:

- near advance road work warning signs where queues are likely to form.
- in advance of work, and in advance of junctions for alternative routes, providing journey time information.
- as additional support to keep left (or right) arrow signs at point of lane closure.
- in the lane change zone (i.e. within 200-800 yds) of a lane closure in place of wicket signs indicating a closed lane to diagram 7202.1 (S13-6-13; **Figure 4.90**).

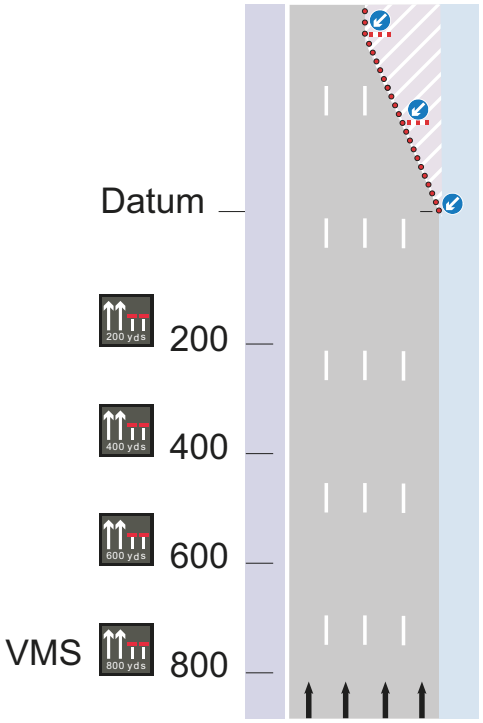


Figure 4.90 VMS replacing the nearside fixed plate lane closure ‘wicket’ signs

4.39.3. On wider carriageways there is a greater chance of nearside signs being obscured to offside traffic by vehicles in the nearside lanes. High-mounted VMS are useful when a sign is required on the verge and there is no suitable location for an offside sign.

4.39.4. Temporary VMS products will need to comply with the relevant requirements in TSRGD and BS EN 12966 ‘Variable message signs’. Not all characteristics or classes in the standard apply to temporary VMS. More information on requirements applicable to temporary VMS can be found in CD 130 ‘Design of temporary traffic management at road works and temporary layouts’. Where VMS does not display aspects with a constant light output then it must display the aspect whole, as prescribed or authorised, at a minimum frequency of 90hz.

4.39.5. Further details on the design of legends and aspects on signs for use on temporary VMS see **Appendix A4**.

4.40 Matrix signals

4.40.1. Permanent motorway matrix signals are generally located at intervals on the central reservation, near side verge and at junctions. On some sections of motorway, these signals are placed on gantries and used to display temporary restrictions. They are operated either by the police or the authority from control centres. Motorway telephones are also connected to the control centres.

4.40.2. The use of matrix signals is normally restricted to situations where the normal methods of traffic control are unlikely to be effective (such as with accidents or incidents). However, in works these must only be set when requested by the contractor, or when identified in the traffic management plan, see **Section 8**. Signals can be used to assist during the setting-up, alteration, or removal of TTM arrangements, when the signs can display a message such as 'WORKFORCE IN ROAD' (see **13.3.3**). Where these signals are located on the approach to fixed taper positions, and have sufficient reliability for planned works (relating to power and control systems) they may be used to display lane usage information see **4.7** (any relevant S.I or order will need to permit them to be used for planned works.

4.40.3. Other than used with fixed taper positions once the normal static signs and cones have been installed and the workforce are clear of the remaining live carriageway, the message should be switched off. The precise arrangements to be adopted should be agreed between the contractor, authority (or the agent acting on its behalf) and, if relevant, the police.

4.40.4. When TTM is set up to close traffic lanes or divert traffic onto the hard shoulder at locations where matrix signals are present, there is a risk that the signals could be set to give contradictory or confusing indications. In such cases, the police or control centre must be notified and kept informed (normally directly or through a traffic management plan) so that they can take account of the changed lane situation if the matrix signals need to be activated.

4.40.5. Depending on the nature of the works the authority (or the agent acting on its behalf) should be informed of the possible need to disabled the signals to prevent the accidental display of inaccurate messages. Where queue detection systems (e.g. MIDAS) are installed within the area of the works, consideration should be given to disabling the system for the duration of the TM operations. Normally would not apply to the approach and lane change zones where MIDAS may continue to be a benefit.

4.41 Publicity

4.41.1. The designer should anticipate the effect of the works on traffic flow and endeavour to minimise delays whilst being careful not to compromise safety. Advance signing and early publication to road users and property owners / landowners are the first steps in addressing this problem. This allows for journeys to be planned and early appropriate action by landowners to avoid possible congestion.

4.41.2. When appropriate, publicity should be carried out in conjunction with the relevant public transport operators to mitigate the impact on services. To meet the needs of passengers with mobility and visual impairments, the use of different media (e.g. websites, local radio) should be considered.

4.42 Temporary lighting

4.42.1. Road works sites may be floodlit. In some cases, temporary lighting may be installed to enable work to proceed in the hours of darkness. Special attention should be given to the orientation of the lighting units to ensure that drivers are not dazzled. Illumination quality should

be such that the work involved can be carried out to the appropriate standard. Safety fencing may be necessary if temporary lighting columns are erected.

4.42.2. The temporary lighting of crossovers is covered in British Standard BS 5489-1:2013. Additional advice is given in DMRB.

4.43 Scaffolding

4.43.1. A risk assessment will need to be provided where scaffolding or other temporary structure (e.g. scaffold tower or hoarding) is to be erected on or next to a road. This is particularly necessary if part of the scaffold is on the carriageway or edge of the footway. The site of the structure must be suitably signed and guarded in accordance with the appropriate principles of the design document. Safety clearances described in **Section 4.2** will always need to be adhered to.

4.43.2. Where scaffolding or other temporary structures are erected on or next to a footway (or any other part of a road), their presence must be made clear to the visually impaired.

- Each tubular support should be provided with a white band. This should be at least 150 mm in depth, with the lower edge of the band being about 1.6 m above ground level.
- Temporary close-boarded structures delineating a footway should be provided with a continuous white band of the same depth and height in the immediate vicinity.
- Scaffolding and temporary structures next to a footway should be lit during the hours of darkness.

4.43.3. A scaffolding licence or other appropriate licence must be obtained from the local authority (or roads authority in Scotland). The structure should display an emergency contact telephone number.

4.44 Works off the carriageway not requiring guarding and signs

4.44.1. Where works vehicles cannot fully pull off the carriageway during off-carriageway operations, a risk assessment should be carried out. Where the risk assessment identifies that advance signing should be provided, the working space should be extended into the carriageway to include adequate space for works vehicles, and TTM as indicated in Sections 6 and 7 should be provided.

4.44.2. Generally, where works are carried out off the carriageway on minor single carriageway roads, there will be no need for signs to warn vehicular traffic in the following situations:

- when the works are wholly within a verge not used by pedestrians and a clearance of at least 0.5 m exists between the working space and the edge of the carriageway; see **Section 4.2**.
- when the works are on a footway or verge used by pedestrians where an unobstructed width of at least 1.0 m can be maintained for pedestrians on the side of the works segregated from the carriageway and a safety zone of 0.5 m can be maintained between the works and the carriageway, or
- when the works are on roads with a permanent speed limit of 30 mph or less, on a footway or verge used by pedestrians where an unobstructed width of at least 1.0 m can be maintained for pedestrians on the carriageway side of the works. The 1.0 m width for pedestrians would constitute the necessary safety zone for road workers.

4.44.3. No signing or guarding will be required in the carriageway for vehicular traffic when work is being carried out off the carriageway on all-purpose carriageway roads in daylight on or above a footway, verge, central reservation, or traffic island in the following circumstances:

- on all-purpose single carriageway roads.
- on dual carriageway roads where the speed limit is 40 mph or less.
- on dual carriageway roads subject to the national speed limit, providing they are no longer than 5 km in length and lie between successive lengths of single carriageway road.
- when the work comprises of inspections, minor repairs, lamp changing or the cleaning of signal heads, and can be done within the limits of the existing refuges.
- when working on fixed apparatus which is closer to the edge of the carriageway than specified below, provided the person carrying out the work, the tools and equipment being used and any ladder are not closer to the edge of the carriageway than the apparatus being worked upon.
- in any other situation, provided the horizontal clearance distances from the edge of the carriageway to the person carrying out the work, the tools and equipment being used and any ladder, are not less than 0.5 m on roads with speed limits up to and including 40 mph and 1.2 m minimum where the speed limit exceeds 40 mph.

4.44.4. For works which are completely outside the carriageway, a risk assessment of their impact on adjacent traffic should be carried out. Consideration should be given to the number of works vehicle movements anticipated and the number of personnel working alongside the carriageway.

4.44.5. Works which do not affect vehicular traffic in any way should not be signed with a 'road works ahead' sign to diagram 7001 (S13-2-9) or 'keep left/right' signs to diagram 610 (S3-2-3). In certain circumstances, coning of the verge to delineate the works area may provide information for drivers that operations are underway off the carriageway and give reference points to the workforce of their works area.

4.45 Reduction in visibility distance

4.45.1. Because visibility reduces when road works are situated near a bend (especially a left-hand bend) it is essential that adequate advance warning is given to approaching drivers. An indication should be given of the path that must be followed to avoid any obstruction in the carriageway. This applies to all works, including those of a short duration.

4.45.2. A tapered line of cones must start far enough in advance of the obstruction to enable drivers to negotiate both the bend and the obstruction safely. The tapered line of cones must be located in advance of the bend so that it is clearly visible on the approach side. These precautions will also help to safeguard operatives working on the road.

4.45.3. Sight lines need to be considered from both the road users' needs and from the operatives' point of view (e.g. the design of works access/ exit). The designer should ensure that layouts consider the sight line requirements from both points of view and endeavour to ensure that provision of forward visibility and signing does not compromise the operatives' safety.

4.46 Surface condition

4.46.1. Temporary surfaces used as part of a TTM layout should be fit for purpose. The effect traffic may have on the following should also be considered:

- cross falls on chevron areas.
- gullies and channels.
- drain covers in hard shoulders and in central reservations at crossovers.
- clearances if traffic runs on edge strengthening (e.g. safety barrier, emergency telephone).

4.46.2. Carriageway features (e.g. drain covers) may need to be strengthened or removed to account for unexpected traffic loads.

4.46.3. Those responsible for works must ensure that the location of a works site is left in a condition which is not dangerous to road users.

4.46.4. Road stud bases, inserts, and their reflectors should be removed and the carriageway reinstated before introducing traffic to a narrow lane used as part of a TTM layout.

4.46.5. The 'TEMPORARY ROAD SURFACE' sign to working drawing 7010.1 (S13-9; **Figure 4.91**) is used to warn drivers of an unfinished road surface. Programming and contractual arrangements should aim to minimise the time between planing and resurfacing operations. Where planed lengths are used as temporary running surfaces, steps should be taken to reduce hazards as much as possible. A longitudinal step of more than 50 mm should always be marked by a line of cones. This sign is not suitable for use to warn of road surface defects due to normal wear and tear.



Figure 4.91 Sign to working drawing 7010.1 (S13-9) Information on road surface condition

4.46.6. Slopes should be provided for every raised cover, allowing an easy path for road users and pedestrians. These sloping fillets should be formed of cold asphalt. If slopes are not provided, advance warning signs and barriers around the obstruction together with a 'keep left/right' sign to diagram 610 (S3-2-3) should be provided. Warning lights should also be provided during the hours of darkness.

4.46.7. These precautions should never act as an alternative to restoring surface levels at the earliest possible opportunity.

4.46.8. The 'RAMP AHEAD' sign to working drawing 7010.1 (S13-9; **Figure 4.92**) is used to warn drivers of a sudden change in road level. It should be used when the change in level is greater than 15 mm and placed no less than 30 m in advance of the ramp. The 'RAMP' sign to working drawing 7013 (S13-9; **Figure 4.93**) should always be used in conjunction with the previous sign and positioned at the ramp. These signs are also required if cable crossing protectors placed in live traffic lanes exceed 15 mm, and when locally fabricated or prefabricated 'humps' run across the road.



Figure 4.92 Sign to working drawing 7010.1 (S13-9) Ramp ahead



Figure 4.93 Sign to working drawing 7013 (S13-9) Ramp

4.46.9. The speed at which vehicles are expected to pass over the ramp will determine the appropriate gradient and length for it. The ramp should ideally be constructed at right angles to the vehicle path.

4.46.10. The 'uneven road ahead' sign to working drawing 556 (S13-2-5; **Figure 4.94**), may be used instead of the 'TEMPORARY ROAD SURFACE' sign in cases with more severe undulations (see also Chapter 4, Section 12.1).



Figure 4.94 Diagram 556 (S13-2-5) Uneven road ahead (Alternative types with typical supplementary plates)

4.46.11. During surface dressing operations, the 'loose chippings on road ahead' sign to diagram 7009 (S13-2-10; **Figure 4.95**) is used to warn of the likelihood of loose chippings on the carriageway. Where there is also a skid risk, a sign to diagram 7009.1 (S13-4-3; **Figure 4.94**) is required. These signs must be retained until the skid risk and risks from flying chippings have passed. For further information, see 'Guidance on Temporary Traffic Management on Slurry Surfacing and Microsurfacing Sites (RSTA / ADEPT, 2021)' and 'Guidance on Temporary Traffic Management at Surface Dressing Sites (RSTA / ADEPT, 2021)'.



Figure 4.95 Diagram 7009 (S13-2-10) Loose chippings on the road ahead combined with plates to diagram 7009.1 (S13-4-3) Skid risk and maximum advised speed limit (With and without backing board)

4.46.12. The provision of signs to diagrams 7009 (S13-2-10; **Figure 4.95**) and 557 (S13-2-6; **Figure 4.96**) does not absolve contractors from their duty under the Highways Act 1980. Mud and similar materials (e.g. clay, chalk) on the road surface present a hazard and must be immediately removed. The use of wheel washing equipment can prevent this problem. Water must also not be allowed to flow on to the highway to an extent which may create dangerous conditions (e.g. through the formation of ice in frosty weather). Special drainage facilities should be provided if necessary.



Figure 4.96 Diagram 557 (S13-2-6) Slippery road surface ahead with and without supplementary plate (S13-2-9).

4.47 Carriageway edge condition

4.47.1. When traffic is run on the hard shoulder or hard strip, consideration should be given to the condition of the carriageway edge. Street furniture (e.g. emergency telephones, drainage facilities, vehicle restraint systems and overhead structures) on the verge should also be considered. Allowance should be made for kerbing as this will reduce the width of the running lane.

4.47.2. Where flush kerbs are provided, the edge line should be superimposed on the kerb. Where there are no raised kerbs, the edge of the carriageway should be indicated by a 100 mm or 150mm wide continuous reflectorised white line to diagram 1012.1 (S11-4-11) and should be placed approximately 200 mm from the edge of the carriageway.

4.47.3. Where there are narrow lanes or where turning vehicles may cause over-run problems, edge protection and/or temporary widening may be needed. If so, the designer should:

- locate services and discuss with the utilities or services provider the need to protect them.
- design construction to withstand loading.
- review environmental concerns and reinstatement requirements.

4.48 Road plates

4.48.1. Road plates may be appropriate to bridge trench excavations. They should only be used following a site specific risk assessment. Where a ramp is used, appropriate ramp warning signs should be used.

4.48.2. Road plates must be made of suitable material with an appropriate skid resistant surface and must not present a hazard to cyclists or motorcyclists. The plates must be rigidly secured to the road surface and must either be sunk into the surface or suitable bitumastic material used to provide a ramp to plate level.

4.49 Tunnels

4.49.1. Many of the design comments outlined in this section relating to TTM in tunnels may also apply to underbridge and underpass structures. This includes:

- lighting.
- fire safety.
- access and escape provisions.
- ventilation.
- lane control provisions.

4.49.2. Tunnels should be designed in accordance with the guidance given in CD 352 'Design of road tunnels', or other equivalent standards which covers enclosed road tunnels of 150 m or more in length. It covers general considerations and specific requirements of tunnels. TTM proposals for tunnels should be in accordance with the principles outlined in this document. Contractors and designers must check if there is a pre-existing TTM plan for the tunnel. This may be covered by an order and therefore limit options to design, sign or guard works.

4.49.3. Road tunnels typically consist of two separate bores, each accommodating a carriageway carrying traffic travelling in a single direction. Planned maintenance will typically require one bore to be closed. This is not necessary if the design supports partial closure and minimum safety clearances (see **Section 4.2**) can be maintained.

4.49.4. The following considerations also apply to tunnels that operate a bi-directional traffic flow. They also apply for a single bore, where it is proposed to run traffic in the opposite direction to its normal lane/carriageway traffic flow.

4.49.5. The designer should ensure that tunnel infrastructure and equipment can support traffic safely during any change in layout e.g. a contraflow. This applies where one bore is to be closed of a two-bore tunnel, and the other bore is to operate two-way traffic. TTM must guide traffic safely into the temporary two-way running bore whilst preventing any vehicle from accidentally entering the closed bore. An access gate or traffic barrier should be considered to control access into the works tunnel site. Designers should also consider providing a means of stopping traffic before the tunnel in an emergency (e.g. temporary traffic signals).

4.49.6. Where traffic is proposed to operate in contraflow within a tunnel, the TTM designer should ensure that the tunnel design can safely support the operation. Proposals will need to be discussed and reviewed by the tunnel operator/maintainer, the police and emergency services, and if relevant, the Tunnel Design and Safety Consultation Group (TDSCG). Where contraflow TTM cannot be operated, the designer will need to consider the steps set out in **4.49.9** to **4.49.12**.

4.49.7. The designer should choose an appropriate temporary speed limit based on risks associated with the introduction of contraflow traffic. Where the permanent mandatory maximum speed limit through a tunnel is 60 mph or above, a temporary mandatory speed limit on the approaches and through the tunnel of should be considered, see **Section 4.8**. Where the permanent mandatory maximum speed limit is 40 or 50 mph, a reduced temporary mandatory speed limit should be considered; however, the permanent limit may be sufficient to maintain safety, depending on the design speed of the TTM.

4.49.8. Operation and maintenance documents relating to a tunnel will need to be checked for information on maintenance, refurbishment and use of contraflows. The TTM designer may need to provide lane control signals and VMS signs in the tunnel and at the portal.

4.49.9. Tunnel traffic will need to be diverted where a contraflow is not possible. Diversions may also be required to allow contraflow enabling works (e.g. installing temporary traffic control signals and signs), where these cannot be accomplished with lane closures in low-flow conditions.

4.49.10. **Section 7.14** outlines information on the design of relevant signs for tunnels situated on a dual carriageway.

4.49.11. Lane control signals and signs may be necessary where a tunnel is not equipped for contraflow TTM. Where this is not possible, the opposing traffic flows should be separated by traffic delineators to Detail H or Detail K (narrow lanes). Where lateral clearance between

opposing traffic flows is not sufficient to install Detail H or Detail K, the temporary central division should be delineated using a double white line road marking to diagram 1013.1A (S9-6-23). These must be removed once work has completed. Lane markings will then need to be reinstated.

4.49.12. For works in tunnels on single carriageway roads, traffic will likely need to be diverted. However, where works can be limited to half carriageway width and traffic flows are low, shuttle working using temporary traffic signals could be considered (see **Section 6.10**).

4.49.13. The designer must ensure that any tunnel prohibition signs are installed at appropriate locations in advance of a tunnel. Appropriate diversion signs should be provided to direct prohibited users to an alternative route.

4.50 Transition sections

4.50.1. The road layout at the transition between single and dual carriageway roads can vary considerably and therefore particular care is required when designing TTM in the vicinity of this area. Historically these situations have represented a significant risk to road users and where signs have not been sufficiently clear.

4.50.2. The speed and nature of the approach road will determine the appropriate signing for traffic as they approach the works. **Table A1.1** (**Appendix A1**) gives the location and number of approach signs required for different types of road.

4.50.3. A ‘road narrows ahead’ sign to diagram 517 (S2-2-14) should be used on the single carriageway approach road. The ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) or its variants should not be used on a single carriageway two-way road to avoid confusing drivers.

4.50.4. A ‘keep left’ sign to diagram 610 (S3-2-3; **Figure 4.97**) should already be positioned at the start of the dual carriageway section. Consideration should be given to providing ‘no entry’ signs to diagram 616 (S3-2-10), on the end of the opposing traffic dual carriageway section, this sign requires a traffic regulation order.

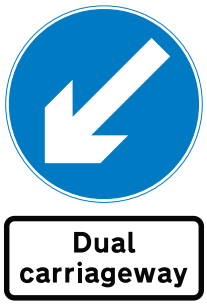


Figure 4.97 Diagram 610 (S3-2-3) Keep left combined with plate to diagram 608 (S9-2-3) Dual carriageway

4.50.5. The start of the single carriageway section should already be signed by appropriate signs to diagram 520 (S2-2-15; **Figure 4.98**) or 521 (S2-2-16; **Figure 4.99**).



Figure 4.98 Diagram 520 (S2-2-15) Dual carriageway road ends ahead

4.50.6. Where the works commence between the start of the dual carriageway and up to, 600m downstream of a single carriageway road, coning should commence at the start of the dual carriageway maintaining traffic in single file past the works.

4.50.7. On single-carriageway roads where sightlines are poor (e.g. left-hand bends), signs should be duplicated on the offside to match those on the nearside.

4.50.8. Where one carriageway of a dual carriageway road is closed and the other is used for contraflow traffic, it is essential that signing and coning is appropriate to direct traffic along the carriageway without risk of entering the closed carriageway. The 'two-way traffic' sign to diagram 521 (S2-2-16; **Figure 4.99**) should be repeated in both directions along the carriageway, especially at pedestrian and traffic access points.

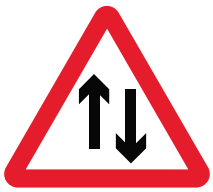


Figure 4.99 Diagram 521 (S2-2-16) Two-way traffic ahead

4.50.9. Additional side road signing may be needed. In which case, existing road signs may need to be temporarily removed or masked. This may include:

- signs to diagram 606 (S9-2-3).
- signs to diagram 818.1 (S11-2-11; **Figure 4.100**) and 818.1A (S11-2-12).
- 'no entry' sign to diagram 616 (S3-2-10).
- 'restrictive turning' signs to diagram 606 (S3-2-1), 612 (S3-2-7), and 613 (S3-2-8).



Figure 4.100 Diagram 818.1 (S11-2-11) Dual carriageway 2 miles ahead

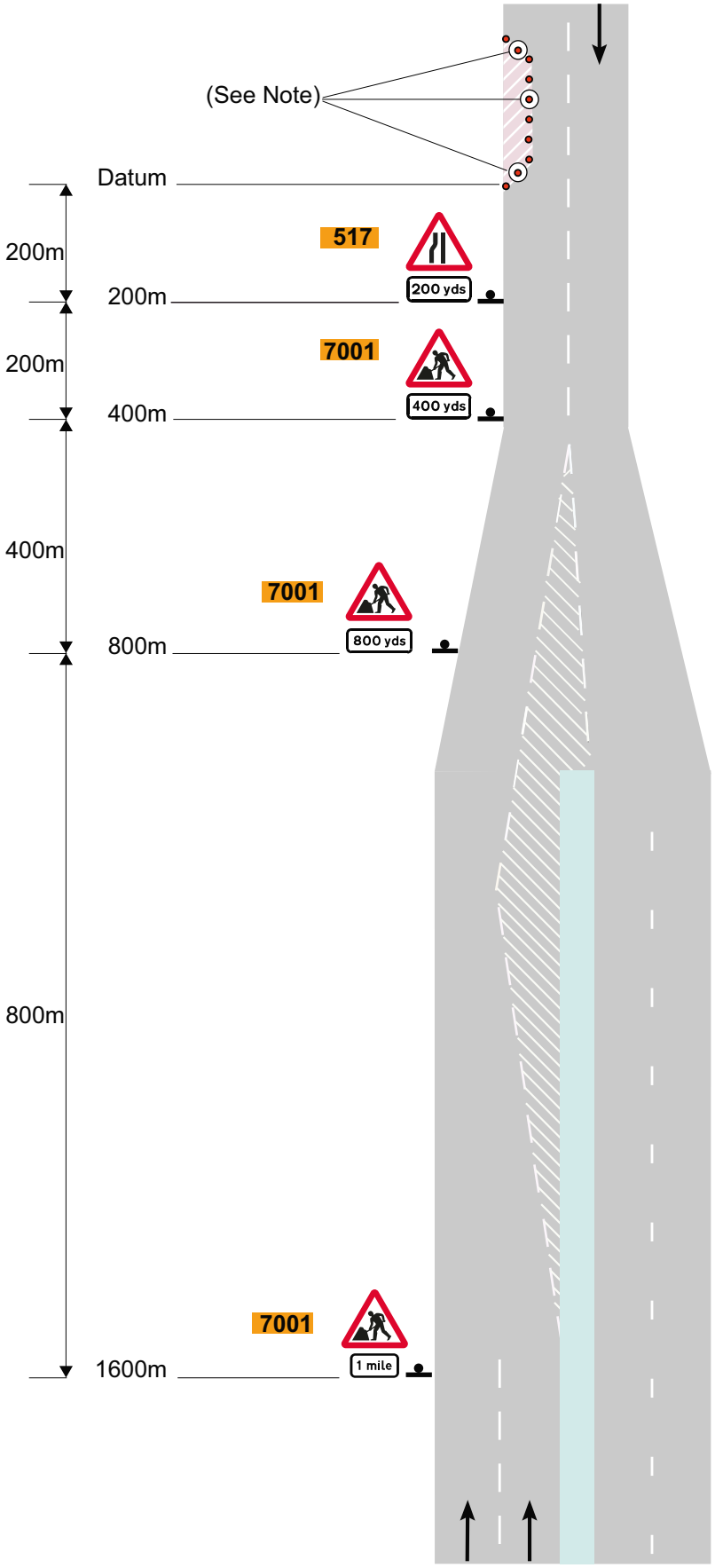
4.50.10. **Plans TS4** to **TS4** show the TTM principles for works with a section that transitions between a single and dual carriageway (and vice versa). These plans cover roads for which the national speed limit applies and should be adjusted as appropriate for lower speed roads.

Plan TS1: Transition section (dual to single), works starting between the end of the dual carriageway and 600 m downstream on the single carriageway road

The principles for the approach signing are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘1 mile’ placed on the nearside 1600 m in advance of the works lead taper.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘800 yds’ placed on the nearside 800 m in advance of the works lead taper.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘400 yds’ placed on the nearside 400 m in advance of the works lead taper.
- a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) with supplementary plate ‘200 yds’ placed on the nearside 200 m in advance of the works lead taper.

Plan TS1 Transition section (dual to single), works starting between the end of the dual carriageway and 600 m downstream on the single carriageway road



NOTE: TTM associated with traffic control on a single carriageway road are detailed in **Sections 6.3** to **6.16**. Cone spacing depends on the type of road (see **Table A1.3**, **Appendix A1**).

Plan TS2: Transition section (single to dual), works starting between the start of the dual carriageway and 600 m downstream, approach signing on the single carriageway road

The principles for the approach signing are:

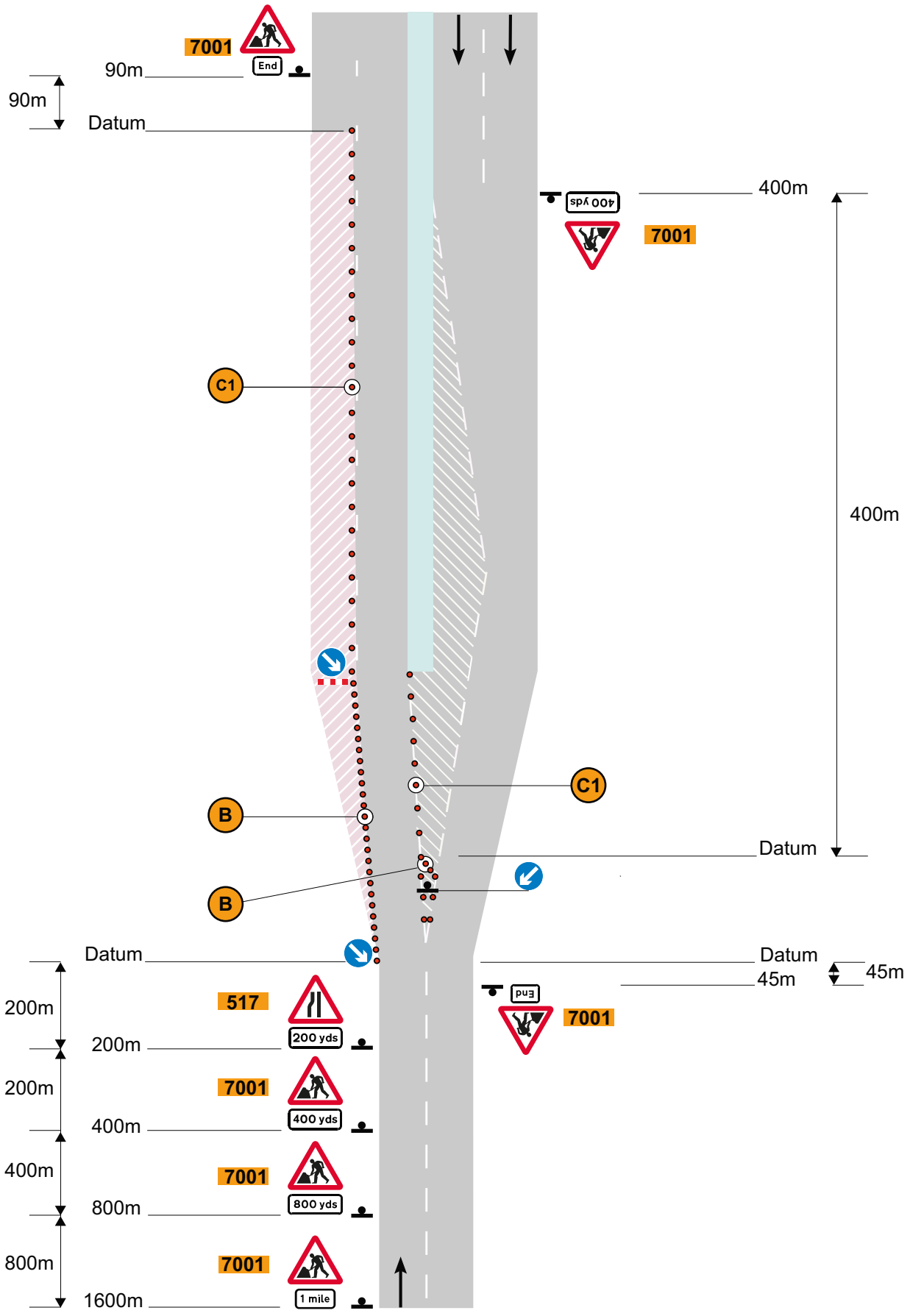
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘1 mile’ placed on the nearside 1600 m in advance of the works lead taper.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘800 yds’ placed on the nearside 800 m in advance of the first cone of initial lane closure.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘400 yds’ placed on the nearside 400 m in advance of the first cone of initial lane closure.
- a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) with supplementary plate ‘200 yds’ placed on the nearside 200 m in advance of the first cone of initial lane closure.
- a ‘keep right’ sign to diagram 610 (S3-2-3) at the start of nearside coning to Detail B, followed by coning to Detail C1.
- coning to Detail C1 at offside on the edge of hatched area.
- a ‘keep right’ sign to diagram 610 (S3-2-3) and lane closure barrier sign to diagram 7105 (S13-6-8) should be placed in the closed carriageway at the start of the closed lane.
- a ‘keep left’ sign to diagram 610 (S3-2-3) at the start of the road markings hatched area, this should be protected from impact from opposing traffic by a short cone taper to Detail B within the hatched area.

Consideration should also be given to providing a ‘no entry’ sign to diagram 616 (S3-2-10) on the offside at the end of the opposing traffic dual carriageway section.

4.50.11. The above is for a nearside lane closure. For an offside lane closure:

- the advance sign to diagram 517 (S2-2-14) should indicate the road narrows on the right ahead.
- the nearside ‘keep right’ sign to diagram 610 (S3-2-3) is not required.
- the offside lane closure coning (Detail B) commences at the start of the central reservation road marking hatching.
- no nearside coning is required.
- the ‘keep left/right’ sign to diagram 610 (S3-2-3) should indicate that traffic should pass to the left.

Plan TS2 Transition section (single to dual), works starting between the start of the dual carriageway and 600 m downstream, approach signing on the single carriageway road



NOTE: Cone spacing depends on the type of road (see **Table A1.3**, **Appendix A1**).

Plan TS3: Transition section (single to dual), works starting between 600 m and 850 m downstream of the start of the dual carriageway, approach signing on the single carriageway road

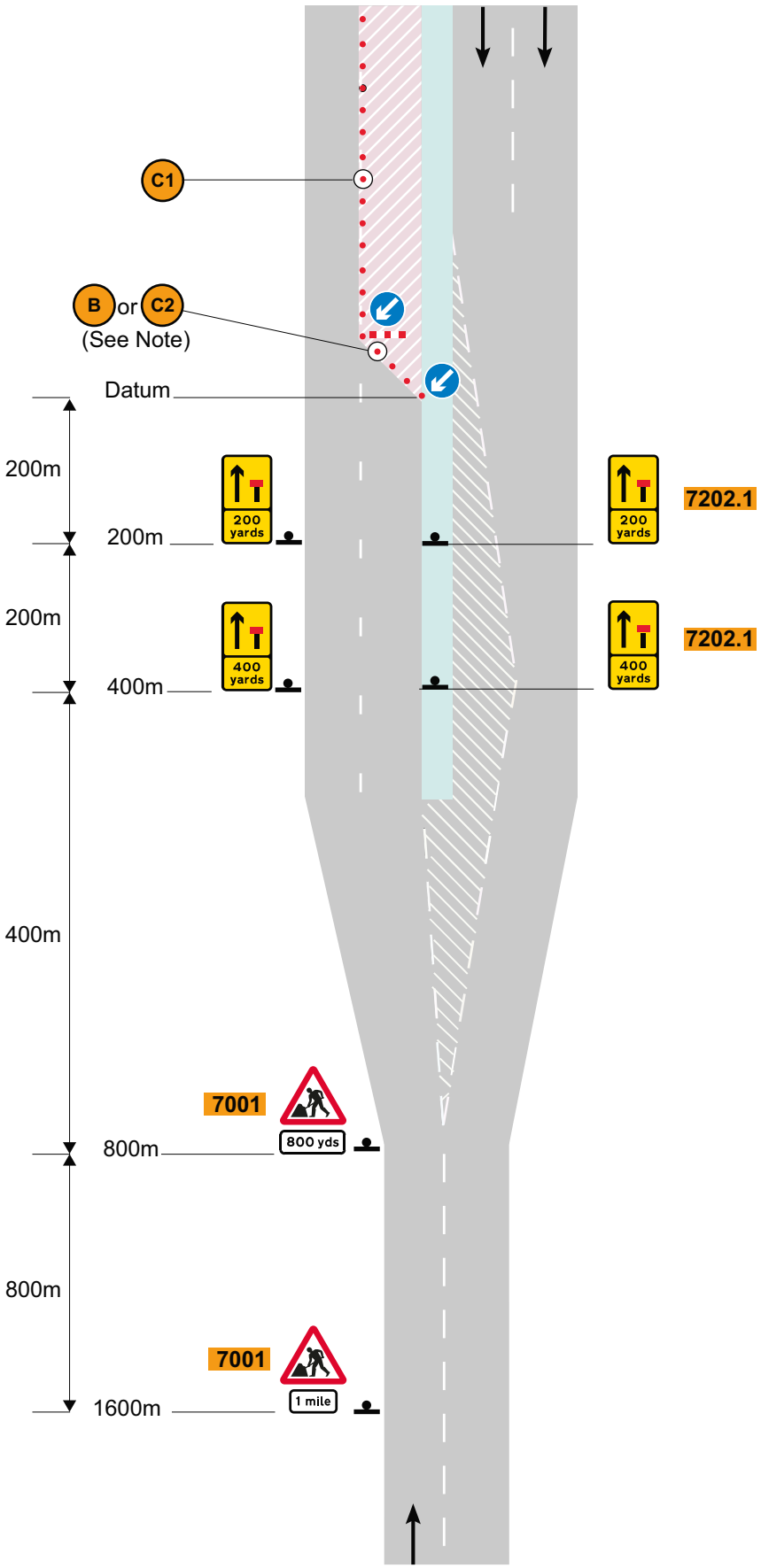
The principles for the approach signing are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘1 mile’ placed on the nearside 1600 m in advance of the works lead taper.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘800 yds’ placed on the nearside 800 m in advance of the first cone of initial lane closure.
- a ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) with supplementary plate ‘400 yds’ placed on the nearside and the central reserve 400 m in advance of the first cone of initial lane closure.
- a ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) with supplementary plate ‘200 yds’ placed on the nearside and the central reserve 200 m in advance of the first cone of initial lane closure.

If the location of the works allow, then a ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) with supplementary plate ‘600 yds’ should be placed on the nearside and the central reserve 600 m in advance of the first cone of initial lane closure.

Consideration should also be given to providing a ‘no entry’ sign to diagram 616 (S3-2-10) on the offside at the end of the opposing traffic dual carriageway section, this sign requires a traffic regulation order.

Plan TS3 Transition section (single to dual), works starting between 600 m and 850 m downstream of the start of the dual carriageway, approach signing on the single carriageway road



NOTE: Cone spacing depends on the type of road (see **Table A1.3**, **Appendix A1**).

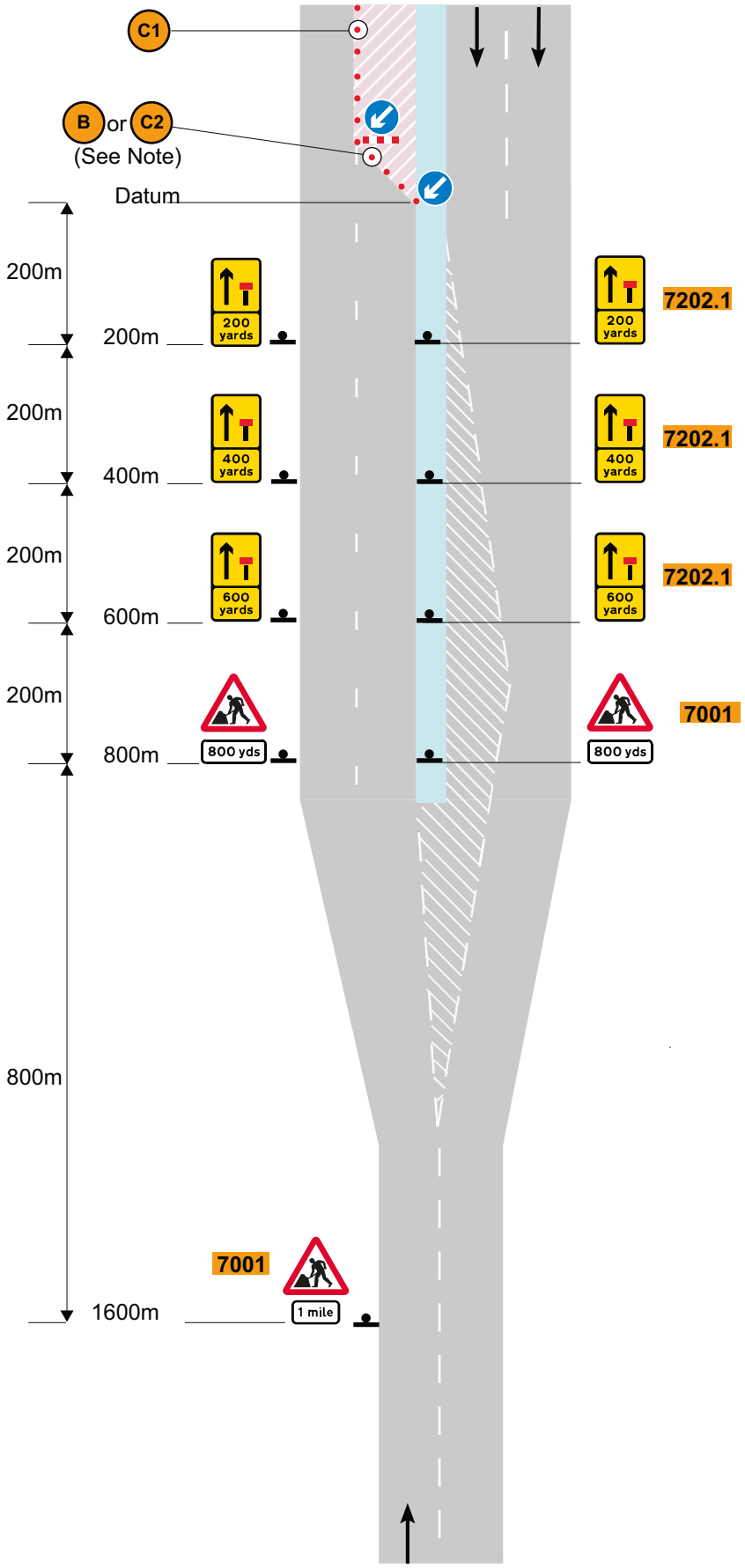
Plan TS4: Transition section (single to dual), works starting 850 m or more downstream of the start of the dual carriageway, approach signing on the single carriageway road

The principles for the approach signing are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘1 mile’ placed on the nearside 1600 m in advance of the works lead taper.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘800 yds’ placed on the nearside and on the central reserve 800 m in advance of the first cone of initial lane closure.
- a ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) with supplementary plate ‘600 yds’ placed on the nearside and on the central reserve 600 m in advance of the first cone of initial lane closure.
- a ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) with supplementary plate ‘400 yds’ placed on the nearside and on the central reserve 400 m in advance of the first cone of initial lane closure.
- a ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13) with supplementary plate ‘200 yds’ placed on the nearside and the central reserve 200 m in advance of the first cone of initial lane closure.

Consideration should also be given to providing a ‘no entry’ sign to diagram 616 (S3-2-10) on the offside at the end of the opposing traffic dual carriageway section, this sign requires a traffic regulation order.

Plan TS4 Transition section (single to dual), works starting 850 m or more downstream of the start of the dual carriageway, approach signing on the single carriageway road



NOTE: Cone spacing depends on the type of road (see **Table A1.3**, **Appendix A1**).

4.51 Equality and disability legislation

4.51.1. Legislation differs between Great Britain and Northern Ireland but in both cases disability is covered. The definition of a disability is included in the relevant legislation, this covers many conditions which limits the ability to undertake normal day to day life, but which does not necessarily qualify for the granting of a blue badge.

4.51.2. In addition to those with disabilities the Equality Act 2010 (Great Britain only) identifies a range of groups with protected characteristics. This includes age, but also other personal factors which may have an impact on the design and operation of works. An example is planning works or events consistently on Fridays, Saturdays or Sundays may disproportionately impact on specific religious groups or denominations if access or parking is restricted near places of worship. Similarly works near places of worship etc, will need to ensure that funerals can continue to be held with the required level of dignity.

4.51.3. Reasonable adjustments may be needed to works in order to comply with the Equality Act 2010 in Great Britain and the Disability Discrimination Act 2005 in Northern Ireland. Further guidance on meeting the requirements of these Acts can be found in the relevant code of practice relating to each legislation.

4.51.4. The recommendations in this document and the requirements in the Safety at Street Works and Road Works: A Code of Practice do not remove the requirement to identify any relevant factors (especially disability) which would require the adoption of an amended design or method of working. Any changes identified would need to ensure the design of the works still meets relevant road, traffic or health and safety legislative requirements. Identifying compliance with this document or the requirements in the Street works Code of Practice does not remove the need for an assessment to be undertaken, and reasonable adjustment made, in respect to the impact on those with disabilities.

4.51.5. When planning and designing works the impact on all disabled road users must be taken into account, not just blue badge holders. As an example, when works require the suspension or removal of parking bays, only providing alternative parking bays for blue badge holders may unacceptably impact other disabled users. Designers should seek to identify and consider any scheme specific information on disabled road users and affected residents. Given some groups with protected characteristics are less likely to have sufficient information on parking restrictions through signs, or the internet, residents will need to be provided with a hard copy of the impact on parking restrictions, locations of alternative parking locations and a contact point for accessibility assistance.

4.51.6. In addition to the impacts of planning, timing and operation of works on those with protected characteristics, the TTM design and the equipment used will also need to be assessed, particularly where this document identifies if it may be acceptable to omit aspects or adopt a reduction in design standard, following a risk assessment.

4.51.7. As an example, the use of narrow lanes below the desirable minimum width disproportionately impacts both the safety and comfort of older drivers and should be minimised and/or mitigated by using higher performing equipment. Similarly omitting warning lamps, or increasing the spacing of them, can disproportionately affect older drivers unless mitigated by the design of the works, or use of higher performing equipment.

4.51.8. Another example is providing walking times on signs for pedestrian. While this is acceptable, only providing walking times may create uncertainty for those who move at different average speeds or where maximum distance is more important than time. Therefore, signs for pedestrians need to include distances.

4.51.9. While designers of works will need to take into account national policies and those of the relevant authority relating to the provision or prioritisation of specific groups e.g. pedestrians, cyclists etc, these normally apply when the road is in normal operation. When works, or other temporary situations, take the road out of normal operation the design of the TTM must provide for the safe and effective transit of all existing users. Prioritisation of transport modes statistically more likely to be used by those with protected characteristics e.g. motor vehicles (bus and cars) and walking, over those modes statistically less likely to be used by someone with a protected characteristic e.g. cyclists, equestrian, is permitted. While providing comprehensive provision for those users with protect characteristics is preferred, as a minimum, from start to post completion of the works, schemes will need to maintain the same level of provision as was provided before the works began.

4.51.10. National guidance which does cover road works e.g. the DfT Inclusive Mobility guide (https://assets.publishing.service.gov.uk/media/61d32bb7d3bf7f1f72b5ffd2/inclusive-mobility-a-guide-to-best-practice-on-access-to-pedestrian-and-transport-infrastructure.pdf) should be considered during the design process. Not all the best practice in this, and similar documents, is reasonably practicable for adoption in all works; designer's should record where highlighted features are not suitable and what alternative options will provide sufficiently safe and effective provision.

4.51.11. The design and operation of schemes must still result in the required level of safety for road workers and road users as well as providing for an acceptable level of provision for those with protected characteristics. As an example, cyclists may be required to dismount, with a possible provision of a wider path through a scheme to accommodate pedestrians and dismounted cyclists, where the nature of the works would prohibit the adoption of lane widths which would be safe to cyclist as well as workers and other road users.

4.51.12. In addition to aspects which may directly impact those with protected characteristics, these groups may also be disproportionally disadvantaged indirectly. The utilisation of new technology and communications during works and events may be helpful; however some groups will require equivalent access or reasonable adjustment. Assuming, or requiring, the possession of, or the ability to use, features such as the internet, smart phones or contactless payment etc. is likely to be discriminatory. Similarly assuming or identifying that road users in this category should rely on friends, family or carers who do have access to these technologies is also not acceptable. In addition to the legal requirements of the Equality Act, providing for those without access to these types of technology would also improve social inclusion for disadvantaged groups outside the scope of the act.

4.51.13. When assessing advance feedback to schemes, or public consultations, the responses to those with a protected characteristic will need to be compared to those of all consultees. Even if the general response is positive, if the response from sections of consultees who declare they have a protected characteristic e.g. disability, is significantly less than the whole then additional adjustments are likely to be needed. As an example, if plans have a 80% positive response from all consultees but support from those with a disability is 55% then the plans are likely to have disproportionately negative affect that group and would need to be improved.

4.51.14. Closures and other TTM related to events are also subject to the relevant legislation. Organisers and authorities share responsibility and liability. The arrangement for events must minimise the impact on those with protected characteristics either directly or directly. Examples of where this would be likely include not being access religious services, restricting access to or from friends and family and those providing care to the elderly or disabled. While it is recommended that the underlying design of event TTM minimised impact in the area, it may be acceptable to provide individual access where the organiser or authority is notified of access needs.

5 SIGNING PRINCIPLES

5.1 Introduction

5.1.1. Effective signing is a fundamental element of any temporary traffic management scheme and key to maintaining safety and efficiency. This section details the considerations for designing and deploying signing at works sites and discusses the meaning and types of signing commonly found in temporary situations. Traffic signs used for road works are predominantly found in TSRGD Schedule 13, in Northern Ireland these signs may be found in Schedule 12 of TSR(NI) 1997.

5.1.2. A sign prescribed by TSRGD may be used on a temporary basis, if:

- used in connection with road works.
- used at accidents or other incidents of an unplanned or emergency nature.
- used in connection with temporary traffic orders or control.
- used during holiday seasons.
- used for other special occasions, such as events or large public gatherings.

Other than when part of works, 'temporary' sign are normally limited to a maximum of 6 months. Longer than this requires signs to be designed and installed to the same requirements as permanent signs.

5.1.3. Signs used must be of a prescribed size and type. Details of their use and siting distances will be found in the appropriate Chapters of TSM.

5.1.4. Most signs which require an Order or site approval by the Secretary of State to be used permanently, will also require an Order or approval to be used on a temporary basis by, or on the behalf of, an authority.

5.1.5. The approval requirements in **5.1.4** do not apply to signs erected by the police in accordance with the powers granted by Section 67 of the Road Traffic Regulation Act 1984, or by Traffic Officers in accordance with powers granted by the Traffic Management Act 2004, who may in an emergency display regulatory signs for a period not exceeding seven days. Section 22 of the Road Traffic Act 1972, which makes it an offence for a driver to disregard the indication given by a sign, applies to any sign so displayed by the police. However, in these situations signs must only be used to indicate a restriction for which they are prescribed e.g. entry restrictions must not be used in place of road closure signs. The police in Northern Ireland do not have these powers.

5.1.6. A check should always be made to ensure that multiple, conflicting signs do not remain in place at any time. Consideration should be given to removing or covering temporary speed limit signs outside working hours, unless they are considered necessary to maintain safety within the site.

5.2 Signing considerations

5.2.1. The traffic management designer should consider all types of signing which form part of the design. These include:

- traffic management signs.
- regulatory signs.

- warning signs.
- temporary diversion signs.
- driver information signs (including those placed in advance of the works).
- VMS.

5.2.2. All traffic signing equipment must comply with any relevant normative British or European Standard. Traffic signing equipment should also comply with any relevant informative British or European Standard.

5.2.3. Use of any traffic sign that is not prescribed by TSRGD is unlawful unless it has been given special signs authorisation. Authorisations should be sought, via the traffic authority, from the relevant national body. Non-prescribed signs must not be used without prior authorisation.

5.2.4. Variable signs that use electrical or other apparatus should be certified by a relevant national and competent body (e.g. Traffic Open Products and Specification Ltd (TOPAS)).

5.2.5. A number of road works signs that are prescribed by the regulations also require temporary traffic orders to be used. Signs that require this can be identified in general direction 6 in Schedules 13 and 14. The traffic authority should be consulted in good time if such orders are required.

5.2.6. Special care should be taken when specifying the location of temporary signs. Temporary signs should be consistent with permanent signing principles. Their placement should consider existing signs and sight lines, as well as be appropriate to actual site conditions.

5.2.7. Unless otherwise stated in this Section, the speed limits referred to are the permanent mandatory speed limit that would apply to the carriageway without road works.

Specific sign requirements

5.2.8. Vehicle width limits must be specified in both metric and imperial units using a dual-unit sign to diagram 629A (S3-2-26; **Figure 5.1**). Height limits must also be specified in both units using the dual unit sign to diagram 629.2A (S3-2-27; **Figure 5.2**). If either dual-unit sign is incorporated into a road works sign, in order to maintain legibility the diameter must be increased to 750mm where text height is 125mm, and 900mm where text height is 150mm. Smaller sizes are not prescribed.



Figure 5.1 Diagram 629A (S3-2-26) Width restriction in metric and imperial units



Figure 5.2 Diagram 629.2A (S3-2-27) Height restriction in metric and imperial units

5.2.9. Temporary diversion signs to working drawings 2703 and 2704 should be located on the approach to and at junctions, along with where they are needed to improve driver confidence

and decision making. These signs should not be used on motorways. Further information on the use of diversion signs can be found in **Section 4.24**.

5.2.10. Unless a roundabout is very large or complex, it is not necessary to provide variant flag or map type signs to guide traffic around the roundabout. However, it is necessary to provide left-pointing flag signs at exits from roundabouts, see **Figure 5.3**.

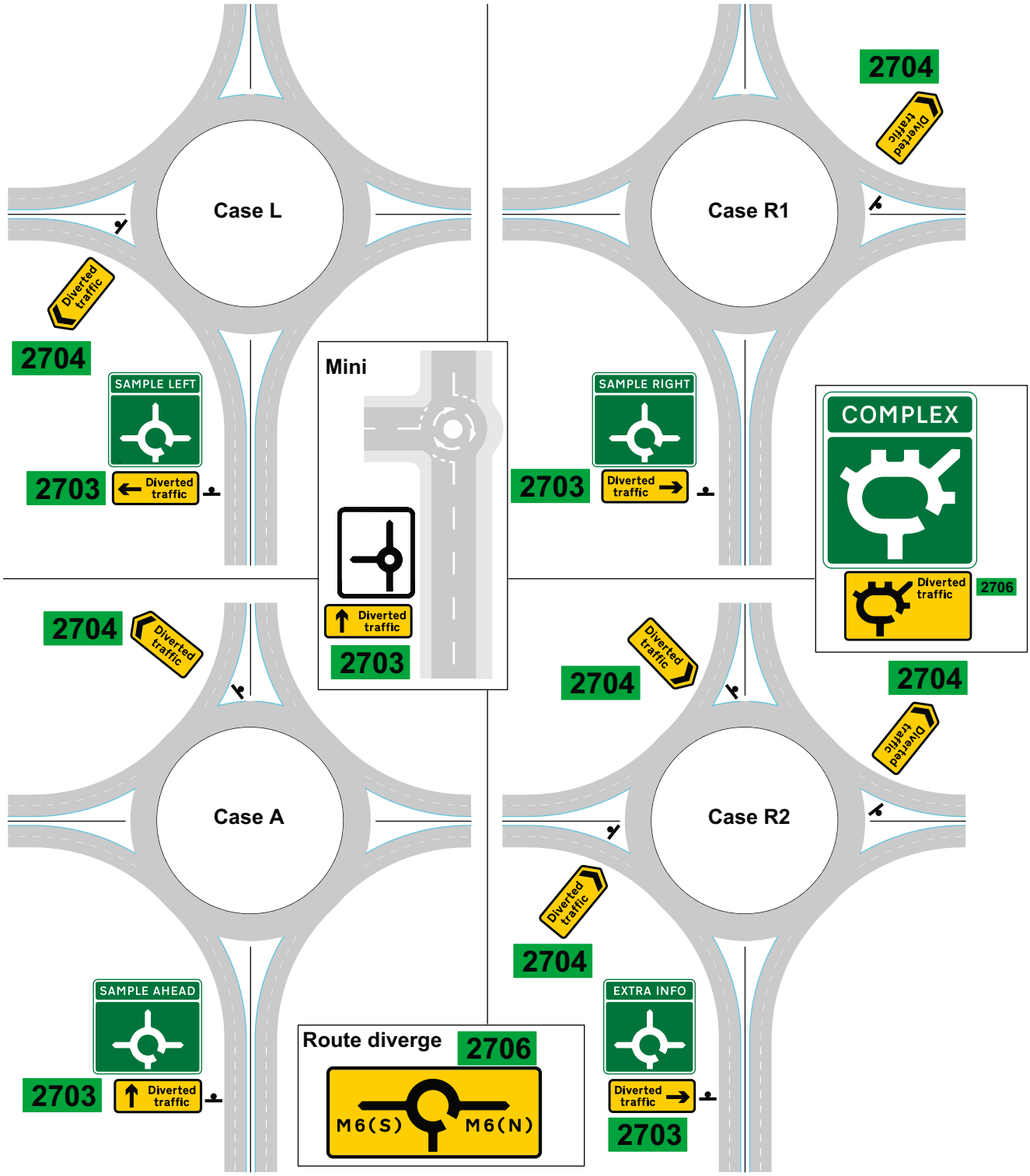


Figure 5.3 Diversion route signing at a roundabout

5.2.11. Driver information signs may be required by the traffic authority to explain the reason for the works and for any delays. Variable message signs on the approaches to the site may be useful in informing drivers about exceptional delays (e.g. due to an incident) or generic journey time information.

5.2.12. Works accesses and exits should be signed both for the purposes of directing works traffic, and to alert other road users of the potential for works vehicles to make unexpected manoeuvres (see **Section 4.26**). These signs should not obstruct sight lines or other signs and should not be obstructed.

5.2.13. Taper start points should be located to enable the necessary advance warning signs to be installed with the required visibility distance (see **Section 5.3**, and **Table A1.1** and **A7** of **Appendix A1**). Consideration should be given to how advance warning signs will be installed. This could involve identifying locations for installing normal fixed signs on 'A' frames at the sizes identified in **Appendix A1** (either on foot or from IPVs). Alternatively, provision may be made at these locations to facilitate easier and/or quicker installation of signs (e.g. mounting brackets, sockets on barriers, maintenance hard standings). A more comprehensive option would involve the provision of remotely controlled signing.

Permanent provision of signing for TTM

5.2.14. Where appropriate, signing for TTM may be provided by permanently fixed signs such as VMS or mechanically operated sign displaying fixed plate aspects.

5.2.15. The nature of approach signing should be based on the site conditions and the type of works needed to be undertaken. For roads of three lanes or less the choice of sign, (including its procurement, installation, and maintenance) should be the responsibility of the maintaining organisation. Providing approach signing as part of the permanent works is an option but this is not mandatory. It is only recommended that provision for installing signs is made for signs that are part of the permanent works.

5.2.16. The type of sign used for approach signing should be able to be varied so that the most relevant sign can be used. Choice should not be limited to signs of a specific manufacturer.

5.2.17. The design of any remote-control sign should be suitable for its location. This would normally be either a mechanically operated sign displaying fixed plate aspects or an LED-based sign. The design and size of socketed mechanical signs using retroreflective sign face material should be based on guidance in **Appendix A1** and **A3**.

5.2.18. Maintaining organisations may decide to use different types of sign for approach signing on either side of the carriageway (e.g. LED on one side, rotating plank on the other). However, for maximising comprehension for all road users it is recommended that signs on both sides of the carriageway are of the same type. The choice of the technology and size of each sign should still enable road users in all lanes to read at least one of the signs.

5.2.19. Authorities and designers of permanent works should check limitations on the placement of authorised signs. A direction or specification etc. in an authorisation creates a legal requirement which cannot be overridden by risk assessment or an advice note from an authority.

5.2.20. Active signs should display warning triangles aspects at the relevant recommended sizes in **Appendix A1**. Wicket signs are required to be displayed with arrows and 'T' bars in the colours shown in **Figure 5.4**. This combination is not included in TSRGD and these aspects will need authorisation by the national authority.



Figure 5.4 Active sign version of fixed plate lane closure sign to Diagram 7202.1

5.2.21. Where the provision of permanent signs is being considered for carriageways of four lanes or wider, LED-based remote-control signs should be used. This would normally require the design of the road, including power and control systems, to accommodate them and therefore the signs would need to be provided by the authority and not the maintaining organisation. However, the authority and designer of any permanent works must consult with the maintaining organisation and must take into account their safe method of working when identifying the number, location and specification of such signs. Preference should always be for signs to be directly controlled by the contractor.

5.2.22. Designers of road improvement schemes should assume that the size of LED-based fixed taper position (FTP) signs, if used, should be equivalent to the size of passive signs identified in **Appendix A1**. The relevant national authority may be prepared to authorise smaller LED signs on a product by product basis considering their performance characteristics. However, designing mounting systems and setbacks for specific products may limit the adoption of more capable and effective products in the future. As such, designers of road improvement schemes should confirm any specific requirements with the relevant authority.

5.2.23. Some products may be authorised for use only on one side of the carriageway for relaxation schemes, subject to a scheme specific risk assessment. In such cases, the scheme risk assessment must consider all options when creating a risk-based design, including the installation of signs on both sides of the carriageway. Any design must ensure that adequate guidance is provided to road users by the signing arrangement chosen and must result in risk that is as low as reasonably practicable (ALARP) for both road workers and road users.

5.2.24. Designers must not assume that relaxation schemes will remain acceptable for the duration of every lane closure. Designers of permanent works must make provisions for the maintaining organisation to be able to implement appropriate contingency arrangements (see 4.6.12) should conditions deteriorate (e.g. weather, traffic flows). Designers must consult with the maintaining organisation and take into account the safe system of work that will be used in the event that conditions deteriorate during a relaxation scheme lane closure.

5.2.25. Designers should use a risk-based design process to identify how adequate guidance will be provided to road users without providing permanent signs in the central reserve and without a continuous place of relative safety (e.g. a hard shoulder). The risk assessment process must consider installing temporary signs in the central reserve using an appropriate safe system of work; for example, from works vehicles protected by Impact Protection Vehicles (IPVs), or signs installed using enhanced mobile carriageway closures. Risk based design of TTM for lane closures on such carriageways, including the method of installation, must result in risk that is ALARP for road users and road workers.

5.2.26. The relevant national authority may authorise signs of a smaller size or different aspect ratio to accommodate the use of an FTP where physical limitations restrict the use of standard sign sizes and aspect ratios. The largest authorised sign size should be used where possible subject to site specific considerations. Signs covered by this paragraph may not be authorised unless placed in pairs or in association with a full-size sign.

5.2.27. When identifying suitable locations for signs on carriageways of four lanes or wider (with or without a hard shoulder), where nearside closures are expected, risk-based design must demonstrate that HGVs or other restricted vehicles will be able to move from the inside lane to the nearest outside lane remaining open, within the distance between the first wicket sign and the first cone of the taper. Fixed signing, when used, should be located in positions that are suitable for all intended lane closure permutations.

5.2.28. The design of all active signs should maximise the readability of the signs over conspicuity. For signs covered by an authorisation all specification requirements must be met. For all other signs, designers, specifiers and maintaining organisations should identify relevant characteristics and classes from the National Annex to BS EN 12966 ‘Variable message signs’. When calculating visual performance levels from table NA1, the approach speed should be the permanent speed limit.

5.2.29. Sign specifications should not include a general requirement to comply with BS EN 12966:2014 as not all characteristics identified in this standard apply to all types of active sign. Only the relevant characteristics and classes from normative and informative sections should be included. An example of this would be the light output settings for LED-based signs; the informative requirements in BS EN 12966 are derived from maintaining the highest conspicuity of message signs, therefore product specific requirements may also be needed.

5.2.30. It should not be assumed that requiring a general compliance with informative sections of BS EN 12966 will result in an effective sign, or one that is in a desirable position.

5.2.31. Authorities may identify suitable specifications for sign characteristics that have not been identified in BS EN 12966 (e.g. communication protocols or power supply characteristics). Any requirement should be consistent with the use of these signs and not unnecessarily restrict the use of alternative products.

5.2.32. The responsibility for the safety of schemes and displaying signs to provide road users with adequate guidance rests with the contractor. Remote-control signs should be directly controlled by the on-site contractor using a suitable, reliable, and secure method of operation. Signs may be operated via a control centre, with control provided either by the contractor, by the authority or by a method of shared control; however, this normally creates additional delays in setting up and removing TTM. Where the authority may wish to use the signs for other situations another option is to control the signs from a control centre but to release control of the signs to the contractor during planned works.

5.2.33. Where signs are controlled by a centralised control centre, the organisation running the control centre should dedicate sufficient resources to monitor the signs and change them as soon as practicable after the contractor has made a request to the control centre operator. In all cases signs should be changed no later than within 5 minutes from the request being made.

5.2.34. Remote-control signs may be battery only powered, connected to an external supply with maintained power or externally connected with no maintained power. For LED-based signs, the preference would be to use external power supply if there is a suitable supply available.

5.2.35. In the event of loss of external power, the risk to road workers and road users should be maintained at a level that is ALARP. Remote-control signs connected to an external supply should be able to continue displaying the relevant aspect in the event of external power loss until contingency arrangements can be put in place. As such, for LED-based signs (and other sign types where the aspect ceases to show in the event of a power loss) a maintained power supply should be provided. The duration that the sign needs to be powered should be confirmed with the maintaining organisation and the road authority. Where there is no alternative provision

in case of a loss of external power, working area and working spaces must be physically protected for the duration of the works. This would normally be one IPV per closed lane; this may limit the available working window and/or method of working.

5.2.36. For rotating plank signs (and other sign types which will continue to display the last aspect set in the event of power loss) the authority and maintaining organisation should be consulted on whether providing a system to maintain power to the actuation systems is required.

5.2.37. Battery only systems should be provided with a capacity to enable the signs to operate for two works periods. This suggests a capacity of between 9 and 18 hours may be required depending on how long the sign may be used during daylight hours.

5.2.38. Any battery charging system (whether for maintained power or battery only systems) should be suitable for the location and should not affect the performance of any vehicle restraint system. It is recommended that the power supplies for all remote-control signs can be monitored (and battery level if relevant) via any fixed control systems and also direct to the contractor via GPRS or similar alert systems.

5.2.39. The design of remote-control signs should minimise the need for maintenance in order to limit risk to road users and road workers. The life expectancy of remote-control signs should be specified by the relevant authority or maintaining organisation. A working life of between five and ten years is suggested, taking into account the rate of development of products. Specifying a longer life requirement may result in poor value for money and limit the adoption of more effective and economic products in future. Visits to remote-control signs locations to deal with weather related issues (e.g. snow) should be considered separately. Maintenance or replacement should be undertaken using the protection of appropriate TTM.

5.2.40. Consideration should be given to placing signs which give general warnings of road works (other than wicket signs) on suitable high mounted gantry and verge matrix signs (7 m and above). Signs to diagram 7001 (S13-2-9) with ‘1 mile’ and ‘End’ plates should be considered for display in this way.

5.2.41. These gantry or verge matrix general warning signs only need to be located at approximately the correct locations as identified in this document; however, the sign nearest to any taper should be as close as possible to the recommended position. The procedure for setting these signs must not result in an increase in time between the first sign being displayed and the completion of the installation of the taper.

5.2.42. Where there is not a suitable verge or high mounted sign or signal to display the ‘road works end’ aspect, a single road works end fixed plate should be provided. However, the aspect may be displayed on a sign at the next downstream FTP.

5.2.43. The authority can provide high mounted signs on the approach to FTPs, instead of standard verge mounted signs, to display signs to diagram 6008.2 (S15-2-6; **Figure 5.5**) and any prescribed variations with the relevant distance aspect. This is suitable for both standard and relaxation schemes if the signs are mounted in the verge (and/or gantry mounted) and high enough that 4.5 m high HGVs do not obscure the sign. Signs which do not include the distance are not acceptable for planned works (except for mobile works). Authorities must not require the use of signalling systems which do not meet these basic requirements.



Figure 5.5 Diagram 6008.2 (S15-2-6) Closure of one lane of a three-lane carriageway ahead

5.2.44. The number of signs on the approach displaying a sign to diagram 6008.2 (S15-2-6) and distance text may be reduced to three, depending on the clear visibility distance and readability. The recommended positions of these signs for road works use is given in **Figure 5.6**. The spacing of these signs would have to be decided based on site-specific factors. If these signals are used for other purposes (e.g. incident management), then the locations may be dictated by the other uses of the signals. For the recommended case, the signal immediately upstream of the taper should be in the zone between 200 m and 400 m upstream of the first cone. In all cases, the first of these signs should be no more than 1.6 km (1 mile) from the start of the taper to be a suitable alternative to standard verge signs.

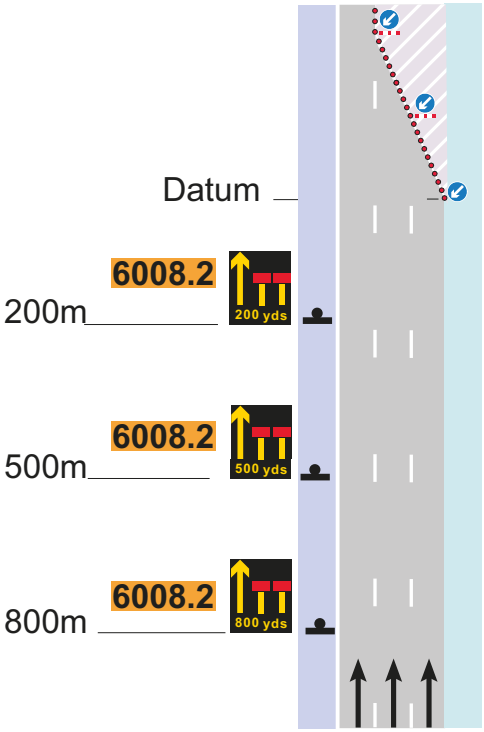


Figure 5.6 Recommended positions of active sign to diagram 6008.2 approaching a lane closure taper

5.2.45. Preference should be given to using white LED systems to display arrows and text rather than yellow LED systems as this improves the distance at which the aspect can be read. This need should not override the ability of the system to maintain the conspicuity of incident management legends in poor weather conditions, where yellow LED systems may perform better.

5.2.46. To be considered as an acceptable alternative to verge mounted signs, the requirements in **5.2.34** and **5.2.35** relating to the reliability of power and control systems, should be met for these signals at least during works periods. An option to provide independent (non-grid connected) power to the gantry signals during the works may be sufficient. Control and monitoring requirements identified in this section for TTM providers would also apply for these signs; this would include a method of validating that signs are displaying the intended aspect.

5.2.47. Signals that do not meet the requirements in **5.2.34**, **5.2.35** and **5.2.46** may be used as part of the approach signing along with compliant signals and fixed sign. If signals not meeting these requirements are the only signs on the approach then this may be an acceptable option if the physical protection identified in **5.2.35** is provided. At least one IPV with operating light arrow, within the taper safety zone or protecting a works vehicle or working space/works area, would be required for the duration of the works to be part of this physical protection to provide the required level of safety as well as warning and information to road users. This is not recommended for use other than for short term or mobile works.

Temporary provision of signing for TTM

5.2.48. Temporary signs, whether directly related to works or not, are required for a limited period only and must be removed as soon as their message no longer applies. For example, if an obstruction of the road is caused during the day by an item of plant which is removed overnight, any associated 'road narrows ahead' signs to diagram 516 (S2-2-13) or 517 (S2-2-14) must also be removed overnight. The site should also be left tidy.

5.2.49. The messages given by temporary signs must be applicable to the situations in which they are used. Sign faces must be kept clean and legible at all times. Any displaced, missing or damaged signs must be replaced as soon as practicable.

5.2.50. Temporary signs must not be displayed at weekends or holiday times etc, if their messages do not apply. If not removed immediately, such signs cause confusion and create a lack of respect for temporary signing.

5.2.51. For guidance relating to traffic signs mounted on and displayed by vehicles involved in TTM operations, refer to:

- Convoy working – **Section 9**
- Mobile lane closure technique – **Section 10**
- Mobile carriageway closure technique – **Section 11**
- Single vehicle works – **Section 12.1**

5.2.52. Schedule 13 of TSRGD identifies the position and type of signs that may be attached to or mounted on a road maintenance vehicle depending on the road's maximum speed limit. These signs should be removed or covered when the maintenance vehicle is not carrying out operations; this is particularly important when a vehicle is travelling to or from a works site.

5.2.53. There will be no need for signs to warn vehicular traffic where works are carried out off the carriageway, see **Section 4.44**.

5.2.54. Where one of the conditions in **Section 4.44** cannot be met, or where pedestrians will need to occupy part of the carriageway. Safety measures similar to those necessary for works in the carriageway should be adopted. See **Section 6.5**.

5.2.55. The procurement of traffic signs will normally be carried out under contracts incorporating the Specification for Highway Works (Manual of Contract Documents for Highway Works Volume 1) or a similar local authority or statutory undertaker specification. As such products conforming to equivalent standards and specifications of member states of the European Economic Area will be acceptable in accordance with the terms of the 104 and 105 Series of clauses of that Specification. Any contract not containing these clauses must contain suitable clauses of mutual recognition having the same effect.

5.2.56. Manufacturers of road works signs for use on trunk roads will need to meet the requirements of an appropriate quality management system, e.g. relevant sections of Sector Scheme 9.

5.3 Size and siting of signs

5.3.1. When sizing and siting signs, the aim should always be to give drivers adequate advance warning, so that they can adjust the speed and position of their vehicles on the road in order to pass an obstruction safely. Signs must not be installed where they are obscured, partially or fully, from approaching traffic. Normal carriageway lighting posts are unlikely to obscure temporary signs, unless a sign is place closely behind a post.

5.3.2. Signs should be placed where they will be clearly seen and cause minimum inconvenience to drivers, cyclists, pedestrians and other road users alike, and where there is minimum risk of them being hit or knocked over by traffic. Signs should normally be placed on a grass verge if there is one (with any vegetation maintained to ensure the sign is readable for the relevant clear visibility distance). If no verge is present, signs may be placed on the footway but under no circumstances can the width of the footway be reduced to less than 1.0 m.

5.3.3. Speed limit repeater signs should be located immediately adjacent to traffic lanes (i.e. behind the coning within the works area) where practicable. At sites where this is impractical, the signs should be located on the nearside verge or central reservation as appropriate. Care should be taken to ensure that these signs are not regularly obscured by site activities. If there is a risk of obscuration, consideration should be given to providing repeater signs larger than the dimensions given in **Table 4.4** and to mounting them at a greater height than normal.

5.3.4. Road works signs should be located to minimise the consequences if a vehicle leaves the carriageway. The following should be considered:

- the sign could be mounted behind a length of existing vehicle safety barrier.
- a new length of temporary safety barrier could be provided around the sign.
- the sign could be mounted further away from the carriageway.
- passively safe posts and signs designed to minimise vehicle damage and injury to occupants could be used – scaffold poles must not be used.

5.3.5. These recommendations are also appropriate for temporary gantries and other temporary equipment. Further guidance is given in CD 377 ‘Requirements for road restraint systems’.

5.3.6. Guidance on the mounting of TTM signing on central barriers, can be found on the following website: https://www.standardsforhighways.co.uk/

5.3.7. The design and location of long-term signs for road works activities at FTPs should be based on the nature of the road and the type of traffic likely to use the road at the sign positions. The relevant standard setback identified in this document should be used. For offside signs, the vehicles permitted to use the outside lane, including in contra-flow situations should be considered along with the widths of the central reservation and the type of vehicle restraint system. If there is no suitable location for an FTP where the sign can be accommodated in the normal position, a remotely operated rotation system could be considered.

5.3.8. The recommended location, number and size of warning and other signs and cones are specified in **Table A1.1** to **A1.3** of **Appendix A1**. These tables give the minimum requirements for straight and level roads with verges. Siting distances will have to be adjusted if gradients, bends or side road junctions on the approaches to the works site are present.

5.3.9. Roads may not have adjacent verges where signs can be placed. In this case, sign sizes (other than regulatory signs) may be adjusted to minimise encroachment on the carriageway depending on the permanent speed limit of the road. For roads where the permanent speed limit applied is:

- 40 mph or less, the smallest size signs may be used;
- 50 or 60 mph, the appropriate size sign should be used where practicable, or.
- the national speed limit, the appropriate size sign must be used.

5.3.10. If no verge or other suitable location exists to mount signs on 'A' frames or temporary vertical posts, signs should be erected in a similar way to permanent signs. In this case, the posts may need to be 'passively safe' depending upon their size and meet the requirements of BS EN 12767:2019.

5.3.11. **Table A1.1** (**Appendix A1**) specifies the size of signs as well as siting and minimum clear visibility distances to the first signs in advance of the works in for different types of road.

5.3.12. In this document, siting distances are specified in metres, kilometres and miles. However, TSRGD requires that all distances and speed limits used on signs are displayed in imperial units. Other dimensions, such on used on width and height restriction are now dual metric and imperial units, and weight restrictions are specified in metric tonnes.

5.3.13. It will not always be possible to place a sign precisely in the correct location to reflect the identified distance. To account for this, variations in positioning of up to 10% are permitted on the distance shown on the supplementary plate. The siting of certain signs in the plans have been rationalised within the permitted 10% variation rather than at the precise location. For example, the 400 yards wicket signs are shown being placed at 400 m (437 yds). In practice this means that signs can only be moved closer to the works. As such, any further required adjustment in siting of these signs from what is stated in the plans should take this into account to ensure that placed signs remain within the permitted 10% tolerance, or change the displayed distance.

5.3.14. For signs where distance values can be varied, the equivalent imperial dimension must be displayed in order to comply with TSRGD (S18-3).

5.3.15. The x-heights of letters displayed on signs must be within the ranges prescribed by TSRGD and be appropriate to the speed of traffic and the quantity of information displayed on the sign. In general, longer messages take longer to read and require larger x-heights. Advice on recommended x-heights can be found in **Table A1.2** (**Appendix A1**).

5.3.16. Traffic signs, cones, cylinders, etc. should be resistant to displacement by wind loads that are likely to be encountered, such as windy conditions or by buffeting from passing vehicles. BS 8442:2022 'Miscellaneous road traffic signs and devices – Requirements and test methods' offers three classes of resistance to wind loads. Any system used to mount signs, or to fix signs to safety fences, must be capable of resisting the specified wind load. For details of the requirements for traffic cones and traffic cylinders see **Section 4.15**.

5.3.17. Ballast used to stabilise traffic signs which is made up of granular material and contained in a sack should be designed in such a way that it would split upon being hit and disperse the contents without causing further problems (see also the section of BS 8442 'Ballasting of Temporary Road Signs', and TMCA TTM ADVICE NOTE 4 'Guidance on BS 8442: 2015 Ballasting of Temporary Road Signs'). Bespoke systems, specifically designed to be passively safe, maybe acceptable as an alternative method of restraining the displacement of traffic signs.

5.3.18. Materials not specifically designed to restrain signs safety e.g. Kerbstones, timber baulks, heavy weights, straw bales, or other traffic management equipment must not be used as ballast. Road pins or timber stakes are not suitable for this use.

5.3.19. Ballast should always be placed below car windscreen height to prevent serious injury in the event of a collision.

5.3.20. The signs may be mounted on portable frames; see BS 8442:2022. Minimum mounting height for all size signs is shown in **Figure 5.7**.

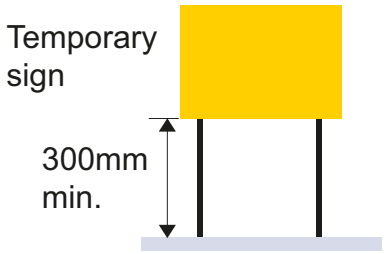


Figure 5.7 Minimum temporary sign mounting height

5.3.21. **Section 4.2** gives minimum clearances for temporary signs to carriageways in use on motorways and dual carriageways, and for the positioning of signs that contain microprismatic material.

5.3.22. Devices similar to traffic cones (e.g. police 'no waiting' signs) are sometimes used as mounting structures for signs. When used as mounting structures, these devices are not considered traffic cones and are not required to conform with the provisions of Part 8 in Schedule 13. Sign faces mounted this way must be flat and not wrapped around the cone (see working drawing 636 S13-6-19).

5.3.23. Traffic cones complying with diagram 7101.1 (S13-6-4, **Figure 5.8**) can be used to support signs to diagram 7104 (S13-6-7, **Figure 5.9**) and 7105 (S13-6-8, **Figure 5.10**) in accordance with S13-8, General Directions in S14 and S15, and individual schedules in respect of upright signs, directions 8 and 9.

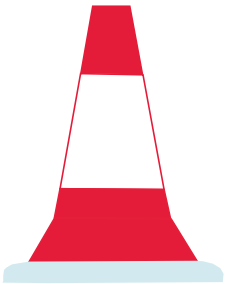


Figure 5.8 Diagram 7101.1 (S13-6-4) Traffic cone



Figure 5.9 Sign to diagram 7104 (S13-6-7) Sharp deviation of route at or near road works



Figure 5.10 Sign to diagram 7105 (S13-6-8) Position of barrier to mark closed length of road

5.3.24. Traffic cones complying with diagram 7101.1 may also be used to support traffic tape or other lightweight barriers used in the demarcation of safety zones within the site.

5.3.25. Road works signs should be sited to ensure that pedestrians can safely pass around the sign. See also **Section 4.32**.

5.3.26. Scaffold poles aligned with the carriageway must not be used.

5.3.27. Mounting posts should not project above the top of the sign because of the additional hazard this poses in the event of a collision.

5.3.28. The colour of the backs of signs is prescribed in S13-8, General Directions in S14, and individual schedules in respect of upright signs, directions 8 and 9.

5.3.29. The colour of sign backs is prescribed but the sign frame/post may be any single colour. Frames may therefore be painted a conspicuous colour (e.g. yellow) to delineate the edge of a sign for the benefit of pedestrians. A cone should be placed to accompany a sign on a footway to ensure sign conspicuity if the mounting is deemed to be not conspicuous enough.

5.3.30. Extracts from **Table A1.1** (**Appendix A1**) may be marked on the back of signs to assist operators to place them at the appropriate distance from the works. If the back of signs are marked in this way then the height of the characters used should not exceed 25 mm.

5.3.31. Cone bases, sign plates and frames may be marked to identify the owner. Identifying marks must not be placed on the front face of a sign (see S13-8, General Directions in S14, individual schedules in respect of upright signs, directions 8 and 9). It is poor working practice to place them anywhere on the front of a frame which is visible to oncoming traffic during normal usage.

5.3.32. It is recommended that a sign is mounted on a temporary vertical post system, or permanent type posts if it is to be present a long duration, such as for a long-term scheme or a temporary layout that is in place for more than six months. This reduces the maintenance burden compared to a sign mounted on a temporary ‘a’ frame and reduces the exposure of operatives to passing traffic.

5.4 Accuracy and condition of signing

5.4.1. All signing (including delineators, markings, traffic control equipment and warning lights) should be consistent and in accordance with its intended legal and informatory function. This is particularly relevant when mobile traffic management techniques are used in conjunction with a static traffic management arrangement.

5.4.2. Signing should represent the prevailing conditions accurately at all times. Conflicting messages between two TTM signs and also potentially between TTM and permanent signs or road markings may cause driver confusion and create additional hazards. Existing signs or road markings may need to be altered, covered, removed or replaced as appropriate and with approval from the authority. Any covers used must be durable, opaque, and secured. Temporary signs must not obscure existing permanent signs which still apply. Spraying with masking material should be done neatly. Designers will need to check the sign face material used for signs to be masked and identify if there are any limitation e.g. anti-dew film, which may limit making material. Sign face material manufacturers are expected to identify one or more masking products which can be used, along with those which would damage the sign face.

5.4.3. Where overhead gantries are in use and traffic lanes are closed or moved onto the hard shoulder, messages on the gantry signs must not conflict with the traffic management arrangement. Action should be taken to eliminate conflicting messages by covering or masking the conflicting gantry signs. Consideration should also be given to temporarily disabling any

queue detection systems associated with matrix or VMS warning signing for the duration of the works.

5.4.4. A pedestrian or cycle crossing must be taken out of service when the crossing is unusable or the markings are substantially or completely removed. Any beacons must be covered, preferably with an opaque black or white bag. For signalised crossings, the signals must be switched off and a 'light signals not in use' sign to diagram 7019 (S14-2-61; **Figure 5.11**) must be displayed. Barriers should be placed across the pedestrian access to the crossing and a 'CROSSING NOT IN USE' sign to working drawing 7016 (S13-9; **Figure 5.12**) to warn pedestrians must be provided.



Figure 5.11 Diagram 7019 (S14-2-61) Traffic light signals not in use



Figure 5.12 Sign to working drawing 7016 (S13-9) Crossing not in use

5.4.5. Permanent road markings should be removed when they are in conflict with temporary traffic requirements for standard works. This may not be practicable for short duration standard schemes e.g. overnight or weekend road closures, in which case the marking may be retained if design of the TTM is adjusted so that it is clear to road users the route to take. Markings must be removed when vehicles would have to pass over raised rib lines at changeover and crossover positions or chevron markings at junctions. However, raised rib and other lane markings may be left in situ where they match with the temporary lane markings. Another situation where markings must be removed is when two or more parallel lanes of traffic are changing lanes. Lane markings do not need to be covered or removed if only one lane is being switched. Raised rib lines should be removed in this instance for standard works and all contra-flow systems

5.4.6. It is important that all TTM equipment is clean and fit for purpose when deployed and should be regularly maintained in the same condition until the works are completed (refer to **Section 13.4**). Temporary traffic signs and cones should be cleaned in a place of safety. See **Section 4.2** for safety clearance requirements.

5.4.7. Temporary sign face patches may be fixed to permanent signing to sign temporary diversions. If used, they should be capable of being removed completely without damage to the sign face. All temporary patches must be removed at the end of the works.

5.4.8. If masking spray paint is used to cover speed limit signs, the entire sign face (including the red border) must be completely obscured. Painting over the numerals only is not sufficient. The numerals must not be visible at any time, including daylight or in silhouette against the retroreflective background at night.

Assessment of traffic sign condition

5.4.9. TTM equipment is subject to more forms of damage than permanent equipment due to storage, delivery, installation, and removal activities. This damage may cause deterioration in appearance and effectiveness. Additionally, the retroreflective properties of signs degrade over time and the sign face colours will fade. The condition of TTM items and equipment (including all signs, delineators, markings, traffic signal equipment and warning lights) should be maintained so that they fulfil their intended legal and informative function throughout the time that they are in place.

5.4.10. In practice, signs and delineators will likely be reused on multiple projects. It is therefore necessary to assess the condition of TTM equipment so it can be taken out of use when it no longer performs its function. This section gives guidance of assessing the condition of signs and delineators. Illustrations and descriptions of sample signs of different quality are provided in **5.4.26**.

5.4.11. Defects which affect recognition and legibility are unacceptable. The situations that the equipment must function in should be taken into account when assessing its condition. For example, a sign face may appear legible in daylight in good weather conditions but may not be adequate in the dark in heavy rain, which would present a potential safety hazard.

5.4.12. The condition of equipment should be assessed:

- prior to storage.
- during assembly.
- periodically throughout its deployment (see **Section 13.4**).

5.4.13. At each stage, a record of the assessment should be taken including any corresponding action taken. This record should be made readily available for inspection as required. In many works contracts, for most types of sign, this inspection and assessment is mandatory when the equipment is erected and while it is deployed.

5.4.14. The condition of each item of TTM equipment should be classified as follows:

- ‘acceptable’ - equipment is appropriate for initial deployment and continued deployment on the highway. All equipment must be ‘acceptable’ at the time of the initial set up.
- ‘marginal’ - equipment which falls within this classification is reaching the low of acceptability and should not be delivered to site. **5.4.15** gives the requirements of dealing with equipment that is assessed as ‘marginal’ during its deployment.
- ‘unacceptable’ – equipment must not be delivered to the site. When found in use, they should be replaced immediately.

5.4.15. During a project, if equipment is classified as ‘marginal’:

- it should be replaced within 24 hours if it is not part of a set of repeated equipment performing a function (e.g. a line of cones, or a set of repeater signs).
- if the item is part of a repeated set, it should be removed if.
  - it is re-assessed as ‘unacceptable’.
  - 20 percent of the set of items are assessed as ‘marginal’ (e.g. a set of repeater signs), or
  - 1 in 5 consecutive items of equipment are assessed as ‘marginal’ (e.g. traffic cones).

5.4.16. During use, TTM equipment will become dirty. As a result, the conspicuity and legibility of equipment will degrade over time, particularly at night and adverse weather conditions. All

items of TTM equipment should be cleaned prior to assessment of their condition and regularly cleaned throughout their time on site.

5.4.17. Signs and delineators should be assessed in relation to the following properties:

- structural integrity.
- sign face condition.
- sign face colour.
- level of retroreflectivity.

5.4.18. If a sign or delineator is assessed as 'marginal' in any one of the properties outlined in **5.4.17**, it should be classified as 'marginal'.

5.4.19. A sign or delineator should be classified as 'unacceptable' if:

- it is assess 'unacceptable'' in any one of the above categories (see **5.4.20** to **5.4.23**).
- it is assessed as 'marginal' in two or more of the above categories.
- it does not conform in every detail with the requirements in the TSRGD 2016.
- there are any defects which impact recognition and legibility.
- the sign is not mounted at the specified height, or
- the sign is mounted on unnecessarily long posts which project above the top of the sign.

5.4.20. Structural integrity: Sign plates should be checked to ensure that they are adequately fixed to their frames. A sign and frame should be classified as 'unacceptable' if the frame is broken or deformed so that the sign is not adequately secure or that the sign plate is not facing an appropriate angle relative to the road surface.

5.4.21. Sign face condition: Scratches and other damage to the sign face can affect legibility. Legibility should be assessed at the appropriate viewing distance. A sign has to be classified as 'unacceptable' if the condition of the sign will make it illegible or will otherwise compromise a driver's ability to comprehend the sign.

5.4.22. Sign face colour: A sign should be assessed for colour fading by comparing the face to a square of new/perfect material. Sign face colour for regulatory signs such as speed limit signs is 'unacceptable' if significant colour fading is likely to compromise regulatory enforcement. For information signs, it would be 'unacceptable' if colours no longer vividly contrast each other and so are no longer legible.

5.4.23. Level of retroreflectivity: During darkness, delineators should be highly conspicuous and signs, symbols, and letters should be clearly visible. The retroreflective properties of signs and delineators should be visually compared with a new/perfect sample of retroreflective material under suitable illumination. Alternatively, a field retroreflectometer may be used in the assessment and readings can be directly compared with BS EN 12899-1 'Fixed, vertical road traffic signs'. The use of a retroreflectometer should only be in special situations or where the results of other methods are disputed. Dew formation on the sign face can significantly impact retroreflectivity, and assessments should not take place in such circumstances.

5.4.24. All lamps must be in good condition and work properly, including retro-reflective sections, infra-red emitters and receivers.

5.4.25. Traffic signal equipment should be inspected and tested before delivery to the site. Faulty traffic signal equipment must not be placed on a public highway. Temporary road markings such as in-situ products and tape must be installed according to the manufacturer's

instructions. This also applied to road studs. Their performance should be regularly monitored throughout the project.

Sign condition assessment guide

5.4.26. The following example illustrations and descriptions of equipment have been classified as ‘acceptable’, ‘marginal’, and ‘unacceptable’ in order to assist with sign condition assessments.

SIGNS WITH SYMBOLS

	**‘Acceptable’** There are some minor abrasions on the sign face, but the symbols are still clearly legible. The colours remain vivid.
	**‘Marginal’** There are numerous abrasions and residue marks on the sign face, but the symbols are not covered or damaged. The colours on the face are noticeably faded but still remains vivid.
	**‘Unacceptable’** There sign face and symbols are heavily damaged. The sign colours are so faded that they no longer match the standard colour.

SIGNS WITH LEGENDS

	**‘Acceptable’** The are some minor abrasions on the surface but the lettering remains intact and legible.
	**‘Marginal’** There are many surface abrasions on the sign face, but they do not impact on the lettering. Colours have evidently faded but the legend clearly contrasts with the background.
	**‘Unacceptable’** The sign face suffers from widespread abrasions affecting legibility. The colour clearly deviates from the standard colour.

SIGNS WITH SYMBOLS AND LEGENDS

	**'Acceptable'** There are minor abrasions on the sign face, but the symbols and legends are still legible. Sign colours remain vivid. The size and proportions of the symbols and legends continue to comply with TSRGD.
	**'Marginal'** There are many minor abrasions on the sign face, but there are no large areas of damage or residue marks. There is some minor fading, but colours are still vivid. The size and proportions of the symbols and legends continue to comply with TSRGD.
 	**'Unacceptable'** In the left-hand example, the relative height and size of the open and closed lane symbols are not in accordance with TSRGD. In the example on the right, the sign face is heavily damaged and there is obvious colour fading.

ROAD WORKS DELINEATORS

	**'Acceptable'** The surface of the cone is free of damage (punctures or abrasions) and residue (asphalt splatter or cement slurry). The retroreflective cone sleeve has only minor tears or scratches.
	**'Marginal'** There are some abrasions, residue marks and some discoloration on the cone, though largely minor. The retroreflective cone sleeve has tears and scratches but is free of large areas of residue or damage.
	**'Unacceptable'** There are large residue marks and punctures on the surface of the cone. The retroreflective cone sleeve is heavily stained or damaged.

5.5 Lighting of signs

5.5.1. The visibility of temporary signs during the hours of darkness should at least be equal to the visibility of permanent signs. Where a sign is reflectorised, all non-black-coloured parts of a sign must be reflectorised, unless otherwise specified in TSRGD.

5.5.2. Signs that are required to be reflectorised should be reflectorised by:

- For all signs in place thought the hours of darkness which are not also externally or internally illuminated, the application of Class RA2/R2 retroreflective material as detailed in BS EN 12899-1:2007 'Fixed, vertical road traffic signs'.

- Where this document identifies a need for higher performance retroreflective sheeting products meeting Class R3B-UK (National Annex Table NA.1B to BS EN 12899-1). or R3C-UK (National Annexe Table NA.1C); is recommended.

NOTES:

1. The performance of retroreflective materials using microprismatic technology can be found in the relevant European Technical Approval (ETA)

2. Class 1 in BS 873-6:1983 is the same as Class RA2 in BS EN 12899-1 which superseded BS 873-6:1983.

5.5.3. It is recommended that signs which are externally illuminated, and do not also need to be constructed with retroreflective material by TSRGD, are still constructed with material to at least Class RA1/R1 retroreflective material as detailed in BS EN 12899-1. This is due to limited capabilities of eternal lighting systems.

5.5.4. Class RA2 gives requirements for the photometric properties of the sign only. Signs are also required to be resistant to weathering and these requirements for temporary signs are specified in BS 8442:2022. BS 8442:2022 provides two classes of weathering resistance:

- T1 which requires two years of resistance to natural weathering.
- T2 which requires three years resistance to natural weathering as in BS EN 12899-1.

5.5.5. Some road signs are also required to be lit (and not just reflectorised) by TSRGD. They must be illuminated directly, by internal or external lighting systems. See **Appendix A8** for details.

5.5.6. Lighting units should be oriented to ensure that they do not dazzle passing drivers.

5.5.7. Where lighting is required, a minimum mean illuminance of 100 lux is required on the sign face. The designed lamp should normally output a minimum of 180 candelas and must evenly illuminate the whole sign face without obscuring it.

5.5.8. Lighting for signs should be provided by electrically powered devices only.

5.5.9. The contractor is responsible for demonstrating that unlit signs are readable. If this cannot be demonstrated, the TTM design must be amended to ensure that the sign can be read, for example by lighting the sign or altering its location or orientation. TTM inspections should include an assessment of the readability of all signs and the findings will needs to be recorded. If an inspection finds a sign to be unreadable then the first action should be to change the location or orientation of the sign to immediately improve readability.

5.5.10. Signs in Schedule 13 Part 6 with a yellow background may be constructed with fluorescent yellow background material (see **Appendix A3** BS EN 12899-1 National Annex Table NA1D - chromaticity and luminance factor for fluorescent retroreflective material).
The following signs are an exception and must not be constructed with fluorescent yellow background material;

- 636 (S13-6-19).
- 636.1 (S13-6-20).
- 636.2 (S13-6-21).
- 640.1 (S13-6-22).
- 832.4 (S13-6-51).
- 2701 (S13-6-28).

- 7003.1 (S13-6-42).
- 7005 (S13-6-43).
- 7006 (S13-6-44).

5.6 Signs authorisation

5.6.1. Signs prescribed by TSRGD or authorised by the relevant national authority may be used at road works, provided that the appropriate criteria are met and any necessary orders have been made.

5.6.2. With a range of prescribed signs for use in temporary situations available within TSRGD, the number of occasions in which a non-prescribed sign is required will be few. In these limited situations, different signs can be authorised by the relevant national authority.

5.6.3. Due to the responsibility of national authorities, the authorisation of new signs for use in temporary situations may have the following limitations:

- Signs must not have the same legal meaning as another, prescribed, sign.
- The authorisation should detail the criteria for use, including if the sign may be used at a specific location, over the length of a route or over the network of an authority.
- The authorisation may also limit the use of a sign (and equipment), including how it can be used, what other signs may, must or must not be used with it, any type approval requirements, and any training requirements needed for its use.
- A single authorisation cannot permit a sign to be used in more than a single authority. The same sign may, however, be authorised for use in more than one authority.
- Authorisations are solely at the discretion of the national authority and may be revoked.
- Testing of the sign may be required before authorisation is given, the nature and requirements of the testing may vary from sign to sign and is determined by the national authority granting authorisation.
- Further limitations apply to signs which indicate mandatory requirements or prohibitions.

5.6.4. National authorities may delegate some or all rights for authorisation to other relevant organisations. Where a sign authorisation is needed, contact with the relevant road authority should be made in the first instance.

5.6.5. Where generic products require authorisation, manufacturers may contact the relevant national authority for any specific requirements. Individual authorisation must still be sought from the national authority through the relevant road authority. Manufacturers may be able to obtain help and guidance on seeking authorisation from the relevant trade bodies.

5.7 Nearside or offside signs

5.7.1. The installation of signs on both sides of the carriageway has the following benefits:

- it reduces the likelihood of obscuration for road users, particularly as traffic flow increases.
- it provides a level of redundancy if one of the signs is damaged or displaced, allowing for more time to replace or reposition the affected signs.

5.7.2. A site-specific risk assessment and associated risk-based design must be undertaken and must consider all potential options for advance signing, to ensure that the risk to road users and road workers is reduced to a level that is ALARP. This includes the option of providing signs on both or just one side of the carriageway. It is unacceptable to select a design that reduces

risk to one party (e.g. road workers) at the expense of increased risk to another (e.g. road users).

5.7.3. If site-specific risk assessments determine that signs can be placed on only one side of a carriageway, these signs must be readable. Readability requirements can be determined for some situations by the information detailed in **Appendix A7** or calculated for individual situations using the methodology detailed in **5.9.4**. Risk assessments must identify the minimum size of the signs and the clear visibility distance which ensures that the signs are readable and clearly communicate the relevant warning, requirement or message to road users (see also **Section 5.3** and **Appendix A7**).

5.7.4. Unless specifically highlighted, recommended traffic sign sizes in this document, for both standard and relaxation works, assume that signs are provided on both sides of the carriageway. The sizes of signs prescribed in TSRGD may not be sufficiently readable if provided on only one side of the carriageway, especially for carriageways wider than three lanes. Signs that are larger than the maximum prescribed size may be used for short term use under the provision of S13-9. However, signs used under this provision have additional requirements or limitations, particularly when used at FTPs.

5.7.5. When used, offside signs should be installed in the central reserve using an appropriate safe system of work. Installing signs manually by carrying out carriageway crossings from a place of relative safety can result in considerable risk exposure and may not be considered reasonably practicable.

5.7.6. If the risk assessment and design process identifies that crossing a carriageway from a place of relative safety to place offside signs is the safest system of work, then the operation, training and supervision of this activity should be conducted in line with the HSE document CIS53 (Rev1). The time taken to safely cross the carriageway with all the required TTM equipment and its impact on the installation or removal time for the works, the available working window and road user risk must be taken into account with this method of working.

5.7.7. Offside signs may be installed in the central reserve using works vehicles protected by IPVs, this approach may however increase the time required to install the lane closure. Risk based planning may identify locations on some dual carriageways where it is not practicable to fit two works vehicles, with associated safety zones, into the available space and with acceptable risk to road users. In these cases, contractors will have to identify a safe method of work, for example by using one vehicle, or installation using enhanced MCC options.

5.7.8. Reducing the number of signs on the approach to a lane closure can reduce the time needed to set up and remove works, reducing the risk exposure of road users and road workers. This practice should only be undertaken when the signs used provide an adequate amount of information to road users. Further guidance on where this approach may be acceptable is given in **Section 7.16**. The principle of placing signs only one side of the carriageway (outlined for nearside only signs on carriageways of five or more lanes in **Section 7.13**) can be applied as a relaxation to lane closures schemes on all carriageways, subject to risk-based design. Signs provided need to be readable and must provide adequate guidance to road users in lanes to be closed and in the first open adjacent lane. For example, for a four-lane carriageway with a closure of the inside two lanes, nearside signs would need to be readable in lanes one to three.

5.7.9. Reducing the number of signs at relaxation schemes increases the importance of the remaining signs and may only be appropriate under particular conditions. An assessment of the conditions is required when the works are installed and throughout the time the works are in place. Should conditions deteriorate, robust contingency plans must be in place for all relaxation

scheme works to ensure that timely action can be taken to reduce the risk to road users and road workers to ALARP.

5.7.10. An assessment of sign obscuration is part of the design process. This assessment should compare the obscuration of a sign provided on one side of a carriageway against the obscuration of signs of the recommended size provided as a pair on both sides of the carriageway. The assessment should take into account traffic flows and the percentage of HGVs within the traffic. Traffic flow values given in **Table 4.2** can be used as an estimate. The percentage of HGVs (and those vehicles over 4.5 m in height) within the traffic flow may be estimated if data are not readily available. Designers should be competent to make an effective assessment of obscuration. Competency requirements are identified in **Section 15.1**.

5.7.11. Construction or maintenance workers should not be required to undertake planned works in a live lane. Work activities should be carried out within a works area or working space that is protected by fixed TTM, an IPV (see **Section 14.9**) or other mobile works (see **Section 10** and **Plan MLC4**). Installing TTM equipment is not normally possible when maintenance or construction workers are active in adjacent areas. If possible, installation, maintenance, and removal of TTM should be undertaken from an existing safety zone.

5.7.12. As with all TTM, when omitting signs from one side of the carriageway, Contractors or Service Providers should monitor the scheme to identify if their risk assessment continues to meet the minimum requirements for road user safety and comprehension. Contractors or Service Providers should record the following:

- instances of taper strikes and any maintenance of the TTM to reset clipped cones in the taper and adjacent areas.
- instances of lane changes within 100 m of the first cone from a lane being closed. This should be identified by personnel on site or from CCTV if it is present.
- any comments from road users provided either direct to themselves or via the authority.

5.7.13. If the data collected as per **5.7.2** indicates that road users may not have seen any or all of the signs, Contractors should identify and record the conditions prevailing at the time in order to identify why the signs were not clearly visible (see **Section 2.6**).

5.8 Advance warning signs

5.8.1. Distances for advance warning signs for different speed limits are given in **Table A1.1** (**Appendix A1**). Further signs should be added at appropriate intervals in advance of the first sign where queuing is expected.

5.8.2. At works for which relaxations apply fewer advance warning signs may be required.

5.8.3. Where work is carried out off-carriageway and signing and guarding is not required (see **Section 4.44**) advance warning signs in accordance with this section are not required. When signing and guarding is required for off-carriageway works, signs should be provided as shown on plans in **Sections 6** and **7**.

5.8.4. The ‘lane closed ahead’ sign to diagram 7202.1 (S13-6-13, see **Figure 5.13**) and its variants should only be used when lanes are completely closed and should not be used when the carriageway space is only narrowed.

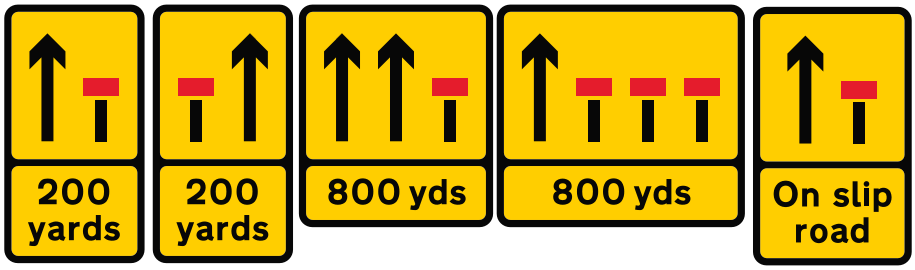


Figure 5.13 Diagram 7202.1 (S13-6-13) Information on number of lanes closure ahead (Examples of alternative types)

5.9 Approach signing for relaxation works

5.9.1. This Section assumes that approach signs to diagrams 7202.1 (S13-6-13), 7243 (S13-6-14), 7244 (S13-6-15), and 7245 (S13-6-16) are provided on both sides of the road or carriageway. The recommended size and clear visibility requirements are based on this assumption. When these signs are placed on only one side of the carriageway, visibility requirements change because the sign has to be read at a greater lateral distance.

5.9.2. **Appendix A7** gives the recommended approach sign sizes for relaxation schemes on dual carriageways that are subject to the national speed limit. This provides options for various situations such as where there may be limitations on the width of verges or central reservations.

5.9.3. For relaxation scheme lane closures, the size of the sign used depends on what side of the carriageway the signs are to be placed. Where pairs of signs are used on both the nearside and offside of the road, a smaller sign may be used for the offside sign. The recommended sizes are shown in **Table A7.1** to **A7.3** (**Appendix A7**). Consideration should be given to the potential manual handling issues of installing signs on the offside compared to the nearside when deciding which approach to take. If placing advance signing on the offside, then an appropriate safe method of working will need to be employed (see **Section 7.16**).

5.9.4. Where signs are only provided on one side of the carriageway, as per **Section 5.7**, designers can also calculate the required ‘x’ height (therefore arrow size) from the methodology in Traffic Signs Manual Chapter 7.

5.9.5. A high performing sign face material should be used when site specific limitations require the size of one sign on the approach to be smaller than recommended, or where the required clear visibility distance required is greater than 175 m. Material to Class R3B-UK as defined in BS EN 12899-1 is recommended in these scenarios. Class R3C-UK may also be used and is recommended where clear visibility distances over 200 m are required, depending on road geometry.

5.10 Temporary traffic control

5.10.1. The following signs may be used for positive traffic control at road works.



7023 (S14-2-64)



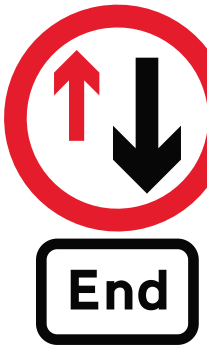
7024 (S14-2-65)

5.10.2. Manually operated 'STOP' and 'GO' signs to diagrams 7023 (S14-2-64) and 7024 (S14-2-65). **Section 6.7** gives guidance on the use of 'STOP/GO' signs. These should not be operated over distances greater than 500 m. If required, a circular frame should be used for both signs (as they are both mounted on a circular substrate).

5.10.3. These signs should not be used at night unless they are directly, steadily, and uniformly illuminated across the sign face. The sign face may also be reflectorised.



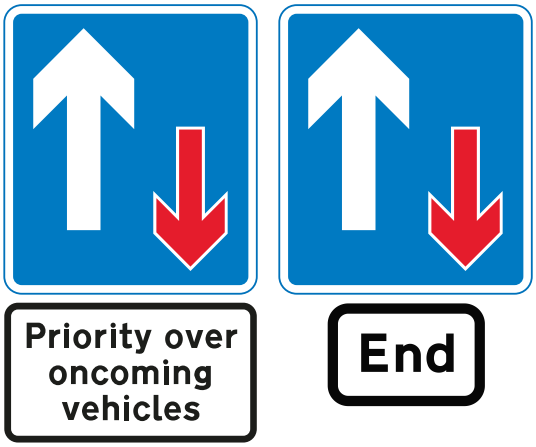
615 (S3-2-9) and explanatory plate (S3-3-9)



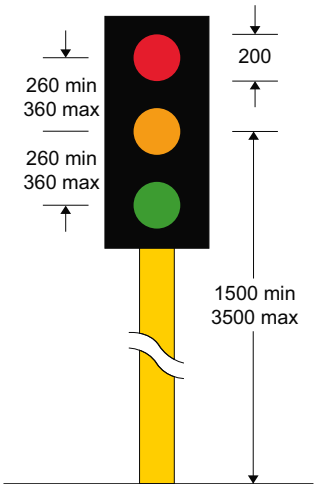
615 (S3-2-9) and explanatory plate (S3-3-5)

5.10.4. 'Priority' signs to diagrams 615 (S3-2-9), 811A and 811B (S11-2-1) to show which direction has priority over opposite traffic. Guidance on priority signs is given in **Section 6.6**. This method can be used where imposing more rigid control is not justified, such as where traffic flow is very low (e.g. less than 800 vehicles per hour).

5.10.5. Explanatory plates to S3-3-9 and S3-3-5, must be used in combination with signs 615.



811A (S11-2-1) and 811B (S11-2-1)



3000.1 (S14-2-2)

5.10.6. Portable light signals can be used for positive control of traffic on shuttle lanes. Guidance on positive traffic control using temporary traffic signals is dealt with in **Section 6.10**.

5.11 General signing



7001 (S13-2-9) with supplementary distance plate (S2-5-5)



7001 (S13-2-9) with supplementary 'For' indicated distance plate (S13-2-9)

5.11.1. A 'road works ahead' sign to diagram 7001 (S13-2-9) should be provided at all road works as well as temporary situations where TTM is placed on the road. This includes events. It should be the first sign seen by drivers from all approaches to the works. The 'road works ahead' sign should be supplemented with a distance plate when used on motorways and all-purpose roads subject to the national speed limit.

5.11.2. The 'road works ahead' sign may be used at the site of road works as well as on the approach, with the supplementary sign indicating the length of the hazard or obstruction, see S18-3. These plates may also be used on restricted all-purpose roads, but are not necessary on roads with a permanent speed limit of 30 mph or less.

5.11.3. A supplementary plate may be provided with the 'road works ahead' sign that indicates the nature of the works. **Table A1.2** (**Appendix A1**) gives the matching supplementary plate size appropriate to the size of 'road works' sign.

5.11.4. Supplementary plates which may be used at 'road works ahead' sign to diagram 7001 (S13-2-9) to give the nature of works are listed in **Table 5.1** below.

Table 5.1 Supplementary plates to diagram 7001 (S13-2-9)

Line painting Single line example	Line painting	← or →
Grass cutting	Surveying	Gully emptying
Tree cutting	Overhead works	Weed spraying
Hedge cutting	Road sweeping	Sign erection
Ditching	Blasting	Gritting
At level crossing	Salting	On slip road
Sign maintenance	Snow ploughing	Mobile road works
Lighting maintenance	On hard shoulder	
End Note: Only used at the end of the roadworks or temporary restriction.	Example of phrase combined with additional elements listed in 5.11.2 to 5.11.9	Line painting for 800 yds

5.11.5. The ‘Blasting’ plate variant gives warning to drivers about the likelihood of hearing an explosion in the area. It should be used to supplement the ‘road works ahead’ sign to diagram 7001 (S13-2-9) when explosives are being used on or near the road and it is safe to allow traffic to keep running. If it is necessary to stop all traffic during blasting, suitable arrangements must be made with the authority and the police.



7001 Supplementary plate (S13-2-9)

5.11.6. Supplementary plate to sign 7001 (S13-2-9) is used to show the distance over which a hazard is present or a prohibition applies.



572 (S2-5-5)

5.11.7. Sign 572 (S2-5-5) is used to warn of a hazard approaching at the specified distance.



572 variant (S2-5-5)

5.11.8. Variant of sign 572 (S2-5-5) is used on adjoining roads to indicate both distance and direction to an approaching hazard. It may be used to supplement a ‘road works ahead’ sign to diagram 7001 (S13-2-9) to indicate the direction of approaching works as well as other warning signs; see TSRGD and TSM Chapter 4. The distance may be omitted.



7001 Supplementary plate (S13-2-9)

5.11.9. Supplementary plate to sign 7001 (S13-2-9) gives the location of road works and warns of possible delays on the ‘named’ road. This plate must only be erected below a ‘road works ahead’ sign to diagram 7001 (S13-2-9) before a junction. The route number and direction may be varied as appropriate. ‘Northbound’ and ‘Southbound’ may be used interchangeably or may be omitted if works are in both directions from this junction. If omitted the word ‘On’ should be inserted, for example this sign should become ‘On M1’.



562 (S13-2-7) and supplementary plate legend 4(a) to 562

5.11.10. Sign 562 (S13-2-7) should be used to warn drivers of unexpected hazards ahead. The sign may be accompanied by the appropriate supplementary plate indicating the nature of the danger. Suitable x-heights and the overall sizes of the plates are set out in **Table A1.2** (**Appendix A1**). This sign should not be used to warn of road works.

5.11.11. Supplementary plates that may be used alongside the ‘OTHER DANGER AHEAD’ sign to diagram 562 (S13-2-7) include:

- a word or phrase from **Table 5.2**;
- a word or phrase from **Table 5.2** followed by a distance and / or.
- an arrow pointing to the left or to the right.

Table 5.2 Supplementary plates to sign to diagram 562 (S13-2-7) Other danger ahead

Accident	Overhead cable repairs	Frost damage	Examples of distance and arrow use
Dust cloud	Runners in road	Accident 100 yds	Runners in road 220 yds →
Census	Smoke	Accident ←	Walkers in road →
Fallen tree	Walkers in road		



7001.3 (S13-9)

5.11.12. Sign to working drawing 7001.3 (S13-9) is used to indicate the presence of a workforce in a live carriageway and to warn drivers to proceed slowly. This sign should only be used when workers are present in the live carriageway (or lateral safety zone).



7015 (S13-9)

5.11.13. Sign to working drawing 7015 (S13-9) is used to warn drivers that works ahead will occupy the hard shoulder at a given distance. It should not be used when lanes are also closed.



7104 (S13-6-7)

5.11.14. 'Sharp deviation of route' sign to diagram 7104 (S13-6-7) is used to warn drivers that an upcoming obstruction requires them to change direction. It is also used to guard the obstruction. TSRGD prescribes the signs minimum length, there is no prescribed maximum length. The sign may be used as a series of separate minimum lengths or in one continuous length. The recommended heights are given in **Table A1.2** (**Appendix A1**).

5.11.15. 'Sharp deviation of route' sign to diagram 7104 (S13-6-7) should not be used as a barrier parallel to a relatively straight carriageway. The black and white version of this sign to diagram 515 (S2-6-3) must not be used at road works.



7105 (S13-6-8)

5.11.16. 'Lane closed' barrier to diagram 7105 (S13-6-8) is used as a visual and physical barrier to a closed lane. It is used in conjunction with traffic cones and other signs to indicate a change in direction is required. It should be used at right angles to the line of traffic and mounted about 1 m above the carriageway. The depth of the sign may be either 150 or 300 mm, refer to **Table A1.2** (**Appendix A1**). It must be at least 1.25 m long and consist of a minimum of 3 red and two white alternating panels.



606 (S3-2-1)

5.11.17. 'Turn left/right' sign to diagram 606 (S3-2-1) indicates to the driver which direction to proceed. This sign must not be used as a directional sign. This sign must not be used without the necessary order, the only exceptions to this are:

- using the 'turn left' sign when on the main island of a roundabout, or
- used in combination with diagram 608 (S9-2-3) 'Dual carriageway'.



609 (S3-2-2)

5.11.18. 'Turn left/right ahead' sign to diagram 609 (S3-2-2) indicates that drivers must turn left or right at an approaching junction. This sign must not be used without the necessary order or as a directional sign. The only exception is on the approach to a junction that joins a dual carriageway road.



610 (S3-2-3)

5.11.19. The 'keep left/right' sign to diagram 610 (S3-2-3) indicates that drivers must pass the sign on the side indicated. It is a regulatory sign. No order, nor national authority site approval, is required for its use.



612 (S3-2-7)

5.11.20. 'No right turn' sign to diagram 612 (S3-2-7) or the 'no left turn' sign to diagram 613 (S3-2-8) is used to indicate that a side road is closed, traffic cannot turn into it, and the traffic must divert by travelling ahead. These must not be used without the necessary order.



613 (S3-2-8)



632 (S3-2-5)

5.11.21. 'No overtaking' sign to diagram 632 (S3-2-5) is used to indicate that overtaking is not permitted, such as when existing double white line markings have been removed and cannot be replaced quickly. This sign must not be used without the necessary order. Where a single carriageway has two lanes in any direction, this does not apply to traffic on the outer lanes passing traffic on the inner lanes,



554 (S13-2-2)



554.1 (S2-2-39)

5.11.22. 'Flood' sign to diagram 554A (S13-2-2) is used to give warning of flood conditions on a road that makes travelling along it hazardous or impossible. Unless this sign is used as a measure for short-duration standing water, it should be followed by a 'Try your brakes' sign to diagram 554.1 (S2-2-39) at the end of the flood hazard.

5.11.23. If the flood causes a complete road closure, the 'Flood' sign should be supplemented by the 'ROAD CLOSED' sign to working drawing 7010.1 (S13-9). If necessary, the 'ROAD AHEAD CLOSED' sign to working drawing 7010.1 (S13-9) should also be used prior to the 'Flood' sign, accompanied by alternative route signs at the preceding junction.

5.11.24. At sites liable to flooding, the 'Flood' sign should always be erected when conditions become dangerous; see Chapter 4.



554.2 (S13-2-4) and supplementary plate

5.11.25. Sign to diagram 554.2 (S13-2-4) is used to warn of situations where icy conditions are present and are hazardous; see Chapter 4. It should be accompanied by a supplementary plate. Warning of fog is given by the matrix signal to diagram 6011 (S15-2-8), warning of ice can also be given by 6011.1 (S15-2-9).



557 (S13-2-6)

5.11.26. 'Slippery road ahead' sign to diagram 557 (S13-2-6) is used to warn drivers of a slippery surface hazard on the road ahead. This sign should only be used until the problem can be rectified; see Chapter 4 for further details. This sign should be used with a distance plate.



584 (S2-2-50) and supplementary plate

5.11.27. 'Queues likely ahead' sign to diagram 584 (S2-2-50) is used to warn that there will likely be traffic queuing upstream of the road works or temporary situation and the end of the queue could be hidden or come upon unexpectedly. It must be used in combination with a supplementary plate 'Queues likely' or 'Queues likely on slip road' with or without an arrow.

5.11.28. Signs to diagram 584 (S2-2-50) should be sited upstream of the anticipated queue; see Chapter 4 for further details.



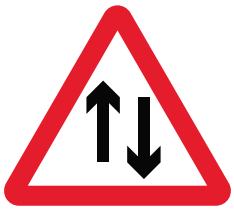
516 (S2-2-13)



517 (S2-2-14) and supplementary plate

5.11.29. 'Road narrows ahead' signs to diagrams 516 and 517 (S2-2-13 and 14) are used to warn drivers that the existing carriageway width is restricted. The manner in which the carriageway width is restricted determines which sign should be used.

5.11.30. Where appropriate, 'Road narrows ahead' signs to diagrams 516 (S2-2-13) and 517 (S2-2-14) signs are supplemented by a 'Single file traffic' plate. This is used to warn drivers that they must now proceed in single file; see Chapter 4 for further details.



521 (S2-2-16)



522 (S2-2-17)

5.11.31. 'Two-way traffic ahead' signs to diagrams 521 (S2-2-16) and 522 (S2-2-17) are used to warn drivers of two-way opposing or cross traffic at situations where it may not be expected. A sign to diagram 522 is used on a one-way road to indicate that the road is about to join a road that carries two-way traffic; see Chapter 4 for further details.



560 (S2-6-2)

5.11.32. The reflectorised 'hazard marker' signs to diagram 560 (S2-6-2) are used to delineate the edge of the carriageway on unlit or poorly lit roads. They may be mounted on suitable posts or stakes (but not traffic cones). They may also be used to mark individual temporary obstructions that are close to the carriageway and cannot be marked using cones and warning lights. For further guidance on the use of these sign, see Chapter 4 and BS EN 12767:2007 'Passive safety of support structures for road equipment'.

5.11.33. On single carriageway roads these signs must be double sided and show red on the left-hand side of the carriageway and white on the right-hand side.

5.11.34. On dual carriageway roads or one-way roads they must be single sided and show red on the left-hand side of the carriageway and amber on the right-hand side.



7021 (S14-2-62)

5.11.35. 'TRAFFIC UNDER SIGNAL CONTROL' sign to diagram 7021 (S14-2-62) is used at side roads leading to an uncontrolled junction joining a section of road which is under temporary control by portable traffic signals. This sign must only be used when traffic held at the signals is visible to the side road joining traffic. This sign should be used in combination with a 'road works ahead' sign to diagram 7001 (S13-2-9).



830.1 (S13-6-46)

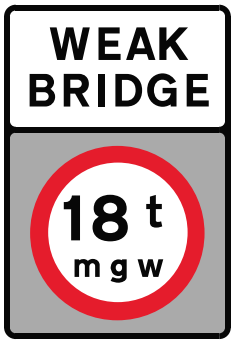
5.11.36. 'CENSUS STOP if directed' sign to diagram 830.1 (S13-6-46) is used to indicate that drivers may be asked to stop at the approaching census traffic point. For more information, see **Section 12.4**. The sign must only be used when the taking of the census has been approved by:

- the traffic authority for the road.
- the chief officer of police of the police area in which the road is situated, or
- on behalf of the Secretary of State.



622.1A (S3-2-13)

5.11.37. 'Weight restriction' sign to diagram 622.1A (S3-2-13) is used to prohibit goods vehicles that exceed the indicated maximum gross weight from entering a road. This does not prohibit vehicles over this weight which are not goods vehicles e.g. coaches.



626.2A (S9-4-2)

5.11.38. A 'WEAK BRIDGE' or 'WEAK ROAD' sign to diagram 626.2A (S9-4-2) must be erected instead if the weight restriction is imposed for structural reasons and there is a need to limit the weight of all vehicles. An 'Except empty vehicles' bottom panel may be added where appropriate.

5.11.39. A Traffic Regulation Order must be in place to use either signs to diagram 622.1A (S3-2-13) or 626.2A (S9-4-2). These signs should usually be placed on each side of the carriageway; see S3-9.



7010.1 (S13-9)

5.11.40. 'ROAD CLOSED' sign to working drawing 7010.1 (S13-9) is used to warn traffic of a road closure ahead. The word 'ROAD' may be replaced by the name of the road, if appropriate. Some of the other commonly used variants of this sign are listed in **Table 5.3**. This is an information/warning sign and is not a regulatory sign; any road or carriageway closure will need to be as indicated in **Section 6** or **7**.

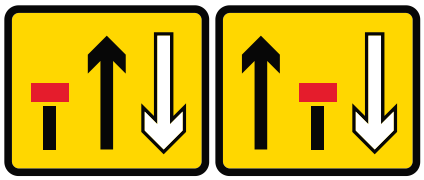
Table 5.3 Typical variants for the sign to working drawing 7010.1 (S13-9) Road closed

RAMP AHEAD	TRAFFIC CONTROL AHEAD	Examples of name replacement for ROAD CLOSED and ROAD AHEAD CLOSED
ROAD AHEAD CLOSED	TRAFFIC SIGN MAINTENANCE	GREAT WEST ROAD CLOSED
SLOW WET TAR	TRAFFIC SIGNAL MAINTENANCE	WEST STREET CLOSED
WORK IN CENTRE OF ROAD	TEMPORARY ROAD SURFACE	WEST STREET AHEAD CLOSED

5.12 Signs for lane restrictions, closures, and contraflow

5.12.1. The principles of using signs for lane restrictions and lane changes are described for single carriageway roads in **Section 6** and for dual carriageway roads in **Section 7**.

5.12.2. The following wicket signs are used to indicate which lanes are open or closed to traffic and contraflow working. Wicket signs (including all variants) illustrated in **5.12.4** and **5.12.6** to **5.12.9** must only be used on one way streets or dual carriageway roads.



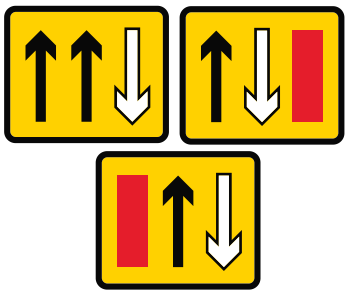
7202.1 (S13-6-13)

5.12.3. Sign to diagram 7202.1 (13-6-13) indicates that the centre or left lane of a single carriageway is closed with traffic on the offside travelling in the opposing direction. The number of arrows to show which lanes are open and closed on the primary direction may be varied as appropriate. A single downward facing white arrow is use irrespective of the number of lanes open in the secondary direction. When placed on a bi-directional single carriageway road the white down arrow must be included to indicate two-way flow.



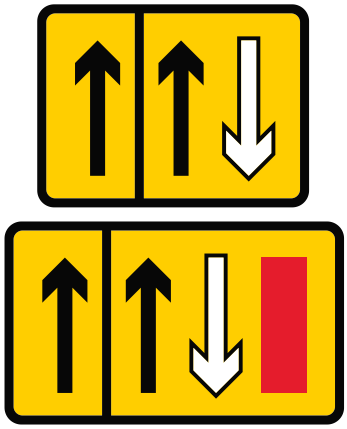
7202.1 (S13-6-13)

5.12.4. This sign indicates that the two right-hand lanes of a dual carriageway or one way street are closed to traffic ahead. The number of arrows to show which lanes are open and closed may be varied as appropriate.



7245 (S13-6-16)

5.12.5. This variant to diagram 7245 (S13-6-16) indicates that two lanes of the carriageway are open to traffic with one or more lanes in use in the opposite direction. When used in a contra flow it should be used where opposing flows are segregated using studs with traffic cylinders to diagram 7103 (S13-6-6) in accordance with Details H or K. This sign should not be used where there is a buffer lane or a vehicle restraint barrier in place between the lanes of opposing traffic. The number of arrows to show which lanes are open and closed on the primary direction may be varied as appropriate. A single downward facing white arrow is use irrespective of the number of lanes open in the secondary direction. When placed on a bi-directional single carriageway road the white down arrow must be included to indicate two-way flow.



7245 (S13-6-16)

5.12.6. This variant to diagram 7245 (S13-6-16) indicates that two lanes of the carriageway are open to traffic, one of which uses the hard shoulder, with the offside lane being used for contraflow working. It should only be used where opposing flows are segregated using studs with traffic cylinders to diagram 7103 (S13-6-6) in accordance with Details H or K. This sign should not be used where there is a buffer lane or a vehicle restraint barrier in place between the lanes of opposing traffic. The number of arrows to show which lanes are open and closed may be varied as appropriate.



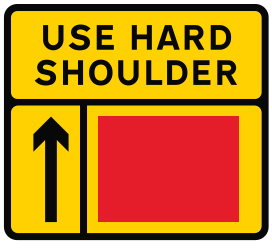
7245 (S13-6-16)

5.12.7. This variant to diagram 7245 (S13-6-16) indicates that two lanes of the carriageway are open to traffic, one of which uses the hard shoulder.



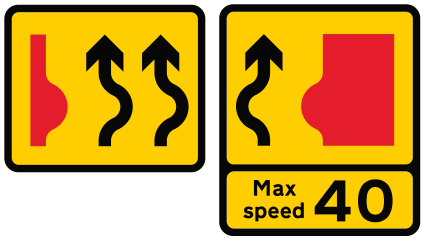
7245 (S13-6-16)

5.12.8. This variant to diagram 7245 (S13-6-16) indicates that two lanes of the carriageway are open to traffic and the works area is on the right. The sign does not include the vertical bar if traffic is not on the hard shoulder or the permanent Diagram 1012.1 road marking has been temporarily removed. Shown with a bottom panel to indicate the distance over which the conditions indicated apply.



7245 (S13-6-16)

5.12.9. This variant to diagram 7245 (S13-6-16) shows that all lanes of a three-lane dual carriageway are closed and one lane is open to traffic which is using the hard shoulder with the permanent Diagram 1012.1 road marking in place. This sign may be used with a bottom panel to indicate the distance over which the conditions indicated apply or a maximum advised speed.



7245 (S13-6-16)

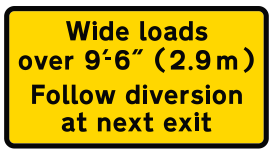
5.12.10. This variant to diagram 7245 (S13-6-16) is used in advance of sharp bends to indicate a diversion onto a temporary road for a short distance. A bottom panel should be used to indicate over what distance the condition applies. Alternative types are shown with a single and two lanes open with the bottom panel.

5.12.11. Signs for lane restrictions, closures, and contraflow to diagrams 7243 (S13-6-14), 7244 (S13-6-15), and 7245 (S13-6-16), may consist of a centre panel with a top and/or bottom panel. TSRGD and TSR(NI) gives a list of the top and bottom panels which may be used with each sign along with all symbols that can be used. The central panels of these signs give warning and indicate restriction on various lane on a carriageway.

5.12.12. A closed carriageway lane should not normally be surrounded on both sides by lanes that are open to traffic as usual (known as island working). As such, if a lane restriction panel is used to show the centre lane (or lanes) of a carriageway as closed, then the same signing for a contra-flow will need to be used.

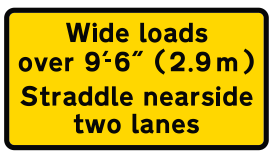
5.12.13. Signs will need to be changed immediately when a road layout is changed to indicate the new arrangements.

Wide loads



7292 (S13-9)

5.12.14. Sign to working drawing 7292 (S13-9) indicates that drivers of vehicles carrying wide loads should take the action shown. This is used primarily on dual carriageway roads but may be used at other locations as appropriate. A carriageway exit should be identified upstream of the works that leads to a suitable diversionary route for wide loads. These signs should be sited on the nearside verge at 2 km and 1 km upstream of the identified exit.



7292 variant (S13-9)

5.12.15. Variant sign to working drawing 7292 (S13-9) indicates that vehicles carrying wide loads are permitted to straddle the nearside two lanes. This is used at road works with three or more running lanes and where the nearside two lanes are contiguous.

5.12.16. Wide loads of 2.9 m to 4.6 m that straddle the two lanes are generally permitted to pass safely through road works un-escorted so long as they straddle the two nearside lanes leaving at least one running lane for other traffic.

5.12.17. These signs should be sited on the nearside verge at 2 km and 1 km upstream of the works. These signs should be repeated at the start of the works and following any junctions within the road works site.



7292 variant (S13-9)

5.12.18. Variant sign to working drawing 7292 (S13-9) indicates to drivers of wide loads that a wide load escort service is available and should be contacted via an emergency phone. At some works, a suitable diversion for wide loads may not be available and the road may not be suitable to allow wide loads to straddle across two lanes. In these cases, an escort service may be appropriate. The wording may be varied where an escort service is provided. The signs should be sited on the nearside verge at 2 km and 1 km upstream of the location.



7293 (S13-9)

5.12.19. Sign to working drawing 7293 (S13-9) indicates to drivers of wide loads where an 'emergency telephone' is located so that an escort service can be requested. This sign should be sited on the verge adjacent to the emergency telephone.

5.12.20. A supplementary plate giving a telephone number may be added below signs to working drawing 7293 as required. Telephone numbers for wide loads should not be included in signs at locations where it is not possible for a vehicle to stop, write down the number and then make a call when stopped.

Vehicle recovery



7291 (S13-6-40)

5.12.21. 'Free recovery service' sign to diagram 7291 (S13-6-40) is used to indicate to drivers that a free recovery service is being provided.

5.12.22. A pair of 'Free recovery service' signs to diagram 7291 (S13-6-40) should be sited between 500 m and 1000 m upstream of the start of works lead-in taper, although this may be extended to 2 miles for major works sites. Repeater signs should be provided across the length of road where the free recovery service is provided. These should be sited approximately every 800 m on alternating sides of the carriageway.



7291 variant (S13-6-40)

5.12.23. 'Free recovery End' sign variant to diagram 7291 (S13-6-40) indicates where the free recovery service ends. This should be located at the end of the recovery service, usually between 50 m upstream or 50 m downstream of the 'end of road works' sign.

5.12.24. The 'x' height detailed for signs to 7291 (S13-6-40) may be reduced to a minimum of 150 mm if traffic conditions and space constraints warrant such a reduction.

5.13 Informatory signs

General principles

5.13.1. The use of informatory signs should be based on needs identified in the TTM design process. They should be used to give specific driver information or where there is likely to be traffic delays as specified by the relevant authority. They should not be used to mitigate issues in place of designing schemes to the guidance and requirements of this document.

5.13.2. Signs to diagrams 7003.1 (S13-6-42), 7006 (S13-6-44), 7006.1 (S13-6-1), and 7007.1 (S13-6-2) contain logo panels which identify the authority responsible for the sign. The logo may be changed to identify a different authority in accordance with the permitted variations. For trunk road schemes, the logo of the authority should be displayed at the start of the works on a sign to diagram 7003.1 and at the end of the works on a sign to diagram 7006.1. The sign to diagram 7007.1 should be erected as indicated in **5.16.1**.

5.13.3. Informatory signs should be installed as part of the TTM arrangement and removed on completion of the works or when no longer required. This does not apply to signs that are used to inform about future works.

5.13.4. Signs for works may need to be placed on roads that are under a different authority. In this case, both authorities must agree the use of the signs, their number, and their location.

5.13.5. The designer should consider using informatory signs to:

- provide the public with advance notification of works due to take place.
- to warn of possible delays.
- to explain the nature of the works.
- give advance warning to travellers so that they may consider an alternative route.
- to apologise for any delays or inconvenience caused, as appropriate.

5.13.6. Driver information signs should be used only where they can be sited safely. They should not be used if they are likely to distract from or obscure essential road signs such as warning or regulatory signs. This is particularly relevant for signs in the works area. Some common information signs are:

7003.1 (S13-6-42)	Major road works at a specified location ahead (see **5.14.5**)
7003.1 (S13-6-42)	Starting date and duration of road works (see **5.14.2**)
7005 (S13-6-43)	Delays possible for specified period owing to road works ahead (see **5.14.4**)
7007.1 (S13-6-2)	Scheme information sign (see **5.16.1** and **5.16.2**)
7008 (S13-6-3)	Street works warning sign for pedestrians (see **5.16.4**)

5.13.7. Statutory undertakers must always display a sign to diagram 7008 (S13-6-3) at their work sites. These signs are designed to be read by pedestrians and should identify the client, promoter, and contractor (as applicable) carrying out the work. They should also give an emergency contact telephone number. These signs must not be placed where they will cause an obstruction or be confused with other traffic signs.

5.13.8. Scheme information signs to diagram 7007.1 (S13-6-2) are used to inform the travelling public about the works. The details on the sign may be varied but must not include any telephone numbers, websites, URLs or email addresses as they are likely to distract drivers as well as encourage the inappropriate use of the relevant technology. Where possible, these signs should be located in advance of the works in both directions and at major intersections. They should also be located within the proposed or existing highway boundary. They should not be provided where they conflict with other traffic signs or cause unnecessary driver distraction.

5.13.9. Care should be taken when placing scheme information signs as they are often relatively large signs. Local planning authorities should be consulted on the placement of these signs if they are to be placed within their boundaries. Similarly, the agreement of another authority should be obtained to place scheme information signs within their boundaries.

5.13.10. Informatory signs are often used by most organisations to provide information about works. However, signs to diagrams 7003.1 (S13-6-42) and 7005 (S13-6-43) are usually used for major road works on motorways and all-purpose dual carriageway high-speed roads.

Sign removal and auditing

5.13.11. Excessive use of non-essential signing (sign clutter) not only has a negative environmental impact but can also reduce road users' ability to read and comprehend the various permanent and temporary signs. Therefore, the use of non-safety critical signs should be minimised in areas which demands high driver workload (particularly the lane-change and lead-in zones) and where the desirable clear visibility cannot be provided. This includes signs giving information on the nature of the works, journey time information, safety messages, or tactical and strategic diversions.

5.13.12. TTM signs and equipment should be removed from view when not in use and taken off site or stored out of sight. This is to ensure that they do not distract road users and do not increase the risk to road users if vehicles leave the carriageway.

5.13.13. Where it is expected that road works might have to stop for a number of days, such as over a weekend, the contractor must assess whether it is reasonably practicable to remove the TTM equipment. If this is not practicable then the contractor should use their best endeavours to continue working through the period in question, subject to any local restrictions.

5.13.14. It is not acceptable to have partially complete signing and TTM present on the road. All signs associated with TTM must be taken down when the TTM equipment is removed between off-peak works. However, if this requirement would unacceptably increase risk or congestion then an alternative safe method of working must be chosen.

5.13.15. If the length of the works is reduced in off-peak times, rather than fully removed, then the approach signing, speed limit signs and signs with distances should also be changed as required. Contractors should design schemes so that signing can be changed when the length of works change without leaving redundant, misleading, or incorrect signs on the road.

5.13.16. Regular audits should be undertaken on temporary signs that are not installed as part of the road works activities (e.g. signs for events, advanced notice signs). Signs that are no longer required or that are going to be present longer than they are legally permitted should be identified so they can be removed. The date that these signs were installed and removed should be recorded and shared with relevant third parties as requested.

5.13.17. Certain signs to diagram 7014 (S13-6-37), and certain temporary signs prescribed by Schedule 13 Part 9, must have a removal date written on the back of them. The removal date should be written on by the organisation placing the sign and should specify what date the sign should be removed by, to the best of their knowledge. For signs to diagram 7014, the removal date must be no later than 3 months after the sign is placed on, or near a road. For temporary signs prescribed by Schedule 13 Part 9, the removal date must be no later than the last date permitted by the Schedule 13 General Directions.

5.13.18. Temporary signs prescribed by S13-9 must always be removed before the specified date even if the works activities are set to continue past this date. All organisations placing signs other than for emergency situations should have sufficient resources to remove the signs by, or before, the removal date.

5.13.19. Temporary signs and equipment relating to works activities must be removed when works are complete. The exception is diagram 7007.1 (S13-6-2) which may be kept in place for three months after works have been completed.

5.13.20. Other than when directly related to works, or where indicated in Schedule 13 General Directions, where signs are likely to be, or have been, in place for more than six months, then the signs and markings should be treated the same as permanent signs and markings and designed to the same requirements

Future road works

5.13.21. Informatory signs may be used to inform drivers of upcoming major road works and warn them of any associated closures or delays. This allows drivers the opportunity to plan their future journeys so that they can take an alternative route or travel outside of the works period.

5.13.22. Signs should be erected at least two weeks prior to the commencement of the road works or carriageway closures and should give accurate dates and details for the work period. The legend on the sign should be modified or the sign should be replaced if any of the works details are changed and the information given is no longer correct.

5.13.23. Where the exact timings of the works can vary reference should be limited to phrases such as ‘overnight’, ‘off-peak hours’, ‘daytime’ and ‘next weekend’.



7003.1 (S13-6-42)

5.13.24. ‘Starting date and duration of road works’ sign to diagram 7003.1 (S13-6-42) should be used where works are expected to be greater than one week. It is primarily used for major road works but should also be considered for shorter term works where the anticipated delay for traffic is likely to be 10 minutes or more. This sign should be placed on the nearside verge at the start of the future works. The sign should be removed when the works commence. The logo panel may be varied with the words ‘National Highways’ varied to ‘Welsh Assembly Government’, ‘Transport Scotland’, ‘Department for Infrastructure’ or the name of the appropriate traffic or roads authority and the logo varied accordingly.



7002.1 (S13-9)

5.13.25. Sign to working drawing 7002.1 (S13-9) indicates the dates when future overnight road works are taking place and that delays are to be expected. This sign should be placed on the nearside verge at the start of the future works. The bottom panel should indicate ‘Expect delays’ as shown when convoy working is planned or if the delays are likely to be severe (greater than 30 minutes). For other road works situations, the bottom panel should indicate the prescribed variant ‘Delays possible’. Unless the end date is more than 6 months after the installation of the sign a year is not needed.

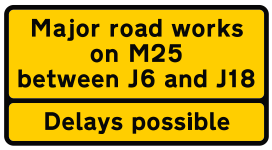


7002B (S13-9)

5.13.26. Sign to working drawing 7002B (S13-9) indicates the dates when a carriageway is to be closed to traffic as well as the location. This sign should be located on the nearside verge at the location of the future carriageway closure. Signs may also be placed on adjoining carriageways to advise drivers of the future closure. Unless the last date is more than 6 months after the installation of the sign a year is not needed.

Advance road works ahead information

5.13.27. The following signs provide advance information of road works ahead. These signs must be accurate and located sufficiently upstream of the works to give drivers adequate opportunity to select an alternative route.



7002A (S13-9)

5.13.28. Sign to working drawing 7002A (S13-9) is used to indicate to drivers of approaching road works and warn them to expect delays. This sign should be sited on the nearside verge. It should be located upstream of any road works signs and at least 1 mile upstream of the last exit junction prior to the works. Where possible it should be located upstream of the two junctions prior to the works to give drivers the opportunity to identify alternative routes to avoid the road works.

5.13.29. Where delays are likely to be severe, placing signs on adjoining routes should be considered to advise of these delays. VMS may also be used in liaison with any relevant Control Centre to divert traffic to other routes. However, information displayed on fixed signs should not be repeated on subsequent VMS signs.

5.14 Approach and lane closure signing

5.14.1. Signs to diagram 7005 (S13-6-43), and its permitted variants, are used to describe the works activities and the length of potential delays. The signs should be used in conjunction with a 7001(S13-2-9) and appropriate distance plate placed on the offside of the carriageway.

5.14.2. The range of legends should be kept to a minimum while conveying clear and meaningful information to drivers (i.e. that is not over technical). Commonly used legends are given with the associated sign variant in the following paragraphs.



7005 and variants (S13-6-43)

5.14.3. Signs to diagram 7005 (and its variants) can be used to give warning of approaching major road works. The legends on this sign may be varied to suit the nature of the works. The legends are laid out across a maximum of four lines. The working drawings detail the correct layout of legends with less than four lines.

5.14.4. When signs to diagram 7005 are used for major road works, the sign should be located on the nearside verge upstream from the major road works in advance of the variant to diagram 7005 (S13-6-43) described in 5.14.6.

5.14.5. Suggested alternative legends for signs to diagram 7005 (and its variants) when used in connection with major works:

Line 1	Line 2	Line 3	Line 4
Road	repairs		
Bridge	upgrade		
Ecology	survey		
Verge	work		
Signal	renewal		
New	road	junction	
Drainage	repair		
Major	collision	repairs	
Unsafe	structure		
New	bus	route	
New	cycle	route	
Traffic	signal	upgrade	
Renewing	damaged	bridge	deck
Repairs to	bridge		
Repairs to	bridge	deck	
Installing	new	hard	shoulder
Installing	new	road	markings
Installing	new	cabling	
Installing	new	lighting	
Installing	new	safety	barriers
Installing	sign	gantry	
Ground	survey	works	
Widening	and	road	repairs

Note: When descriptive words of longer than 6 to 7 letters per line are used it significantly increases the sign width making positioning alongside roads more difficult.

Sign sizes are given in **Table A1.2**.

Engineering technical terms should also be avoided to aid readability and understanding by road users, for example the term ‘waterproofing’ is a ‘Bridge repair’ or ‘Bridge upgrade’.

Examples of signs to diagram 7005 to illustrate the need for designers to consider the number of characters in the text description to aid readability and suitable safe positioning on site.





7005 and variants (S13-6-43)

5.14.6. Variants to diagram 7005 give warning of potential delays approaching major road works until the specified date. This sign should only be used when the anticipated delay is likely to be 10 minutes or greater. The date legend must reflect the most accurate information available.

5.14.7. This variant sign to diagram 7005 should be located upstream of the works on the nearside verge and is normally used in conjunction with the variant to diagram 7005 sign in 5.14.5. If these signs are used, then the advance sign to diagram 7001 (S13-2-9) and the distance plate on the verge are replaced by this sign to diagram 7005 (S13-6-43).

5.14.8. The date specified on signs to diagram 7005 (S13-6-43) should be updated when the end date of the work is known more precisely. Unless the date is more than 6 months after the installation of the sign a year is not needed. The date should be updated at least ten days before the end date of the carriageway restrictions. The available legends are given below. Lines 3 and 4 may be omitted on short duration contracts.

5.14.9. Suggested available legends for signs to diagram 7005 (S13-6-43), used 1 mile upstream from major works:

Line 1	**Line 2**	**Line 3**	**Line 4**
Delays	possible	until	Date (see details below)
Delays	expected	for	time

5.14.10. Line 4 details should include:

1. Day. Should be given as 1 to 31. Day should be included when the precise date is known, particularly during the final stages of the work.
2. Month. May be abbreviated to; Jan, Feb, Mar, Apr, May, June, July, Aug, Sept, Oct, Nov, Dec.
3. Year. May be abbreviated to; 25,26 etc. Year may be omitted when day and month are included, particularly during the final stages of the work. Also the year may be omitted when the end date is less than 6 months after the installation of the sign.

5.14.11. Where there are no delays anticipated, the sign to diagram 7005 should not be used. The ‘road works ahead’ sign to diagram 7001 (S13-2-9) with a 1 mile distance plate should be used instead.

5.14.12. On wide carriageways where two or more lanes merge, the sign to diagram 7005 may be replaced with a ‘lane closed ahead’ wicket sign to diagram 7202.1 (S13-6-14) with a bottom integral panel varied to ‘1 mile’. When this occurs, signs to diagram 7005 (S13-6-43) and 7001 (S13-2-9) normally provided at 1 mile are relocated to the 2 miles and those at 2 miles, to 3 miles. Additional intermediate signs to diagram 7005 (S13-6-43) and 7001 (S13-2-9) with the appropriate distance plates to the nearest part mile may need to be provided between the 1 mile and 3 mile locations dependent on road layout and topography.



7005 (S13-6-43)

5.14.13. Sign to diagram 7005 (S13-6-43) can also be used for both routine and minor works. It should be located on the nearside verge 1 mile upstream of the works. The distance plate may be replaced with a plate according to S18-3.

5.14.14. Suggested alternative legends for signs to diagram 7005, used for routine and minor works:

Line 1	Line 2	Line 3	Line 4
Repairs	due to	road	accident
Essential	maintenance		
Overnight	road	repairs	
Urgent	road	repair	
Daytime	lane	closures	
Daytime	essential	maintenance	
Daytime	routine	maintenance	

Lane closure information

5.14.15. As with all informatory signs, lane closure information signs should only be used where they can be sited safely and should not be used where they may distract from or obscure essential traffic signs (such as warning or regulatory signs). They should also be removed as soon as the information given ceases to be applicable.

5.14.16. Lane closure information signs are subject to the safety considerations detailed in the following paragraphs. They should not be used where these considerations cannot be met.



7005 variant – Style A



7005 variant – Style B



7005 variant – Style C

5.14.17. Variants of sign to diagram 7005 are used to indicate the reason for the lane closure. Where the reason for the lane closure is displayed, these signs should be located within the road works site, behind the line of cones or barriers, and be visible to road users. Two styles of sign are available (Style A and Style B), Style C may need to be used where widths are restricted. The appropriate legend should be selected from the following table:

Style	Line 1	Line 2	Line 3	Line 4
A	Work suspended	Unsuitable weather		
A	Road repairs	Materials	hardening	
A	Further work ahead	Lane remains closed	for safety	
B	Repair work on	Bridge below		
B	Lane closed	for safety		
B	Lane closed	to protect	workforce	
B	Concrete	setting		
B	Damaged	road surface		
C	Work	suspended	Unsuitable	weather
C	Repair	work on	bridge	below
C	Road	repairs	Materials	hardening
C	Further	work ahead	Lane remains	closed for safety

5.14.18. Lane closure information signs are used to assure drivers that lanes are not being taken out of operation unnecessarily. The use and number of these signs should be determined by the situation on the works site. All information signs used must accurately reflect why there is no activity at the works. They must not be used to excuse poor planning or inefficient work practices.

5.14.19. The first lane closure information sign should be placed as shown in **Figure 5.14** at a position where the length of coned-off or fenced area permits the legend to be read safely. The position of works accesses and other features may require the sign to be moved from the position identified; the sign should be no closer than 50 m from any other vertical sign or obstruction. Repeater signs, where appropriate, should be placed at about 1 km intervals through the works.

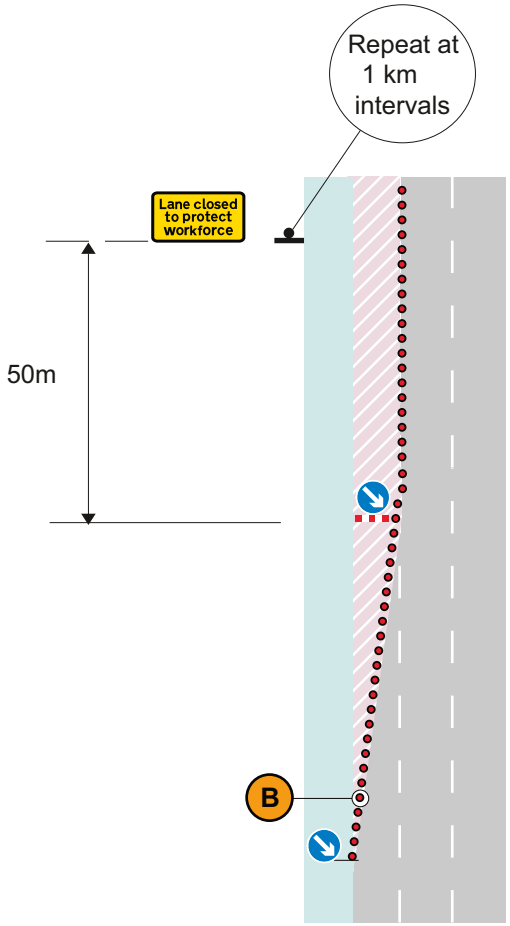


Figure 5.14 Diagram 7202.1 (S13-6-13) Placement of lane closure information signs

5.14.20. Each lane closure information sign should be readily displayed at short notice and removed when no longer applicable.

5.14.21. Each lane closure information sign may be mounted at a fixed location, where it is safe and convenient to do so. When not in use, a permanently located sign should be either covered to fully obscure the legend or be dismounted and kept in a safe place until it is required.

5.14.22. Each lane closure information sign may also be kept to one side (e.g. within the works on the verge) if it is not permanently mounted, ready to be displayed at short notice.

5.14.23. Information signs must not be left in areas where they may cause a hazard to road users or interfere with the performance of vehicle safety barriers. As such, they must not be stored in the safety zone, propped against vehicle safety barriers, or left lying in the central reservation between safety barriers.

5.15 End of road works signs

5.15.1. End of road works signs are used to cancel all traffic restrictions for temporary works and notify that normal traffic regulations and conditions now apply. These signs should be placed for all works greater than 50 m in length when measured between the end of the entry taper and the beginning of the exit taper.

5.15.2. End signs are not required for works on minor roads as defined in **Section 6.2**.

5.15.3. The termination signs to diagram 670 (S10-2-1), or 671 (S10-2-2) must be used when the permanent speed limit beyond the road works is different to that at the start of the works, or on any adjoining roads. If used, these signs must be located on both sides of the road on both single and dual carriageway roads. Appropriate sizes are given in **Table A1.2** (**Appendix A1**).

5.15.4. At a minimum, the sign to diagram 7001 (S13-2-9) with an 'End' plate must be used when the permanent speed limit beyond the road works is the same as that at the start of the works, and on all adjoining roads. A combined sign (see **5.15.5**) may be used instead.



7001/671 (S10-2-2) or 670 (S10-2-1)

5.15.5. This combined sign can be used to indicate the end of works where a temporary speed limit has been applied, subject to the conditions in **5.15.3**. The lower sign should be to diagram 671 for roads subject to the national speed limit, or to diagram 670 where the permanent speed limit is lower than the national speed limit. This sign must be sited on both sides of the carriageway.



7006 (S13-6-44)

5.15.6. For motorways and high-speed dual carriageway roads, the sign to diagram 7006 (S13-6-44) should only be used where anticipated delays are likely to be severe. It should be placed off the nearside of the carriageway and should be accompanied by a sign to diagram 7001 (S13-2-9) with the regulatory 'End' plate in the central reservation. The words 'National Highways' and logo should be varied as per **5.15.2**.

5.15.7. For all other situations the sign to diagram 7001 (S13-2-9) with the 'End' plate should be displayed. The sign should be sited on both sides of a dual carriageway road and on the nearside of a single carriageway road. Sign siting distances and appropriate sizes for 'End' plates are set out in **Table A1.1** and **Table A1.2** (**Appendix A1**) respectively.



7006.1 (S13-6-1)

5.15.8. Sign to diagram 7006.1 (S13-6-1) is used to provide the telephone information number to be used for enquiries about road works. It should be placed at the end of all major road works sites. The sign should be located on the nearside approximately 200 m downstream from the 'end of road works' sign. The words 'National Highways' and logo may be varied, as per **5.13.2**, as along with the telephone number.

5.16 Additional signs

Scheme information signs



7007.1 (S13-6-2)

5.16.1. Sign to diagram 7007.1 (S13-6-2) is used to provide detail of a major construction or improvement scheme being carried out on the road ahead. This sign should be located on the nearside verge generally 1½ miles in advance of a major road scheme site. It may be moved if it could conflict with junctions or could distract the driver in high workload situations (see **5.12.11**). This sign should not be used in advance of off-line works schemes.

5.16.2. Signs to diagram 7007.1 (S13-6-2) should be varied to reflect the details of the particular scheme. Details provided on the sign should include route, location, type of scheme and opening details. An authorisation allows for the inclusion of a photograph to the sign on roads managed by National Highways.

5.16.3. Signs that are planned to be placed on non-highway land will require the landowner's and local authority's permission before erecting them.

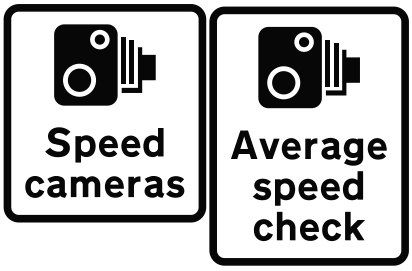


7008 (S13-6-3)

5.16.4. Sign to diagram 7008 (S13-6-3) is used to give details to pedestrians about the nature of street works, and where applicable the works permit number. It should include the name of the employer and contractor, emergency telephone number, and an apology for any inconvenience. Signs must be sited where they will not cause an obstruction to pedestrians.

Speed cameras

5.16.5. Speed control and enforcement of the permanent or temporary mandatory speed limit may be required for the works (see **Section 4.8**). If speed cameras are used for temporary enforcement, the use of speed camera signs and speed check area signs indicate where speed cameras are present, this is an intrinsic part of the safety of road users. While the number and location of these signs will need to be agreed with the authority and enforcement body they must not be omitted.



878 variant (S11-2-63)

5.16.6. A sign variant to diagram 878 (S11-2-63) is used to indicate the area where speed cameras are used to enforce a mandatory speed limit. This should be used where multiple speed cameras are used to measure average speed over a set distance.

5.16.7. An initial pair of signs to diagram 878 must be placed within 1 km upstream of the first speed camera housing. The signs should be placed in pairs on both sides of the carriageway or slip road. They should be placed within the verge, central reservation or works site.

5.16.8. The ‘Average Speed Check’ variant is prescribed for use on all roads.



670 (S10-2-1) plus 878 (S11-2-63)

5.16.9. The combination of two signs to diagrams 670 (S10-2-1) and 878 (S11-2-63), on a common yellow backing board is suitable for all situations with a reduced speed limit except on a restricted road (i.e. street lighting in use) where diagram 880 (S11-2-64) is used (diagram 880.2 in Wales). The speed roundel can be changed to 60 (dual carriageway only), 50, 40, or 30 (on unlit roads).

5.16.10. Speed camera repeater signs to diagram 670 (S10-2-1) plus 878 (S11-2-63) should be placed approximately 1 km downstream of the initial speed camera sign to diagram 878 (S11-2-63) and then at 1 km intervals on alternating sides of the carriageway.

5.16.11. Speed camera repeaters to diagram 670 (S10-2-1) plus 878 (S11-2-63) should be co-located with the speed limit repeaters where possible, on a common grey or yellow backing board as shown. The signs and the speed camera must be placed so that both are visible to the driver in the same view. Additional signs may be used to achieve this. Where enforcement of the National Speed Limit occurs, and where there is carriageway lighting, diagram 670 is replaced with diagram 671 (S10-2-2). Where enforcement of the National Speed Limit occurs where there is no carriageway lighting diagram 880.1 (S11-2-656) must be used instead.



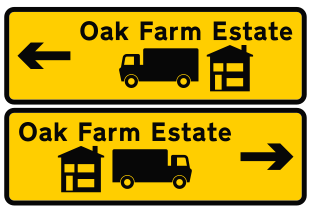
829.5 (S11-2-25)

5.16.12. The sign to diagram 829.5 (S11-2-25) is used to indicate the area where police are carrying out vehicle speed checks on a regular basis. An initial pair of signs, placed on both sides of the carriageway, should be located 50 m to 100 m upstream of the first mandatory speed limit signs (including on any slip roads). Repeater signs should be placed at around 1 km intervals and at intermediate junctions. These signs should not obscure drivers' view of speed limit signs.

Housing developments



2701 (S13-6-28)



2701.1 (S13-6-28)

5.16.13. Signs to diagram 2701 and 2701.1 (S13-6-28) are used to provide advanced direction to a new housing development. Where the route for lorries to the development is different to that of other traffic an appropriate symbol (S32) may be used.

Emergency vehicles



2708 (S13-6-45)

5.16.14. The sign to diagram 2708 (S13-6-45) is used to direct emergency vehicles to a temporary incident control point and should align with the emergency service providers method of working.

Level crossings



790 (S14-2-67)

5.16.15. The sign to diagram 790 (S14-2-67) may be used to temporarily indicate an approaching new method of controlling traffic at a railway or tramway or the presence of a new level crossing.

Temporary parking restrictions

5.16.16. Upright signs must be provided for all temporary parking and loading restrictions. These must be displayed on a flat surface; placing these signs on sleeve on a traffic cone is not permitted.

5.16.17. Where no existing restrictions apply, signs to diagram 636 (S13-6-19, **Figure 5.15**) will prohibit all waiting, including those normally exempt from waiting restrictions (e.g. blue badge holders).



Figure 5.15 Sign to diagram 636 (S13-6-19) Temporary prohibition of waiting except for loading and unloading

5.16.18. Where pre-existing restrictions apply and there is a need to prohibit all waiting or loading, a combination of signs to diagram 636 (S13-6-19) and 636.1 (S13-6-20, **Figure 5.16**) must be used.



Figure 5.16 Sign to diagram 636.1 (S13-6-20) Temporary prohibition of loading and unloading

5.16.19. For both works and other temporary situations e.g. events, the time restrictions are applied should be kept to a minimum, especially where residential use is to be prohibited or curtailed. It is considered practicable to provide sufficient parking (i.e. enough free spaces to cover all displaced users) at an alternative safe location for residential parking (as well as parking for public facility) during the time relevant restrictions apply. This parking should come at no additional cost to users and the location of the parking must take account of any mobility limitations for users (see **Section 4.51**). If it is not possible to locate parking close enough to properties to take account of any mobility limitations identified to the authority, contractor,

or event organiser those undertaking the works or temporary situation will need to provide transport to and from the parking location. Given some groups with protected characteristics are less likely to have sufficient information on parking restrictions through signs, or the internet, residents will need to be provided with a hard copy of the impact on parking restrictions, locations of alternative parking locations and a contact point for accessibility assistance.

Cycle events



633.1 (S13-6-18)

5.16.20. The sign to diagram 633.1 (S13-6-18) may be used to stop vehicular traffic at cycle events where the road is otherwise open to traffic. Its use must be authorised by the Police and should be used in accordance with British Cycling protocol. Where cycle events are held on closed sections of road theses must be signed as a road closure as per Section 6 and 7.

Infected areas



574 (S13-9)

5.16.21. Signs to working drawing 574 (S13-9) is used to warn the public that they are entering an area infected with an animal disease. The name of the disease may be omitted or varied as required.

5.17 Work site signs and signals

5.17.1. Work site signs and signals are required to highlight the risks posed to workers within a works area or working space, as identified in the specific risk assessment developed for the work activities. Signing requirements are determined by the Health and Safety (Safety Signs and Signals) Regulations 1996. These signs would normally need to be designed as prescribed traffic signs if they relate to hazards to the movement of traffic in the works area, working space or adjacent carriageway.

5.17.2. However, works site signs and signals must not be designed or placed on site where approaching traffic could interpret them as indicating a message, warning, restriction, or requirement to road users. An example is not signing site speed limits with diagram 670 (S10-1) but with a worded sign e.g. ‘Site speed limit ten mph’.

5.17.3. Prescribed and authorised signs and TTM equipment must be used to highlight the risks for workers related to moving vehicles where there is a suitable sign. Where there is no suitable sign, non-prescribed signs are permitted, but only within the working space or works area. They may not be used to mark the inner boundary of the safety zone. Site specific signs must not be designed or located in a way which may be confused with signing for traffic on the carriageway. It is essential that any site signs relating to speed limit cannot be taken by road users or in-vehicle technology to apply to traffic.

5.17.4. Non-prescribed or unauthorised work site signs should be set back from any live section of road as much as possible while still being visible to workers (e.g. the back of hard shoulder or on the verge). The design of the TTM may be adjusted to ensure that non-prescribed or unauthorised work site signs are not visible to road users such as placing work site signs behind barriers, screens, or traffic signs. Extra care must be taken if non-prescribed signs are used close to the boundary of the working space and the safety zone.

5.17.5. Non-prescribed or unauthorised work site signs must not be used as substitutions for prescribed signs outside of the working space or works area. This includes all planned works and emergency traffic management. They should be kept apart from prescribed signs (particularly cones) to avoid confusion. These signs must not be left visible when the TTM has been removed during peak periods. Signs should be removed from site after the works have been completed and before the TTM is removed.

5.17.6. Signs (whether prescribed or not) should not be the primary method of notifying workers that a hazard is present on-site. Workers must be adequately briefed or trained on how to access the worksite, on what hazards from vehicles in the works zone or working space may be present and how to exit the works safety. Signs should only be used to highlight the location of a hazard that the worker is already aware of. Although signs should be provided where necessary, the working area and works zone should be designed so that hazards are obvious to workers without having to rely on the signs, for example by directly lighting the hazard.

5.17.7. Non-prescribed works site signs should not be required to be used to enable the installation, maintenance, and removal or TTM as the TTM design should already consider how these activities will be undertaken safely.

5.17.8. Organisations undertaking works should review guidance and industry practice relating to work site signs. Industry standard approaches for signing and specific hazards (e.g. overhead power cables, reduced headroom) at structures should be used where possible. Extra care should be taken if alternative methods of signing and highlighting are used. Site signs, especially ones utilising symbols should be reviewed periodically to ensure that they can be comprehended. Where non-standard colours are used, the impact of colour blindness and the differences in contrast, reflective and retroreflective performances of materials of different colour must all be taken into account.

5.18 Vehicle mounted signs

5.18.1. Details on the use of signs mounted on vehicles can be seen in **Sections 9**, **10**, **11**, and **14**.

5.18.2. Signs can only be attached to vehicles if specifically permitted in the Regulations or if stated in an authorisation. Prescribed signs may be used on vehicles in motion or stationary.

5.18.3. Authorisations may permit signs, or specific aspects, to be placed on vehicles only when stationary. Such limitations should be identified before authorised vehicle mounted signs are used. Where vehicles, or trailers, are used as support for other signs, contractors will need to check with the authority for specific requirements. As a minimum the ignition of such vehicles should be off.

5.18.4. Examples of signs which may be attached to vehicles, depending on authorisation by the appropriate authority, are shown in **Figure 5.17**.

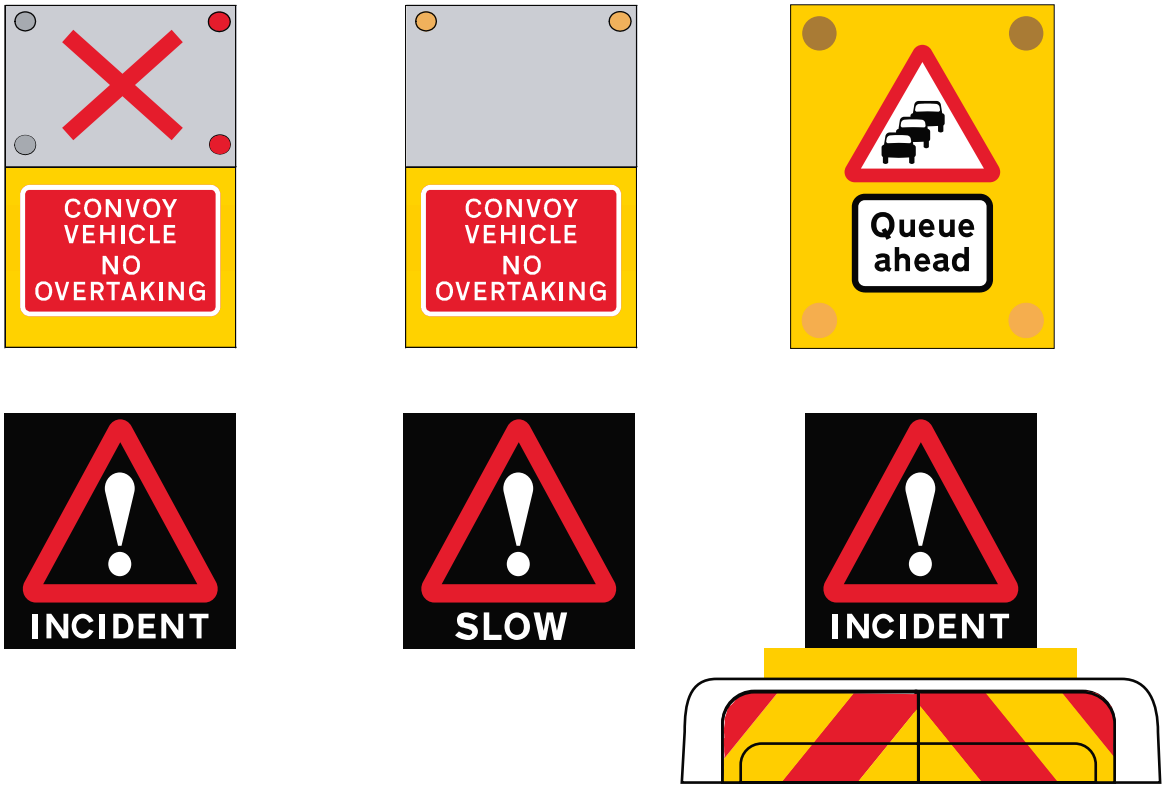


Figure 5.17 Example vehicle mounted signs (including incident management VMS)

5.18.5. Due to the varying limitations of use, such as a maximum height for mobile signs, it is vital that those driving, operating or supervising the use of stationary or in motion vehicle mounted signs have relevant training certification (e.g. Sector Scheme 12C) and are aware of both general and vehicle specific requirements. This is particularly important for general hire vehicles or vehicles used in more than one authority.

5.18.6. Those using vehicle mounted signs should identify that the mechanisms, whether mechanical or electrical, for bringing the sign or aspects into use do not impact on the safety or effectiveness of the sign or other equipment on the road. It is considered reasonably practicable to only use equipment certified by a relevant national and competent body (e.g. TOPAS).

Vehicle mounted light arrows

5.18.7. Various types of lights arrows hold authorisations from different authorities. These types consist of either individual lamps making up the arrow (see **Figure 5.18**), or a LED matrix panel capable of displaying the arrow.

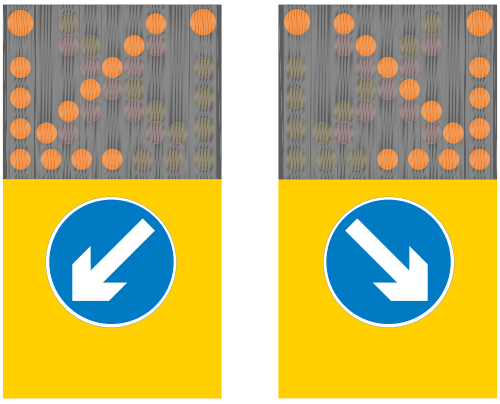


Figure 5.18 Example lamp type light arrow left/right (alternative to diagram 7403 (S13-6-10))

5.18.8. It's recommended that authorities and those undertaking works consider using vehicles fitted with LED matrix panels. These systems are more flexible and allow vehicles to be used for other activities, such as mobile advance signs or mobile carriageway closures.

5.18.9. Light arrows, with associated impact protection devices, need to be mounted on large vehicles. For some locations, and activities, smaller works vehicles are required, in such cases several authorities have authorisations for smaller light arrows (see **Figure 5.19**) as a replacement for signs to diagram 610 (S13-6-11) and, in some situations, 7403 (S13-6-10). The requirements for use of individual small light arrow products should be checked within the specific authorisations as they vary from product to products and authority to authority.

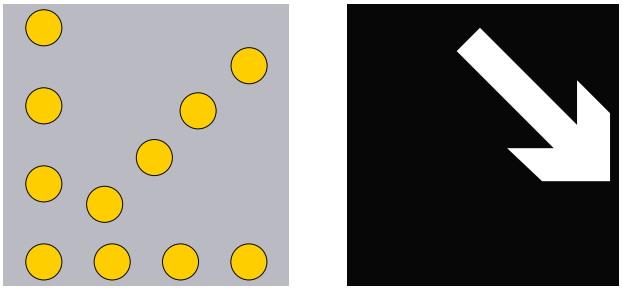


Figure 5.19 Example smaller light arrows

6 TTM ON SINGLE CARRIAGEWAY ROADS

6.1 General issues

6.1.1. This section sets out the principles for signing and guarding when carrying out works on all-purpose single carriageway roads. Where the Safety at Street Works and Road Works: A Code of Practice (Red Book) is in force, see **Section 2.14**, it may include specific requirements for some common layouts and types of works activity, this may limit the application of some options identified in this document. The red book is not comprehensive and does not cover all aspects which are not works, e.g. some event signs and other temporary situations, nor does it provide detail on the application of certain requirements. Where there are features which are outside the scope of the red book the guidance and requirements in this section can be used directly, or used to develop a scheme specific method of working.

6.1.2. The authority should be advised of any works to be undertaken on public roads so that necessary traffic measures can be coordinated.

6.1.3. Reducing the number of traffic lanes available should be avoided during the periods of 7am-10am and 4pm-7pm, particularly on heavily trafficked commuter routes. Local circumstances may permit or require a variation of these times.

6.1.4. Works which reduce the width of a single carriageway road will lower capacity and may cause delays. The form of control and its operation should aim to reduce any traffic delay to a minimum, subject to acceptable safety standards.

6.1.5. Two-way traffic should be maintained wherever possible. Where it cannot, single-file traffic such as shuttle working should be considered. Details on minimum lane widths can be found in **Section 4.3**.

6.1.6. The period during which traffic is subjected to one-way working should be kept to the absolute minimum. At certain times it may be possible to reduce the area of the carriageway occupied by the works, this should be done if it allows two-way working to resume. During periods of one-way working provision should be made for shared footways, including any exemptions for cyclists.

6.1.7. On roads where traffic flow is very high, overload of the controlled area is possible and may cause delays. This can occur with:

- two-way flows as low as 1300 veh/hr (for sites about 50 m long).
- one-way flow of 900 veh/hr (for longer sites with balanced flows) with signal control.

6.1.8. If overload is likely, the designer must consider the implications and possible alternatives (e.g. diversions or restrictions on working hours).

6.1.9. Suitable diversions will need to be provided and adequately signed when a single carriageway road is to be completely closed. Other than the section of road closed, access to the wider network must be maintained. Any necessary statutory procedures should be followed in consultation with the relevant authority. See **Section 4.24** and **Figure 4.58**.

6.1.10. Work may be carried out on single carriageway roads using single vehicles standing or operating in the carriageway. See **Section 12.1** for details.

6.2 Works on minor roads

6.2.1. In the context of this section, a road is defined as a minor road if it does not carry a significant volume of through traffic or many large vehicles, even during peak periods, and either of the following:

- it is a single carriageway road in a residential or industrial district, or rural area. It may be an access road or possibly a local distributor, but it should not be a district distributor or primary distributor, or
- it is either restricted to 30 mph or less, or its layout is such that speeds greater than 30 mph are unlikely.

6.2.2. Minor road will generally have the following characteristics:

- traffic flows are less than 400 veh/hr, of which less than 5% are heavy vehicles.
- bus services are infrequent.
- pedestrian flows are less than 100 per hour.
- parking or limited waiting may be allowed on one or both sides of the road.
- cyclists will be present.

6.2.3. A road that does not match the conditions **6.2.1**, may still be considered a minor road, where there is general agreement between the authority and the police to do so.

6.2.4. Signs to warn vehicular traffic are not needed for works off the carriageway where clearances are as given in **Section 4.4**. Where these conditions cannot be met, pedestrians may need to occupy part of the carriageway. Therefore, safety measures like those necessary for works in the carriageway should be adopted (e.g. **Plan SC3** in **Section 6.5**).

6.2.5. Where there aren't parked vehicles in the vicinity of works on the carriageway, and there is no works vehicle in attendance to afford protection, the signs shown in **Figure 6.1** to **Figure 6.4** should be provided together with cones and pedestrian barriers as necessary. The presence of an occasional parked vehicle does not require different treatment.



Figure 6.1 Diagram 7001 (S13-2-9) Road works ahead

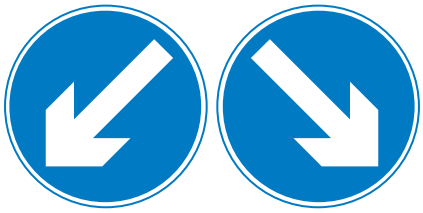


Figure 6.2 Diagram 610 (S3-2-3) Keep left/right



Figure 6.3 Diagram 517 (S2-2-14) Road narrows ahead



Figure 6.4 Diagram 7105 (S13-6-8) Traffic lane or carriageway closed to vehicles

6.2.6. The 'road works ahead' sign to diagram 7001 (S13-2-9) should be placed 45 m in advance of the works. This distance may need to be increased if the visibility of the sign is impaired by road features, or the speed limit is greater than 30 mph. In urban areas, the sign may need to be placed closer where there are numerous side roads so that the sign is clearly associated with the works.

6.2.7. **Section 14.1** provides details on permitted reduced signing for works on the carriageway where works vehicles are present.

6.3 Traffic control

6.3.1. The main factors affecting the choice of control type are:

- visibility through the works area.
- length of the controlled area.
- volume of traffic flow.
- duration of the works.
- proximity of junctions, pedestrian crossings, or railway level crossings.

6.3.2. The minimum carriageway widths for two-way working and shuttle working with traffic control are summarised in **Table 6.1**.

Table 6.1 Minimum carriageway widths for two-way working and shuttle working with traffic control

	Normal traffic including buses and HGVs	**Cars and light vehicles only**
Two-way working	6.75 m minimum	5.5 m minimum
Shuttle working with traffic control	3.7 m maximum 3.5 m desirable minimum 3.0 m absolute minimum	3.7 m maximum 3.25 m desirable minimum 2.5 m absolute minimum

6.3.3. The factors affecting the choice of traffic control method are summarised in **Table 6.2**.

Table 6.2 Factors affecting the choice of traffic control method

Method	**Maximum speed limit (mph)**	**Length of coned area length**	**Maximum traffic flow**
'Give and take'	30	50 m (max)	400 veh/hr and 20 HGV/hr
Priority signs	60	80 m (max)	840 veh/hr
'STOP/GO' signs	60	100 m	1400 veh/hr
		200 m	1260 veh/hr
		300 m	1060 veh/hr
		400m	940 veh/hr
		500 m	840 veh/hr
Portable traffic signals	60	300 m (max)	No limit
'STOP WORKS'	60	Not applicable	Not applicable

6.3.4. Two-way traffic, 'give and take' and positive traffic control options and the criteria for their use are described in the following paragraphs. The final decision should be made according to site conditions, risk assessment and local experience.

6.3.5. **Table A1.4** (**Appendix A1**) provides a key to the meaning of the shading and symbols used in the plans in the following sections. **Table A1.5** (**Appendix A1**) explains the meaning of Details A to K in the plans. It also includes details of cone height and spacing, which varies according to road type and/or works type (see also **Table A1.3** (**Appendix A1**). **Table 6.3** gives values for the following distances shown in the plans:

- D – normal siting distance to the first sign.
- L – minimum longitudinal safety clearance.
- T – lead-in taper length.
- S – safety zone width.
- E – distance to the 'end of road works' sign.

6.3.6. **Table 6.3** specifies the lead-in taper lengths that should be used. It may not be possible to provide the full taper. If this happens on congested roads with speed limits of 30 mph or less, it is permissible to reduce the lead-in taper to an angle of up to 45° to the kerb, particularly if the parking of cars is usual.

Table 6.3 Distances shown in plans in Sections 6.5 to 6.8 and 6.10

		Single carriageway road: Permanent speed limit			
		30 mph or less	**40 mph**	**50 mph**	**Unrestricted (60 mph)**
Minimum and normal maximum siting distance D of first sign in advance of lead in taper in metres		20* - 45	45 - 110	275 - 450	275 - 450
Minimum longitudinal clearance L in metres[1]		0.5	15	30	60
Length of taper T in metres[2]	1	13	20	25	25
	2	26	40	50	50
	3	39	50	75	75
	4	52	80	100	100
Width of hazard (metres) including safety zone S	5	65	100	125	125
Minimum lateral safety zone clearance		0.5	0.5	1.2	1.2
Distance E to 'end of road works ahead' sign		10 - 30	10 - 30	30 - 45	30 - 45

*When 'STOP/GO' signs or portable traffic signals are used, the normal siting distance (45 m. should be used (see notes in Plans **SC5** and **SC7**).

NOTES:

1. Minimum longitudinal clearance applies only for traffic approaching on the same side as the works. Where the works extend beyond the carriageway centre (or is in the centre of the carriageway) longitudinal clearance applies to traffic approaching in either direction.

2. Lead-in and exit tapers used with traffic control should be at about 45° to the kerb line with cones spaced 1.2 m apart. This does not apply when guide islands are provided or as outlined within **6.3.6**.

6.4 Two-way traffic systems

6.4.1. Wherever possible, two-way traffic should be maintained using normal delineated TM arrangements. This system may be used provided that:

- the carriageway unobstructed traffic width is as wide as is practicable. This should not be narrower than the minimum width given in **Sections 4.3** and **6.3** (**Table 6.1**), for appropriate conditions.
- the appropriate minimum safety clearances given in **Section 4.2** are achieved.
- there is always clear visibility of and through the site by the drivers of vehicles approaching from either direction.

Two-way traffic – principles for single carriageway roads

6.4.2. The following principles for two-way traffic TTM on single carriageway roads are illustrated in **Plans SC1** and **SC2**.

6.4.3. The principles for the advance signing are:

- two advance signs are required.
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) on the nearside only, in both directions. A distance plate is required for roads with a permanent speed limit of 50 mph and above.
- a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) on the nearside only, in both directions. On roads with a permanent speed limit of 50 mph and above, a distance plate (**Figure 6.5**) is required.



Figure 6.5 Supplementary plate to warning signs, distance as table A1.1, plan or changed to nearest 10 yards, size as table A1.2.

Relaxations to advance signing:

- If a works vehicle with a clearly visible continuous roof-mounted beacon is present (**Section 14.2**), then the ‘road works ahead’ sign to diagram 7001 (S13-2-9) and ‘road narrows ahead’ sign to diagram 517 (S2-2-14) may be omitted.
- If parked vehicles are present and are likely to be there for the duration of the works, then the ‘road works ahead’ sign to diagram 7001 (S13-2-9) and ‘road narrows ahead’ sign to diagram 517 (S2-2-14) may be omitted.

Relaxations to advance signing should not be applied if:

- pedestrians are directed into the carriageway.
- the speed limit is more than 30 mph.
- the total two-way traffic flow exceeds 400 veh/hr.
- the total HGV flow (including buses) is more than 20 veh/hr, or
- the two-way single carriageway road has three lanes.

On two-way single carriageway roads with three lanes, sign to diagram 7202.1 (S13-6-13; **Figure 6.6**) is used in place of the ‘road narrows ahead’ sign to diagram 517 (S2-2-14). The white down arrow must be included in the sign. Full lanes must be closed and not partially closed, as shown in **Plans SC1** and **SC2**.

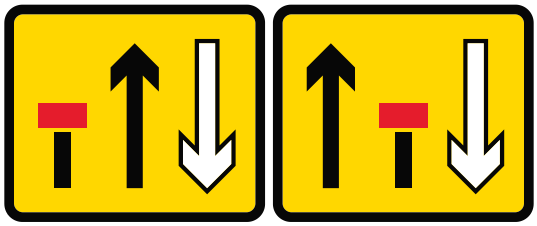


Figure 6.6 Diagram 7202.1 (S13-6-13) Lane closure ahead

The principles for signing the lead-in taper are:

- coning to Detail C2 with the taper length as per **Table 6.3**, or Detail B with 45° tapers (**Table A1.5**, **Appendix A1**) if it is not possible to provide a full taper.
- a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed on the nearside at the start of the taper.
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a ‘keep left/right’ sign to diagram 610 (S3-2-3) placed at the end of the taper behind the cones. The ‘keep left/right’ sign should be mounted directly above the barrier sign or may be placed in front of the barrier or the last cone of the taper.

Relaxations to lead-in tapers:

- if a conspicuous vehicle (see **Section 14.7**) is parked in the works, behind the taper, then the barrier to diagram 7105 (S13-6-8) may be omitted.
- on congested roads, if it is not feasible to provide the full taper then the taper may be reduced to an angle up to 45° to the kerb using coning to Detail B.

The principles for the work zone are:

- coning to Detail C1 is used to mark the edge of the works area safety zone. No additional signing is required.

Relaxations to the works zone:

- permitted relaxations to Detail C1 are outlined within **Table A1.3** (**Appendix A1**).

The principles for the exit taper are:

- coning to Detail B at 45° to the edge of the carriageway. For central island works sites, the same coning as the lead-in taper should be used (**Plan SC2**).
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a ‘keep left/right’ sign to diagram 610 (S3-2-3) placed at the start of the taper behind the cones facing the opposite traffic. The ‘keep left/right’ sign should be mounted directly above the barrier sign or may be placed in front of the barrier or the last cone of the taper.

Relaxations to the exit taper:

- If a conspicuous vehicle is parked in the works before the exit taper, then the barrier to diagram 7105 (S13-6-8) and sign to diagram 610 (S3-2-3) may be omitted.

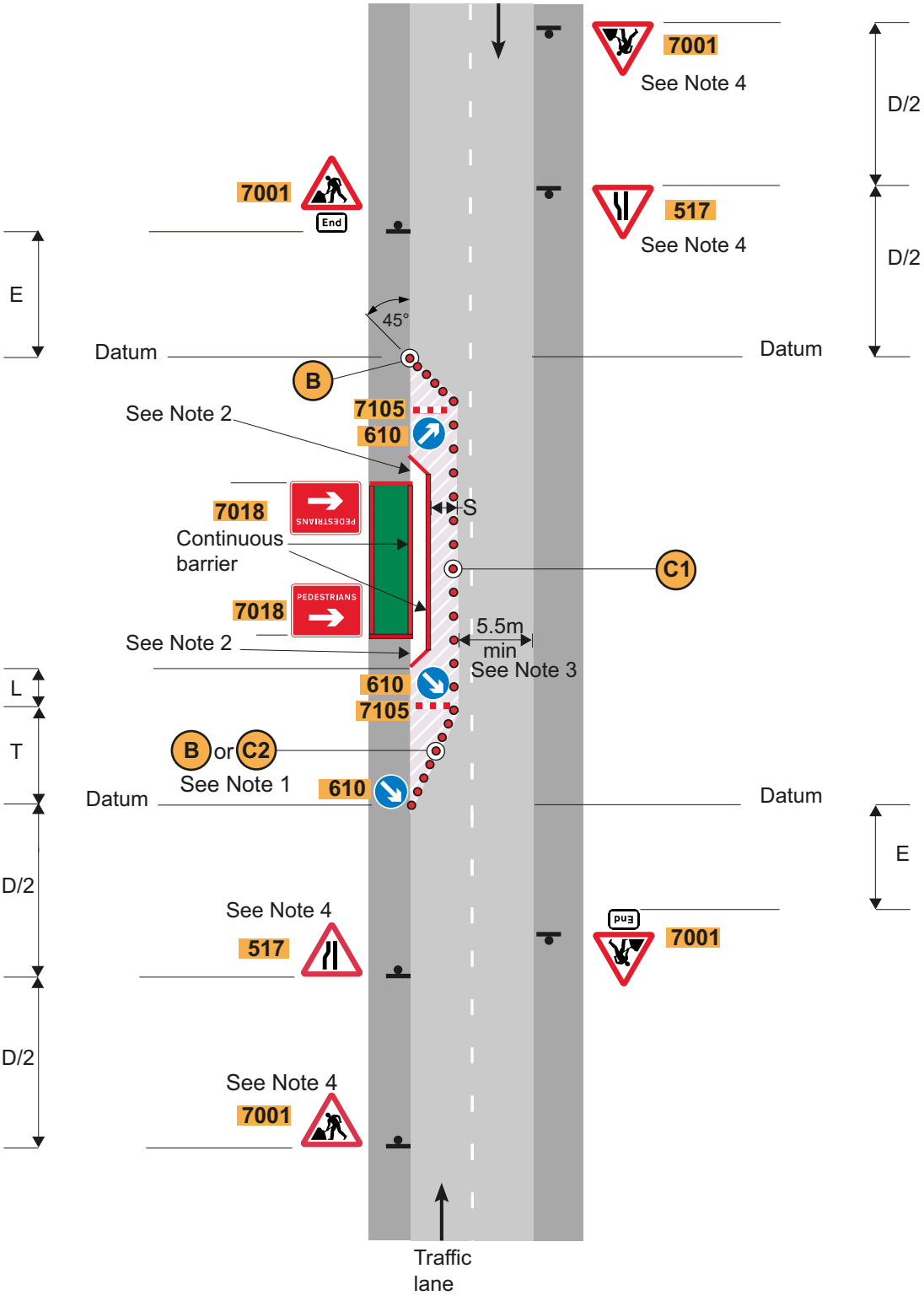
The principles for signing at the end of road works are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘End’ located on the nearside only, at distance E from the end of the works (**Table 6.3**).

Relaxations to signing at the end of the road works:

- end of road works signing may be omitted on roads with a permanent speed limit of 30 mph or less.

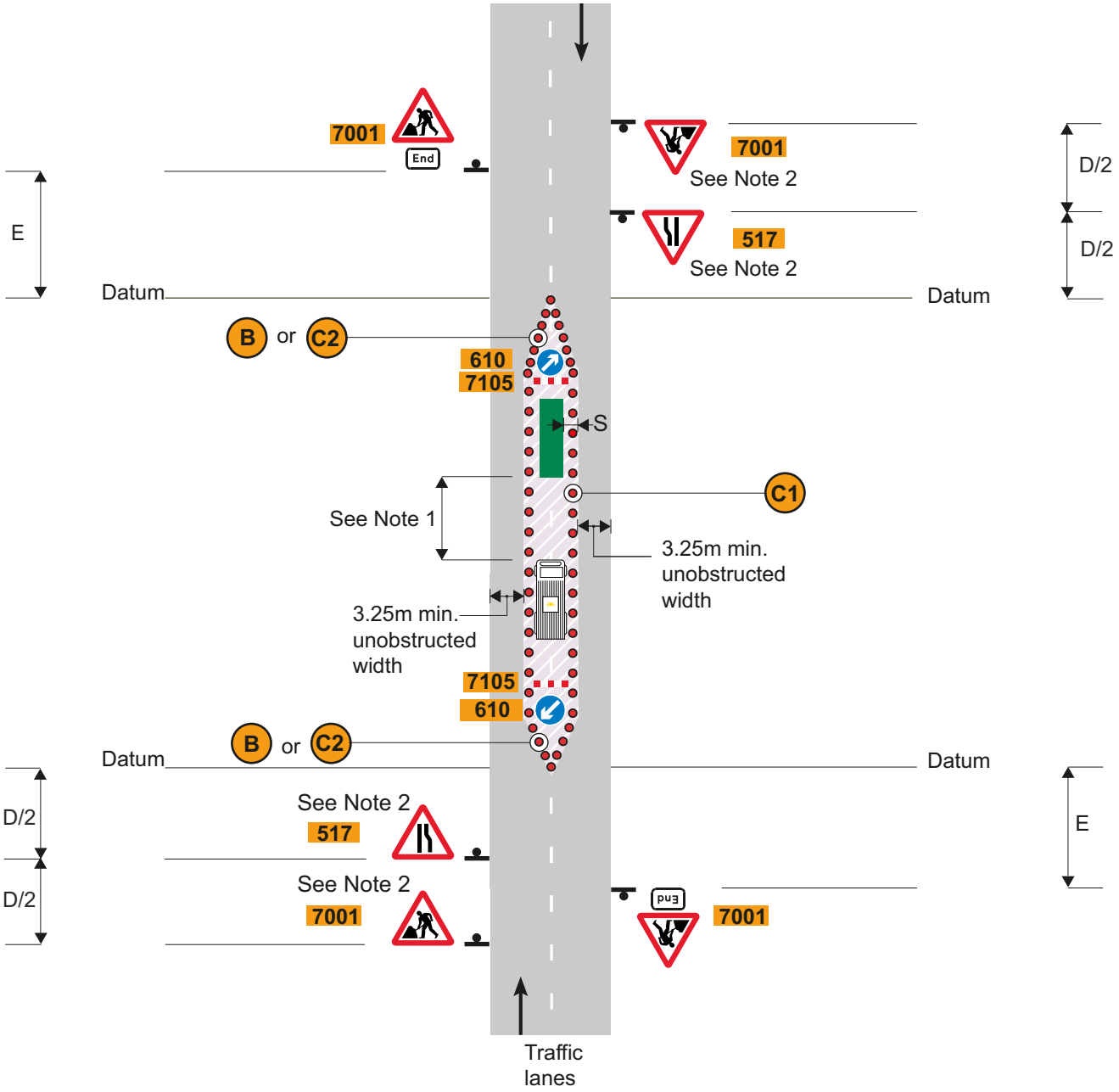
Plan SC1 Two-way traffic on a single carriageway road, footway diversion



NOTES:

1. Cone spacing will depend on the road type (**Table A1.3**, **Appendix A1**).
2. A ramp must be provided at the transition between the footway and carriageway.
3. See **Section 4.3** and **Table 6.1** for guidance on lane widths past works.
4. A distance plate is required for roads with a permanent speed limit of 50 mph and above.
5. Additional pedestrian barriers may be provided as necessary either parallel or at a right angle to the kerb line to guide pedestrians past the works.

Plan SC2 Two-way traffic on a single carriageway road, works in the centre of the road



NOTES:

1. If the permanent speed limit is 30 mph or less, minimum clearance is 2.0 m. If 40 mph or more, minimum clearance is 5.0 m.
2. A distance plate is required for roads with a permanent speed limit of 50 mph and above.
3. Cone spacing will depend on the road type (**Table A1.3**, **Appendix A1**).
4. See **Section 4.3** and **Table 6.1** for guidance on lane widths past works.

6.5 GIVE AND TAKE traffic systems

6.5.1. The normal method of traffic operation for shuttle working, during daylight hours, at sites on minor roads will be a natural ‘give and take’ system. This system may be used provided that:

- drivers approaching from either direction can see 50 m beyond the end of the works.
- the speed limit is 30 mph or less.
- the total two-way traffic flow is less than 400 veh/hr.
- the total HGV flow is less than 20 veh/hr.

- the length of the works from the start of the lead-in taper to the end of the exit taper is 50 m or less.

6.5.2. Where the criteria for ‘give and take’ systems cannot be met, then one of the positive traffic control systems should be adopted (see **Sections 6.7** to **6.10**).

6.5.3. The natural ‘give and take’ system of shuttle working should not be operated at night or in poor visibility. If works continue into the hours of darkness, traffic control should be changed to temporary traffic signals.

GIVE AND TAKE – principles for single carriageway roads

6.5.4. The following principles for ‘give and take’ TTM on single carriageway roads are illustrated in **Plan SC3**.

The principles for advance signing are:

- two advance signs are required:
  - a ‘road works ahead’ sign to diagram 7001 (S13-2-9) on the nearside only, in both directions.
  - a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) on the nearside only, in both directions. A ‘Single file traffic’ plate is also required for each sign.

Relaxations for advance signing:

- no relaxations to advance signing permitted.

The principles for signing the lead-in taper are:

- coning to Detail B at 45° tapers is used (**Table A1.5**, **Appendix A1**).
- a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed on the nearside at the start of the taper.
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a ‘keep left/right’ sign to diagram 610 (S3-2-3) placed at the end of the taper behind the cones. The ‘keep left/right’ sign should be mounted directly above the barrier or may be placed in front of the barrier or the last cone of the taper.

Relaxations to signing the lead-in taper:

- no relaxations to signing the lead-in taper permitted.

The principles for the works zone are:

- coning to Detail C1 is used to mark the edge of the works area safety zone.

Relaxations for the works zone:

- permitted relaxations to Detail C1 are outlined within **Table A1.3**, **Appendix A1**.

The principles for the exit taper are:

- coning to Detail B at 45° taper is used.
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed at the end of the taper behind the cones. The ‘keep left/right’ sign should be mounted directly above the barrier or may be placed in front of the barrier or the last cone of the taper.

Relaxations for the exit taper:

- no relaxations to exit taper permitted.

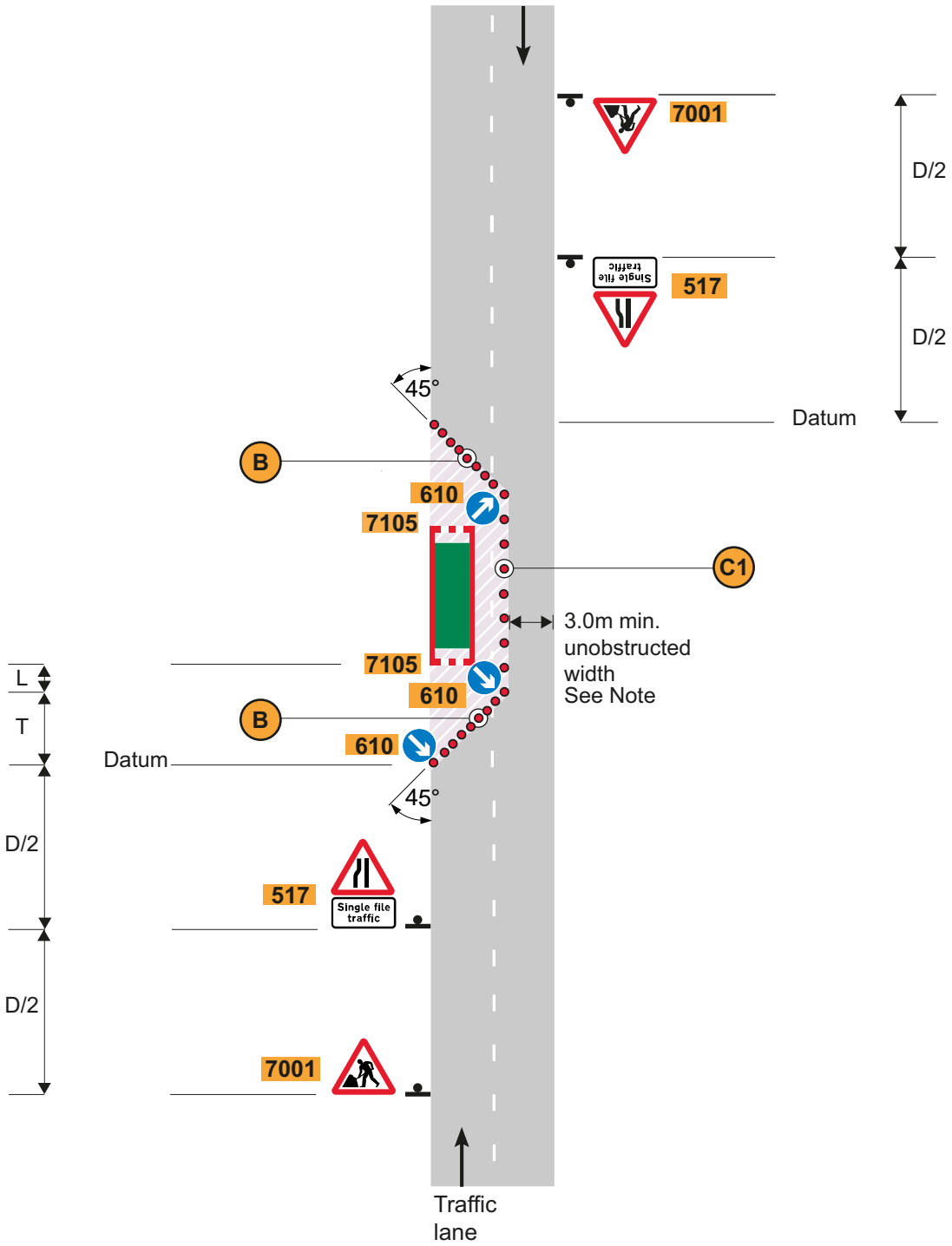
The principles for signing at the end of works are:

- no signs required.

Relaxations for signing at the end of the works:

- no relaxations to end of works permitted.

Plan SC3 Give and take system on a single carriageway road with a permanent speed limit of 30 mph or less



NOTES:

1. See **Section 4.3** and **Table 6.1** for guidance on lane widths past works.
2. Barriers will be needed where any pedestrian may be adjacent to the works.

6.6 Traffic control by priority signs

6.6.1. Priority signs may only be used on single carriageway roads and when the following conditions are met:

- there is clear visibility to the start of the coned area and the same distance beyond the end of the coned area. The distance required will be based on the maximum permanent speed limit of the road (**Table 6.4**).

- the two-way traffic flow is less than 850 veh/hr.
- the site length (measured from the first cone to the last cone of the entry and exit tapers) is not more than 80 m.

Table 6.4 Visibility distances for priority control

Maximum permanent speed limit	Visibility distance
≤30	60
40	70
50	80
60	100

6.6.2. Priority control should not be used at night, unless:

- there is street lighting at the location.
- it remains lit throughout the night.
- the traffic signs are internally or externally illuminated.

6.6.3. Priority control should not be used where fog is common.

6.6.4. The following signs and supplementary plates must always be used in conjunction with each other (see **5.10.4**) as part of a priority sign traffic control:

- 'Priority to vehicles from the opposite direction' sign to diagram 615 (S3-2-9; **Figure 6.7**) with 'Give way to oncoming vehicles' plate. This may also indicate the relevant distance.
- 'Priority over vehicles from the opposite direction' sign to diagram 811A (S11-2-1; **Figure 6.8**) with 'Priority over oncoming vehicles' plate.



Figure 6.7 Diagram 615 (S3-2-9) Priority to vehicles from the opposite direction in combination with Give Way to oncoming vehicles supplementary plate



Figure 6.8 Diagram 811A (S11-2-1) Priority over vehicles from the opposite direction in combination with Priority over oncoming vehicles supplementary plate

6.6.5. Signs to diagram 615 (S13-2-9) and 811A (S11-2-1) must never be used upside down to imply a reversal of the sign's prescribed meaning.

6.6.6. Where necessary, the signs may be accompanied by the 'keep left/right' sign to diagram 610 (S 3-2-3) at the point where the obstruction occurs. Priority should be given to the vehicles which have an unobstructed lane past the works or given to those which are climbing a steep gradient. However this will depend on local conditions. Reversing the priority from the permanent situation should be avoided. If this is necessary, the sign 'CHANGED PRIORITIES AHEAD' to diagram 7014 (S13-6-37; **Figure 6.9**) should be used in the direction that previously had priority and any conflicting permanent priority signs should be covered.



Figure 6.9 Diagram 7014 (S13-6-37) Changed priorities ahead

Priority signs – principles for two-lane single carriageway roads

6.6.7. The following principles for priority control TTM on two-lane single carriageway roads are illustrated in **Plan SC4**.

The principles for the advance signing are:

- three advance signs are required:
  - a 'road works ahead' sign to diagram 7001 (S13-2-9) on the nearside only, in both directions. A distance plate is required for roads with a permanent maximum speed limit of 50 mph and above.
  - a 'road narrows ahead' sign to diagram 517 (S2-2-14) with supplementary plate 'Single file traffic' on the nearside only, in both directions. On roads with a permanent speed limit of 50 mph and above, a site-specific risk assessment should decide a distance for which this applies, and the distance should be included on the supplementary plate.
  - priority signs to diagram 811A (S11-2-1) in the priority direction, and 615 (S3-2-9) in the 'Give way' direction, with explanatory plates (e.g. 'Give way to oncoming vehicles') on the nearside only. Distances for which these apply may be incorporated in these signs.

Relaxations to advance signing:

- no relaxations to advance signing permitted.

The principles for the lead-in taper are:

- one 'keep left/right' sign to diagram 610 (S3-2-3) on the nearside at the start of the taper.
- coning to Detail B at an angle of 45° to the edge of the road.
- a 'lane closed' barrier to diagram 7105 (S13-6-8) with a 'keep left/right' sign to diagram 610 (S3-2-3) at the end of the taper.

Relaxations to the lead-in taper:

- no relaxations to lead-in taper permitted.

The principles for the work zone are:

- coning to Detail C1 is used to mark the edge of the works area on single carriageway roads.

Relaxations to the work zone:

- permitted relaxations to Detail C1 are outlined within **Table A1.3** (**Appendix A1**).

The principles for the exit taper are:

- coning to Detail B at 45° to the carriageway (coning for the exit taper may be the same as for the lead-in taper at some works).
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) facing opposing traffic with a ‘keep left/right’ sign to diagram 610 (S3-2-3).

Relaxations to the exit taper:

- no relaxations to exit taper permitted.

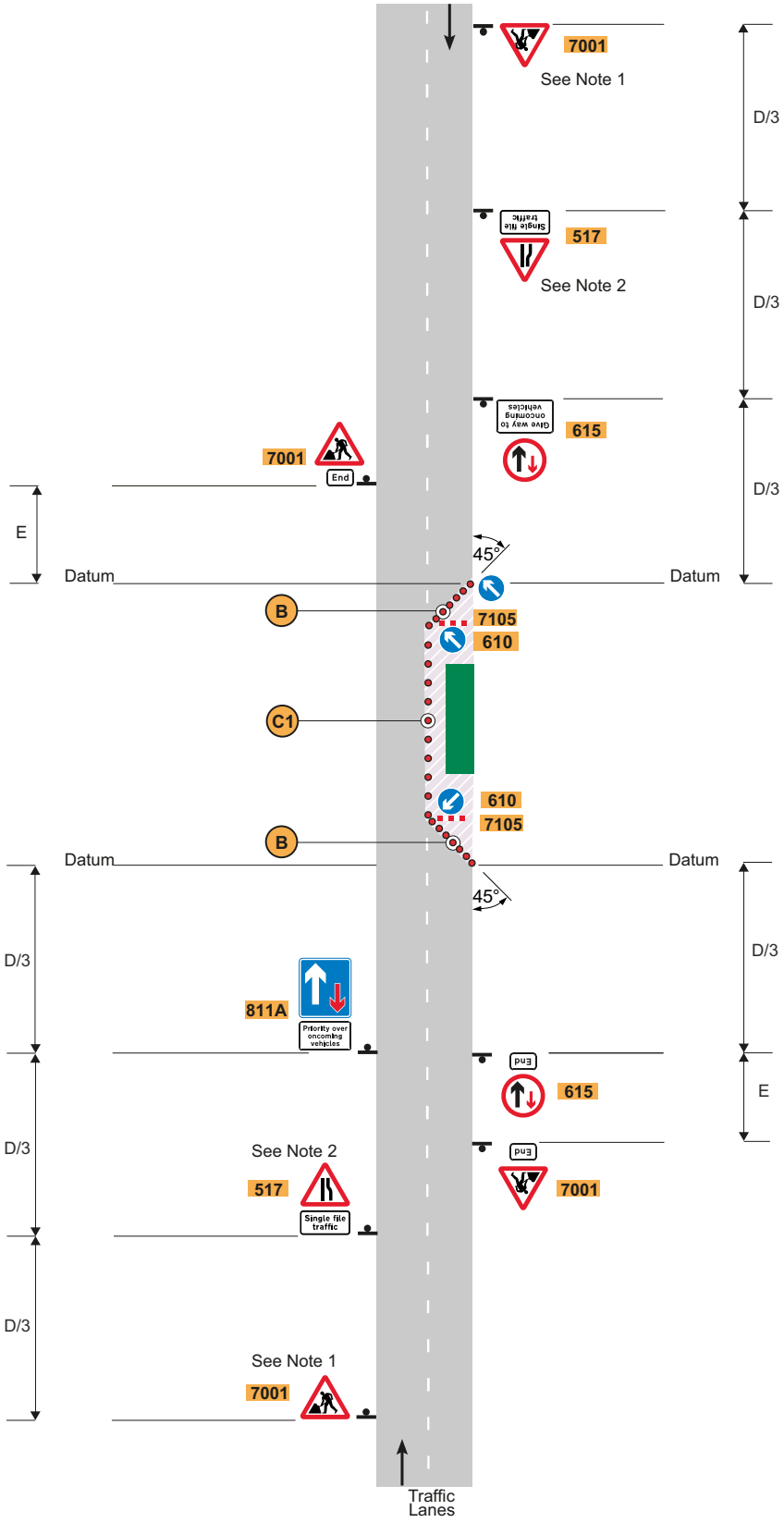
The principles for signing at the end of the road works are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘End’ is located at distance E from the end of the works (**Table 6.3**). This sign is not required when the length of the single file lane is less than 50 m.

Relaxations for signing at the end of the road works:

- no relaxations to end of works signing permitted.

Plan SC4 Priority signs on a two-lane single carriageway road



NOTES:

1. A distance plate is required for roads with a permanent speed limit of 50 mph and above.
2. On roads with a permanent speed limit of 50 mph and above, a site-specific risk assessment should be used to decide whether ‘for’ and a distance should be included on the supplementary plate for signs to diagrams 517 (S2-2-14).
3. Cone spacing will depend on the road type (**Table A1.3**, **Appendix A1**).
4. See **Section 4.3** and **Table 6.1** for guidance on lane widths past works.

6.7 STOP/GO traffic systems

6.7.1. STOP' and 'GO' signs to diagrams 7023 (S14-2-64; **Figure 6.10**) and 7024 (S14-2-65; **Figure 6.11**) are used to control traffic on single carriageway roads by one or more operators on site (see **5.10.2**). They are combined to form a double-sided sign and used on a suitable stand or post. A system where a pair of 'STOP/GO' signs is operated remotely by staff via radio is available. The signs can also be used in conjunction with single vehicle works (see **Section 12.1**). They must not be used to close a road in place of STOP-WORKS signs (see **Section 6.9**), nor all red-signals (see **Section 6.13**). Signs with 'STOP' on both sides are not lawful.



Figure 6.10 Diagram 7023 (S14-2-64) Stop



Figure 6.11 Diagram 7024 (S14-2-65) Go

6.7.2. Before selecting this method of traffic control, a risk assessment should investigate whether alternative methods could remove the need for operators to stand near to live traffic flows.

6.7.3. Manually rotated 'STOP/GO' signs should only be used if a risk assessment has determined the use of remotely controlled 'STOP/GO' signs to be inappropriate, with the reasoning documented in the method statement.

6.7.4. Manually rotated 'STOP/GO' signs are not to be operated by an operative standing in a safety zone. If this is not possible, then temporary traffic signals should be used or the road temporarily closed to vehicular traffic.

6.7.5. Operators should be competent in controlling traffic using these signs. The training of operators is covered in **Section 15.1**.

6.7.6. Manually rotated 'STOP/GO' signs may be appropriate at works of short duration or where the works progress along the road quickly. The two-way traffic flow should not exceed the figures given in **Table 6.5** for the stated site length (measured from the first cone of the entry taper to the last cone of the exit tapers). Intermediate values may be interpolated.

Table 6.5 Permissible site lengths for manually rotated ‘STOP/GO’ signs

Site length m	Maximum two-way flow	
	(veh/hr)	(veh/3 min)
100	1400	70
200	1250	63
300	1050	53
400	950	47
500	850	42

6.7.7. This control type should not be operated over distances greater than 500 m.

6.7.8. If remotely controlled ‘STOP/GO’ signs are used, then the following conditions should apply:

- the operator should be positioned no more than 100 m from either sign.
- the two signs should be no more than 200 m apart.
- the operator must have an unobstructed view of both signs and of oncoming traffic in both directions.
- vehicle flow through the works site is no more than 850 veh/hr.
- use of the remotely operated device should be restricted to daylight hours.
- the operator should be fully familiar with the advice contained in this section concerning the normal manual control of ‘STOP/GO’ signs.
- the operator should be fully instructed in the use of both manual and remote operation of these signs.

6.7.9. Where the site length exceeds the criteria set out in **6.7.8**, each remotely controlled sign should be controlled by a separate operator. This also applies if works take place during the hours of darkness. The operators should continually maintain contact with one another.

6.7.10. ‘STOP/GO’ signs need to be positioned to ensure the maximum visibility of the sign and safety of the operator.

6.7.11. Appropriate measures should be taken, in advance of the works, to reduce the speed of the traffic passing through the works.

6.7.12. For very short lengths of alternating traffic movement, manually rotated signs at one end or in the middle may suffice. If the distance exceeds 20 m control should be operated at both ends using a pair of ‘STOP/GO’ signs. When signs are not manually rotated, the operator must be on site and remote activation must be manually initiated by the operator.

6.7.13. Manually rotated ‘STOP/GO’ signs may be used where the obstruction continues round a bend, providing both operators are in radio contact or a third operator who can see the full length of the works is placed at an intermediate point.

6.7.14. When more than one operator is employed, the operator showing ‘STOP’ will ask the operator showing ‘GO’ to reverse their sign when the queue of traffic on the approach to the ‘STOP’ sign has grown unacceptably long (normally taken as the maximum number of vehicles per 3 min for the length of site in **Table 6.5**). The first operator will continue to display ‘STOP’ until the traffic already in the shuttle lane has passed through.

6.7.15. Each sign should be located in full view of approaching drivers, with adequate regard for operators' safety.

6.7.16. Using 'STOP/GO' signs as a traffic control method is most appropriate in daylight hours and good visibility. It is unlawful to use 'STOP/GO' signs during hours of darkness unless they are directly lit with steady uniform illumination across the sign face. On single carriageway roads with permanent speed limits of 50 mph and above, 'STOP/GO' signs are not recommended for use during hours of darkness even if illuminated.

6.7.17. The 'TRAFFIC CONTROL AHEAD' sign to working drawing 7010.1 (S13-9; **Figure 6.12**) should be used to warn that traffic ahead is controlled by manually operated 'STOP/GO' signs. It is not to be used to warn of traffic control by traffic signals (see **Section 6.10**).



Figure 6.12 Sign to working drawing 7010.1 (S13-9) Traffic control ahead

6.7.18. STOP/GO' signs must not be used in conjunction with priority control signs to diagrams 615 (S3-2-9) and 811A or 811B (S11-2-1).

6.7.19. Where excessively windy conditions make a large sign difficult to handle, the alternative smaller size may be used as described S14-2-64 and 65.

STOP/GO signs – principles for two or three-lane single carriageway road

6.7.20. The following principles for 'STOP/GO' control on two-lane single carriageway roads are illustrated in **Plan SC5**, and on three-lane single carriageway roads illustrated in **Plan SC6**.

The principles for advance signing are:

- for both two and three-lane single carriageways the following two advance signs are required;
  - a 'road works ahead' sign to diagram 7001 (S13-2-9) on the nearside only, in both directions in advance of the works. A supplementary distance plate is required for roads with a permanent speed limit of 50 mph and above.
  - a 'TRAFFIC CONTROL AHEAD' sign to working drawing 7010.1 (S13-9) in advance of the works on the nearside only, in both directions.
- these signs are to be accompanied by a third advance sign, the required sign depends on the number of lanes:
  - on a two-lane single carriageway road, a 'road narrows ahead' sign to diagram 517 (S2-2-14) with supplementary plate 'Single file traffic' on the nearside only, in both directions. On roads with a permanent speed limit of 50 mph and above, 'for' and a distance are required on the 'Single file traffic' plate.
  - on a three-lane single carriageway road marked as two lanes in one direction and one in the other, a sign to diagram 7202.1 (S13-6-13) on the nearside of the two-lane approach to indicate that the centre lane is closed, with traffic on the offside of the works travelling in the opposite direction;

    - for roads with a permanent speed limit of 40 mph or less, one sign (S13-6-13) is required.
    - for roads with a permanent speed limit of 50 mph and above, one sign (S13-6-13) is required with a bottom panel indicating the distance to the works of 200 yards, placed 200 m in advance of the works. A second sign is required with a bottom panel indicating the distance to the works of 100 yards, placed 100 m in advance of the works.
- where works consist of surface dressing and the new surface is to be trafficked, then the 'road narrows ahead' sign to diagram 517 (S2-2-14) should normally be replaced by a sign to diagram 7009 (S13-2-10; **Figure 6.13**) with supplementary plates to diagram 7009.1 (S13-4-3; **Figure 6.14**). In situations where both signs are required, the placing of the initial surface dressing warning signs should be far enough in advance of the loose chippings to give drivers adequate distance to slow down.
- on a two-lane single carriageway road, a 'STOP/GO' sign to diagram 7023 (S14-2-64) and 7024 (S14-2-65) is required 15 m in advance of the start of the taper, as well as a 'WHEN STOP SIGN SHOWS WAIT HERE' sign 7011 (S14-2-58; **Figure 6.15**) 15 m in advance of the 'STOP/GO' sign. This distance may need to be increased to avoid a waiting vehicle blocking the path of vehicles as they leave the works.
- on a three-lane single carriageway road:
    - on the two-lane side, a 'STOP/GO' sign (S14-2-64/S14-2-65) on the nearside opposite the end of the lead guide island. Accompanied by a 'WHEN STOP SIGN SHOWS WAIT HERE' sign to diagram 7011 (S14-2-58) 15 m in advance of the 'STOP/GO' sign, or
    - on the single-lane side, a 'STOP/GO' sign (S14-2-64/S14-2-65) halfway along the lead-in taper on the nearside. Accompanied by a 'WHEN STOP SIGN SHOWS WAIT HERE' sign to diagram 7011 (S14-2-58) 15 m in advance of the 'STOP/GO' sign.



Figure 6.13 Diagram 7009 (S13-2-10) Loose chippings on road ahead



Figure 6.14 Diagram 7009 (S13-2-10) Loose chippings on road ahead combined with diagram 7009.1 (S13-4-3) Skid risk, Max Speed advised 20 mph



Figure 6.15 Diagram 7011 (S14-2-58) When stop sign shows wait here

Relaxations for advance signing:

- no relaxations to advance signing permitted.

The principles for the signing of the lead-in taper are:

- one ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed on the nearside at the start of the taper.
- on a two-lane single carriageway road, coning to Detail B is used at an angle of 45° to the edge of the road.
- on a three-lane single carriageway road, coning to Detail B or C2 is used, with a length as specified in Table 6.3. The length of the guide island is dealt with in **Section 6.11**.
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed at the end of the taper behind the cones. The ‘keep left/right’ sign to diagram 610 (S3-2-3) may be placed behind or in front of the barrier.
- on a three-lane single carriageway road when two lanes are crossed, one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed in each closed lane.

Relaxations for lead-in taper:

- permitted relaxations to Detail C1 are outlined within **Table A1.3** (**Appendix A1**).

The principles for the exit taper are:

- coning on two-lane single carriageway roads to Detail B at 45° to the edge of the road.
- the coning for the exit taper on three-lane single carriageway roads is the same as for the lead-in taper.
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) facing opposing traffic with a ‘keep left/right’ sign to diagram 610 (S3-2-3). On a three-lane single carriageway road, these signs are positioned on the central traffic control island.

Relaxations for exit taper:

- no relaxations to exit taper permitted.

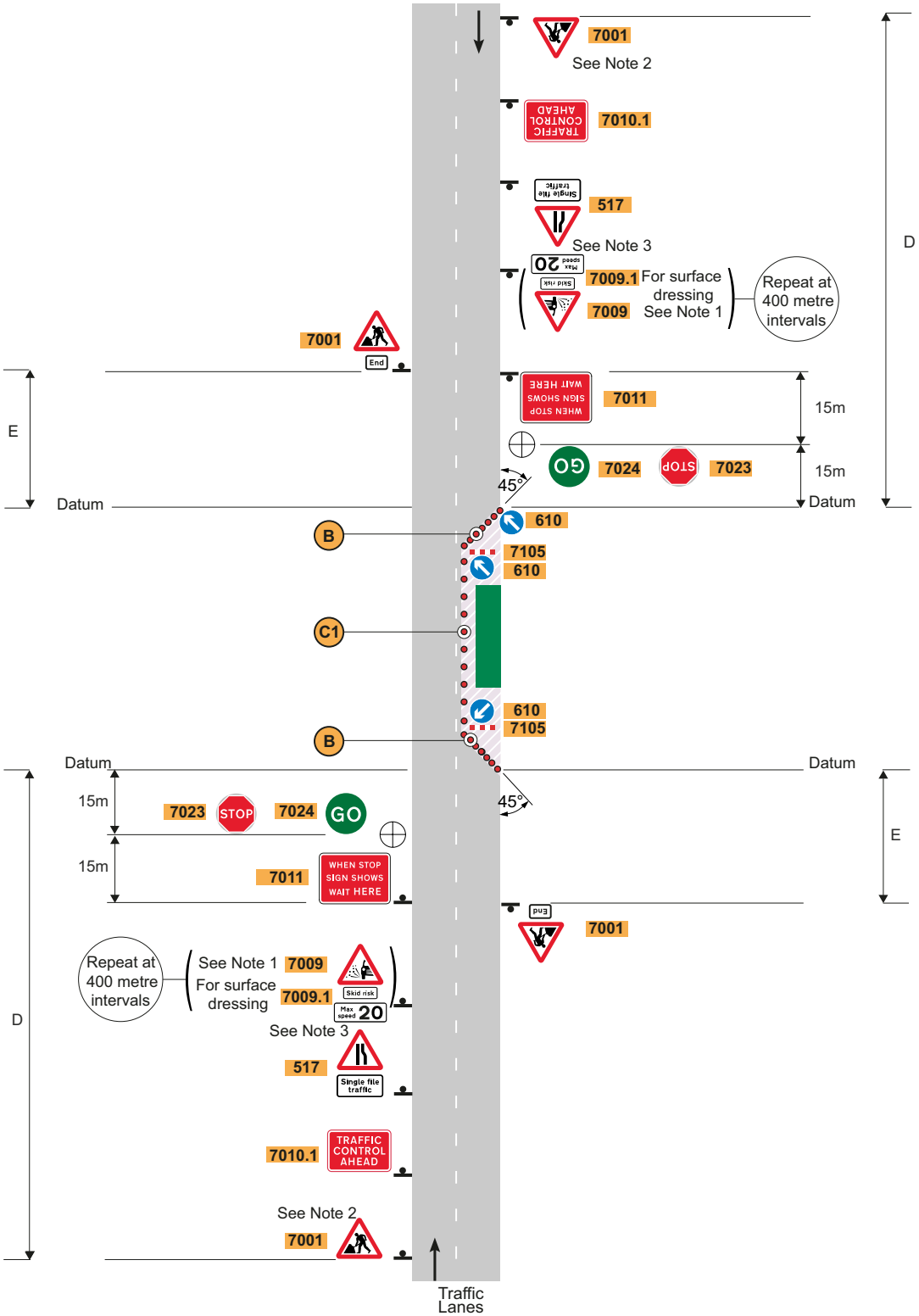
The principles for signing at the end of the road works are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘End’ is located at distance E from the end of the works (see **Table 6.3**).

Relaxations for signing at the end of the road works:

- no relaxations to end of works signing permitted.

Plan SC5 STOP/GO signs on a two-lane single carriageway road



NOTES:

1. This sign should be used if works consist of surface dressing. The signs should be placed far enough in advance of the loose chippings to allow drivers to slow down and retained for as long as the loose chippings persist (**4.46.11**).

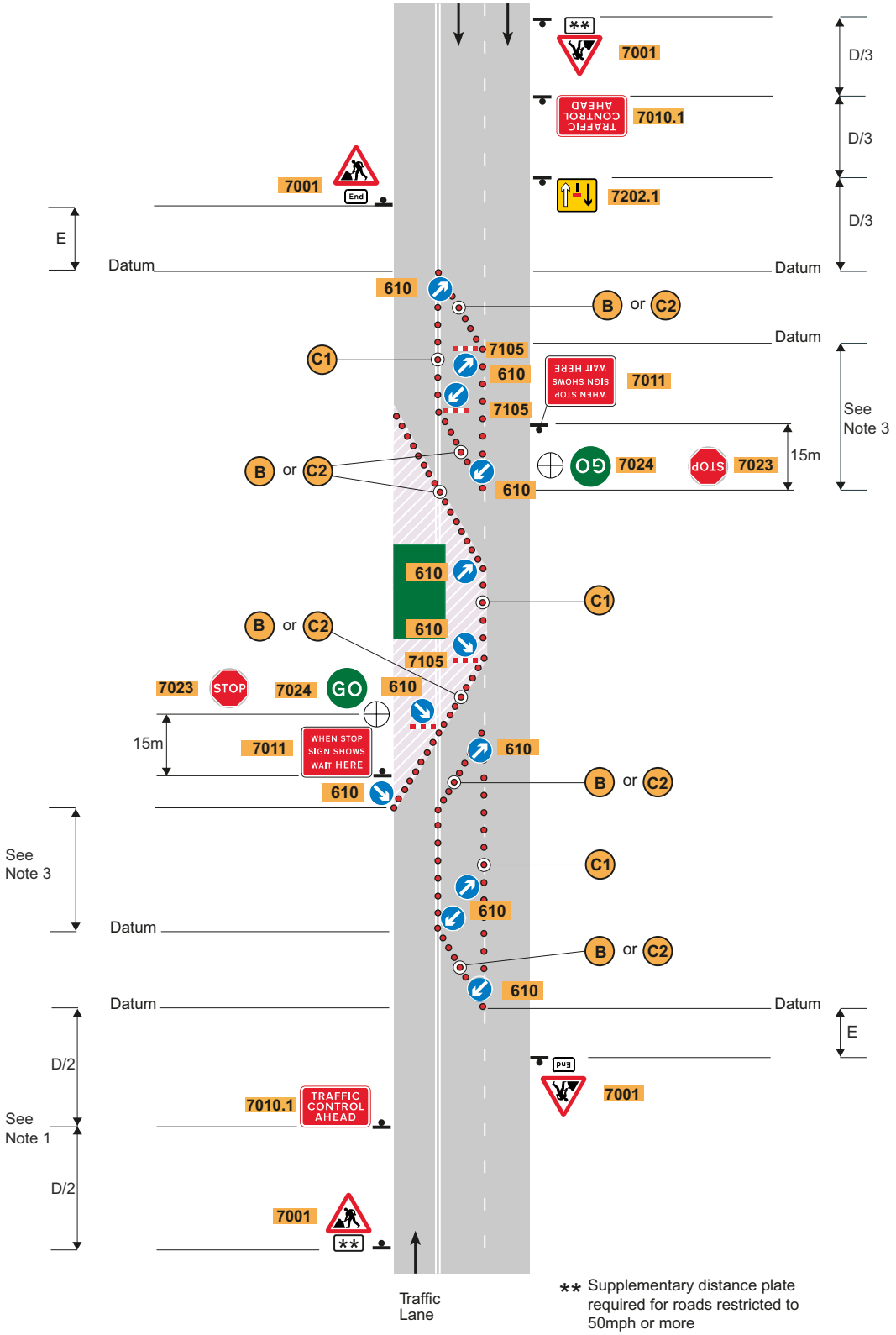
2. A distance plate is required for roads with a permanent speed limit of 50 mph and above.

3. On roads with a permanent speed limit of 50 mph and above, a distance is required on supplementary plates for signs to diagram 517 (S2-2-14).

4. Refer to **Table 6.3** for dimensions of D and E.

5. Cone spacing will depend on the type of road (see **Table A1.3**, **Appendix A1**).

Plan SC6 STOP/GO signs on a three-lane single carriageway road



NOTES:

1. Where overtaking is permitted in both directions, a sign to 7202.1 (S13-6-13) should be erected on each approach. In this case, all approach signs should be located at D/3 spacing.

2. Where drivers would be required to cross continuous white lines in the lane changeover positions, these should be masked or removed.

3. Refer to **Table 6.6** for the lengths of guide islands.

4. Refer to **Table 6.3** for the recommended range of distances D and E.

5. Cone spacing will depend on the type of road (see **Table A1.3**, **Appendix A1**).

6.8 High intensity warning lights in area of priority control

6.8.1. During the hours of darkness, high intensity warning lights are required where priority signs are used to control traffic where there is a loss of one lane or part of a lane. They should be positioned above any cones and face oncoming traffic so they are visible from both directions.

6.8.2. A high intensity warning light should be placed between the end of the lead taper coning and the start of the parallel coning e.g. in **Plans SC5** and **SC6**, and at the end of the 'lane closed' barrier to diagram 7105 (S13-6-8) next to the 'keep left/right' sign to diagram 610 (S3-2-3).

6.8.3. If the remaining single carriageway is 5.5 m or less, a further high intensity warning lights should be placed between the end of the parallel coning and the start of the exit taper coning.

6.8.4. High intensity warning lights are not required where there are positive traffic controls, such as portable signals, but may help in delineating the layout.

6.9 Use of STOP WORKS sign

6.9.1. The 'STOP-WORKS' sign to diagram 7031 (S14-2-66; **Figure 6.16**) may be used to stop traffic for a short period during works on or near a road, or during the temporary obstruction of a road.



Figure 6.16 Diagram 7031 (S14-2-66) Stop works

6.9.2. The sign should only be used when all the following apply:

- on low-risk sites.
- on single carriageway roads.
- when the stoppage is to be for a planned maximum period of 2 minutes.
- the minimum clear visibility for drivers to the sign is:
  - 60 m where the speed is restricted to 40 mph or less, or
  - 75 m where the speed limit is 50 mph or above.

6.9.3. Signs to diagram 7031 (S14-2-66) should not be used as a substitute for other forms of priority control and should not normally used on dual carriageways or motorways. Care must be taken if the sign is to be used at a junction.

6.9.4. The sign must be:

- double-sided.
- mounted on a black/yellow banded pole (Schedule 13 General Direction 38).
- held by an operator wearing high visibility clothing.

6.9.5. During the hours of darkness, each sign face must be adequately illuminated by its own light source. Using only reflectorised materials is not sufficient.

6.9.6. Two ‘STOP-WORKS’ signs (S14-2-66) may be required in some circumstances (e.g. manoeuvring plant or works vehicles).

6.9.7. Unless the site is already signed and guarded, additional signs ‘TRAFFIC CONTROL AHEAD’ to working drawing 7010.1 (S13-9) should be positioned on both approaches when any of the following conditions apply:

- the two-way traffic flow is greater than 400 veh/hr.
- bends in the road or other obstructions affect visibility, or.
- the speed limit is 50 mph or above.

6.10 Traffic signal control systems

6.10.1. Portable traffic signals are used at works sites where:

- positive traffic control is required.
- works are to be in place long enough to justify the time taken to install and remove the equipment and / or.
- there is a high volume of traffic.

The maximum distance between signal heads should not exceed 300 m. For greater distances, consult the authority.

6.10.2. Portable traffic signals are suitable for use at most sites. However, where the criteria for priority control or ‘STOP/GO’ signs (see **Sections 6.6** and **6.7**) are met, those methods should be considered when possible to reduce traffic delays. Signal control may cause difficulty where flows are so heavy that the road on the approach to the signals is overloaded. Queuing traffic on each approach should not pass through any other prior controlled junctions.

6.10.3. In these cases, the designer should contact the authority to consider alternative solutions.

6.10.4. Traffic Authority’s permission is required before portable traffic signals are placed on the highway, unless placed by undertakers under powers in the New Roads and Street Works Act 1991. Undertakers must however give advance notice of the use of portable traffic signals (NRSWA, 1991, sections 54 and 55).

6.10.5. It is recommended that signal equipment is certified to a relevant TOPAS, or equivalent, standard. Traffic signals should be set to vehicle actuated unless works require the use of chicanes (see **Section 6.12**), extended all-red periods (see **Section 6.13**), or as otherwise instructed by the authority. It is recommended that STOP/GO or STOP–WORKS signs be available in case of signal failure.

6.10.6. Advice regarding signal control and setting-up procedures is covered in **Section 6.15**. The DfT document ‘An introduction to the use of portable vehicular signals’ (TSO, 2016) has been withdrawn. The Association for Road Traffic Safety and Management (ARTSM) has produced advice titled the ‘Guidance on the use of portable traffic signals’ which is available as a PDF download from their website and as hard copy. It is essential to note the signing and TTM identified in the ARTSM document is indicative and is not applicable for all situations or all parts of the UK. Designers should use the ARTSM guidance as part of the design process (where relevant), but the requirements in this document should take precedence. Standalone portable pedestrian crossings (i.e. not part of shuttle working or signalised junctions) are not covered in this Chapter; Section 13 of the ARTSM guidance should be used in Great Britain.

6.10.7. The position of signals and signs can affect traffic flow. The recommended positions are shown in **Plans SC7** and **SC8**. For many sites where signals are used, two-phase control for shuttle working may be all that is required. The need for additional or alternative TTM or signals should be identified at the design stage.

6.10.8. The use of two traffic signals should be considered on each approach, especially where traffic speeds are high. This may not always be necessary or possible. In such instances, **Plan SC7** shows alternative positions for signals:

- on the nearside to approaching traffic, at each end of the works, or.
- on or near the centre line of the road, at each end of the works.

6.10.9. The authority may require variants of these layouts to meet certain conditions. The main factors which need to be considered are:

- the duration of the works.
- the visibility of the signals.
- the traffic flow.
- whether any crossing cables can be safely accommodated.

6.10.10. A signal's vehicle detector(s) are generally most effective when positioned on the nearside of the approaching traffic. The road geometry, or street furniture, may require an alternative location to be adopted. Where signals are connected by cable, the nearside position requires the cable to cross the running lane. This cable should be fitted in a cable protector secured against movement to reduce damage and minimise risk. The crossing protector should not present a hazard to road users, especially cyclists and motorcyclists. The authority should be satisfied that the cable crossing protector is safe and fit for use.

6.10.11. A 'RAMP' sign to working drawing 7013 (S13-9; **Figure 6.17**) is required on each approach to the cable crossing.



Figure 6.17 Sign to working drawing 7013 (S13-9) Ramp

6.10.12. The 'Traffic signals ahead' sign to diagram 543 (S14-2-28; **Figure 6.18**) is used to warn drivers that they are approaching traffic signals. It may be accompanied by a distance plate.



Figure 6.18 Diagram 543 (S14-2-28) Traffic signals ahead

6.10.13. Within a length of road controlled by portable traffic signals, the 'JOINING TRAFFIC NOT SIGNAL CONTROLLED' sign to diagram 7022 (S14-2-63; **Figure 6.19**) is required at each uncontrolled junction with a side road. Where it is not possible to place this sign so it has the recommended clear visibility advance warning signs may be needed.



Figure 6.19 Diagram 7022 (S14-2-63) Joining traffic not signal controlled

6.10.14. Traffic signals (permanent, temporary or portable) which are not operating for any significant period should be bagged. For periods of less than one week, signs to diagram 7019 (S14-2-61; **Figure 6.20**) may be erected instead to indicate that the signals are not in use. These signs should normally be fixed to the traffic signal posts but may also be erected in advance. This sign may be used for short term situations where signals are stuck on a single phase and displaying constant red aspects on one or more approaches and where turning off the signals is not immediately practicable or safe. They must never be used to indicate that a permanent set of signals are not in use if portable signals are in use at the same location, as they may be taken as indicting that road users are permitted to proceed past a red aspect. Where personnel are working on signals near traffic, the traffic signal maintenance sign to working drawing 7010.1 (S13-9; **Figure 6.21**) should be provided in advance of the signals. This is not required in short-term situations.



Figure 6.20 Diagram 7019 (S14-2-61) Traffic light signals not in use



Figure 6.21 Sign to working drawing 7010.1 (S13-9) Traffic signal maintenance

6.10.15. Signs to diagram 7014 (S13-6-37; **Figure 6.22**) include ‘SIGNAL TIMING CHANGED’ and ‘SIGNAL PRIORITIES CHANGED AHEAD’.



Figure 6.22 Diagram 7014 (S13-6-37) Signal priorities changed ahead

6.10.16. The ‘HEAVY PLANT CROSSING’ sign to diagram 511 (S13-4-1; **Figure 6.23**) is used at a haul route crossing (see Section 4.27).



Figure 6.23 Diagram 511 (S13-4-1) Heavy plant crossing

Portable traffic signals – principles for two and three lane single carriageway roads

6.10.17. The following principles for portable traffic signals on two and three-lane single carriageway roads are illustrated in **Plans SC7** and **SC8**.

The principles for advance signing are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) on the nearside only, in both directions in advance of the works. A supplementary distance plate is required for roads with a permanent speed limit of 50 mph and above.
- a ‘traffic signals ahead’ sign to diagram 543 (S14-2-28) on the nearside, in both directions in advance of the works.
- on a two-lane single carriageway road, a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) with supplementary plate ‘Single file traffic’ on the nearside only, in both directions. On roads with a permanent speed limit of 50 mph and above, ‘for’ and a distance are required on the ‘Single file traffic’ plate.
- on a three-lane single carriageway road marked as two lanes in one direction and one in the other, a sign to diagram 7202.1 (S13-6-13) on the nearside of the two-lane approach to indicate that the centre lane is closed, with traffic on the offside of the works travelling in the opposite direction:
  - for roads with a permanent speed limit of 40 mph or less, one sign to diagram 7202.1 (S13-6-13) is required.
  - for roads with a permanent speed limit of 50 mph and above, one sign to diagram 7202.1 (S13-6-13) is required with a bottom panel indicating the distance to the works of 200 yards, placed 200 m in advance of the works. A second sign is required with a bottom panel indicating the distance to the works of 100 yards, placed 100 m in advance of the works.
- a ‘WHEN RED LIGHT SHOWS WAIT HERE’ sign to diagram 7011 (S14-2-58) on the nearside only, in both directions placed 15 m in advance of the works. This distance may need to be increased to avoid a waiting vehicle blocking the path of vehicles as they leave the works. Where shuttle working also includes an integrated pedestrian crossing facility diagram 7011 must still be used. Signs to diagram 7011.2 (S14-2-60) are only prescribed for pedestrian only signals.
- Where shuttle working is on a section of road with a cycleway delineated by a marking, there may be a need for signing to indicate it is closed.

Relaxations for advance signing:

- no relaxations to advance signing permitted.

The principles for the lead-in taper are:

- one ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed on the nearside at the start of the taper.
- on a two-lane single carriageway road, coning to Detail B is used at an angle of 45° to the edge of the road.
- on a three-lane single carriageway road, coning to Detail B or C2 is used (**Table 6.3**) gives the taper length. The length of the guide island is dealt with in **Section 6.11**).
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed at the end of the taper behind the cones. The ‘keep left/right’ sign may be placed behind or in front of the barrier.
- on a three-lane single carriageway road, when two lanes are crossed, one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3) is placed in the closed lane.

Relaxations for the lead-in taper:

- permitted relaxations to Details B and C2 are outlined within **Table A1.3**.

The principles for the works zone are:

- coning to Detail C1 is used to mark the edge of the works area on single carriageway roads. No additional signing is required.

Relaxations for the works zone:

- permitted relaxations to Details C1 are outlined within **Table A1.3** (**Appendix A1**).

The principles for the exit taper are:

- coning on two-lane single carriageway roads to Detail B at 45° to the edge of the road.
- the coning for the exit taper on three-lane single carriageway roads is the same as for the lead-in taper.
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) facing opposing traffic with a ‘keep left/right’ sign to diagram 610 (S3-2-3). On a three-lane single carriageway road, these signs are positioned on the central traffic control island.

Relaxations for the exit taper:

- no relaxations to exit taper permitted.

The principles for the signing at end of the road works are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘End’ is located at distance E from the end of the works (**Table 6.3**).

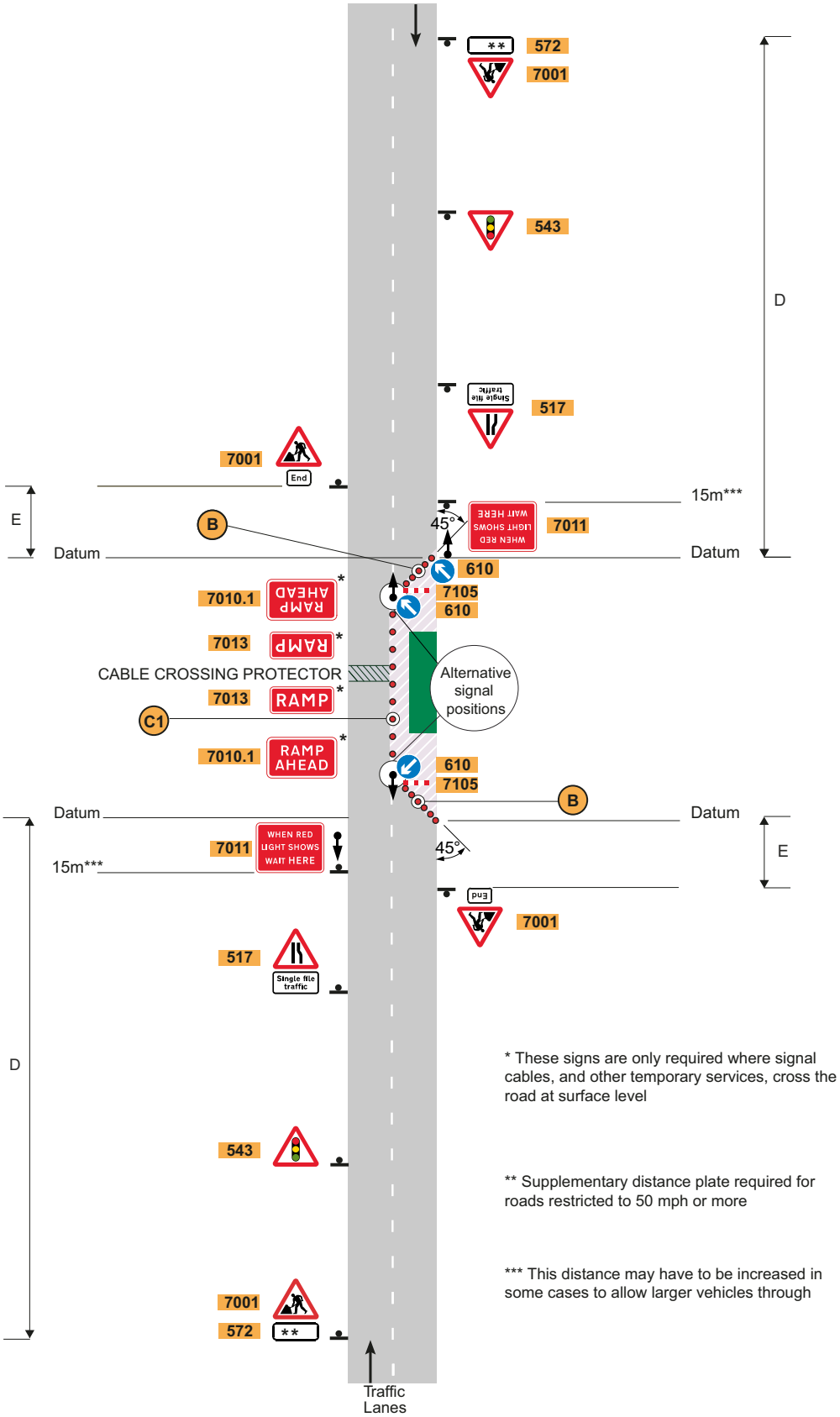
Relaxations for the signing at the end of the road works:

- no relaxations to end of road works signs permitted.

Placing of signals:

- on a two-lane single carriageway, see **6.10.8**.
- on a three-lane single carriageway road, on the two-lane side, a portable traffic signal is placed on the nearside opposite the end of the lead guide island. On the single-lane side, a portable traffic sign is placed midway along the taper behind the cones.

Plan SC7 Portable traffic signals on a two-lane single carriageway road

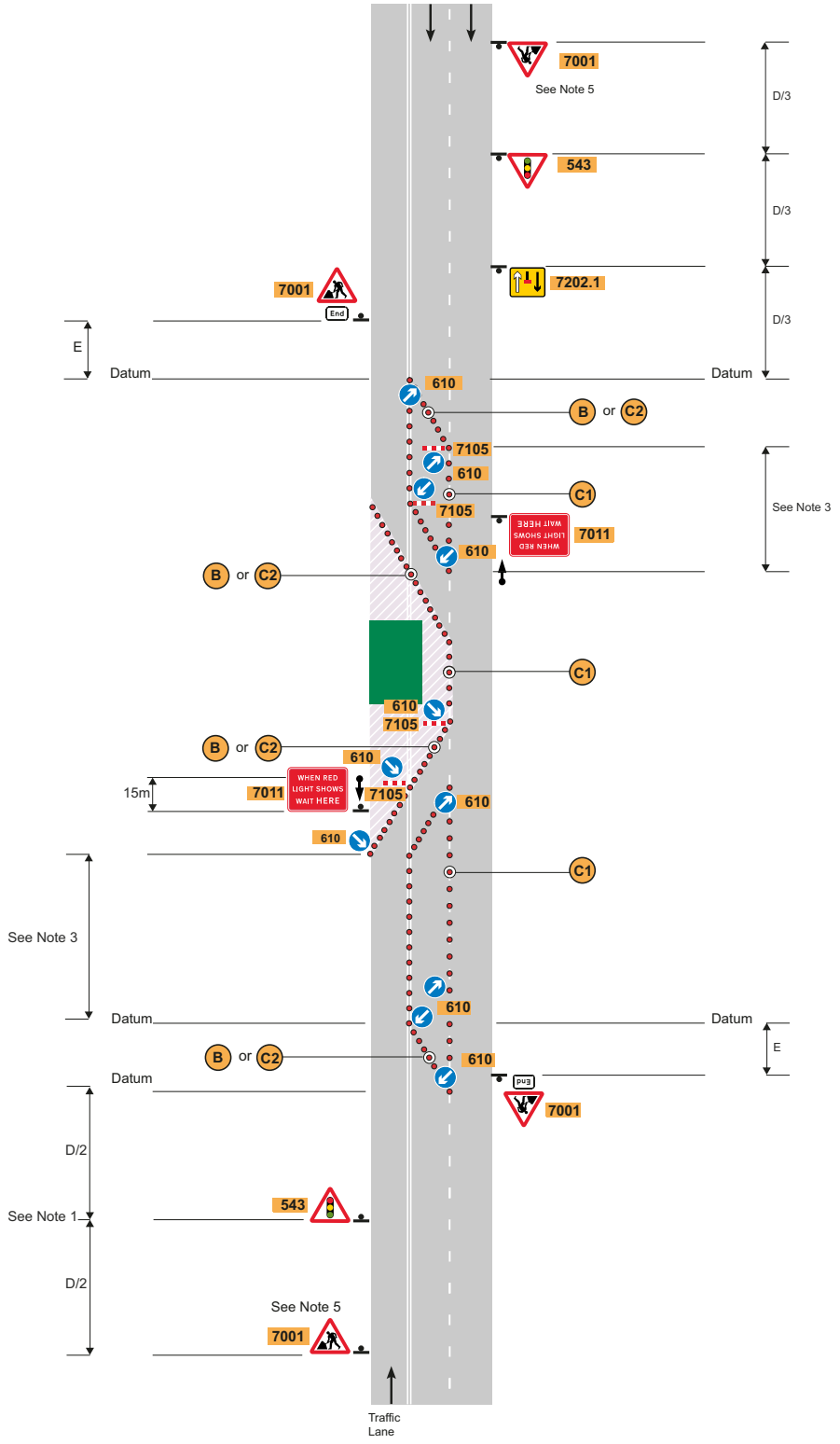


* These signs are only required where signal cables, and other temporary services, cross the road at surface level

** Supplementary distance plate required for roads restricted to 50 mph or more

*** This distance may have to be increased in some cases to allow larger vehicles through

Plan SC8 Portable traffic signals on a three-lane single carriageway road



NOTES:

1. Where overtaking is permitted in both directions, a sign to 7202.1 (S13-6-13), including a downward white arrow, should be erected on each approach. In this case all approach signs should be located at D/3 spacing.

2. Where drivers would be required to cross continuous white lines in the lane changeover positions, these should be masked or removed.

3. Refer to **Table 6.6** for the lengths of guide islands.

4. Refer to **Table 6.3** for the recommended range of distances D and E.

5. A distance plate is required for roads with a permanent speed limit of 50 mph and above.

6.11 Guide islands

6.11.1. Guide islands should be provided where a single three-lane carriageway is reduced to one or two lanes. Minimum taper lengths for guide islands are given in **Table A1.3** (**Appendix A1**). Lengths of guide islands excluding tapers are given in **Table 6.6**.

Table 6.6 Guide island lengths

	Standard works	Relaxation
Roads for which national speed limit applies	200 m	100 m
Roads with a permanent speed limit of 50 mph or less	100 m	50 m

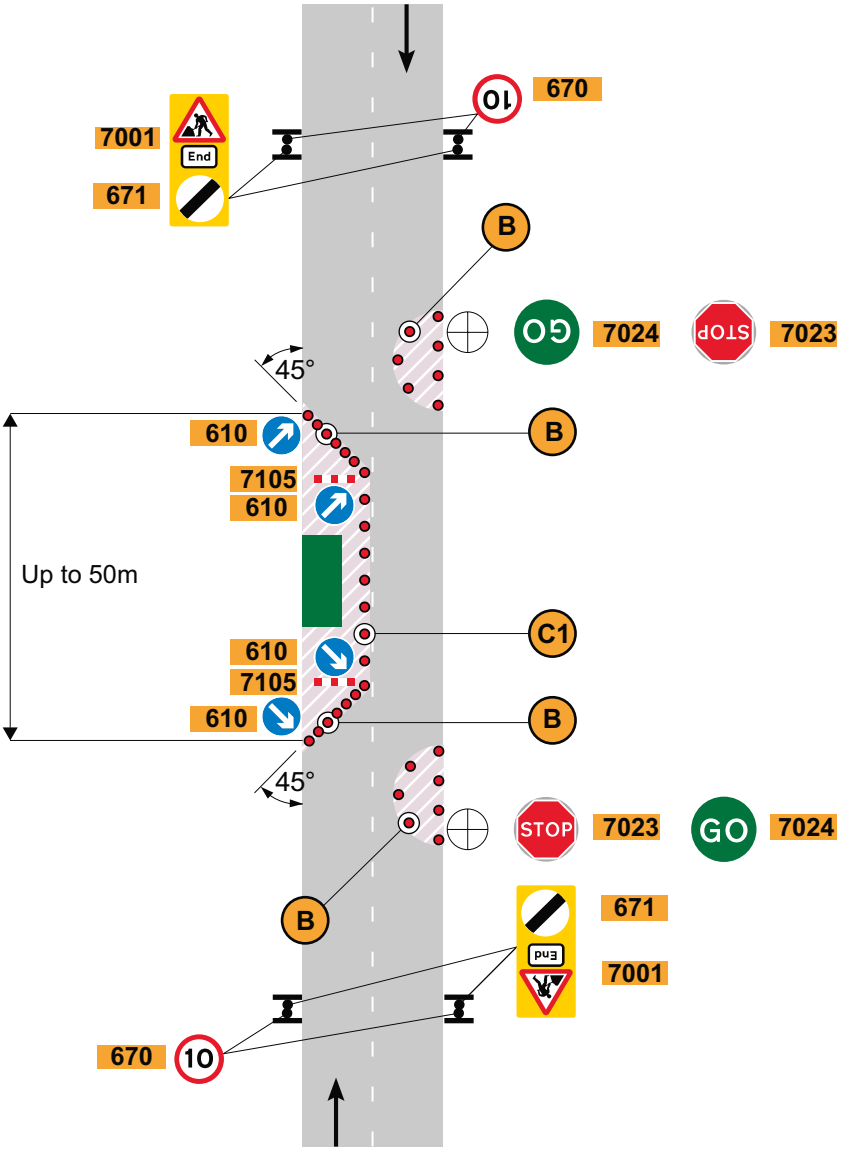
6.11.2. When guide islands are used with positive traffic control, the taper lengths should be as shown in **Table 6.3**.

6.12 Use of chicanes

6.12.1. Chicanes may be suitable to reduce traffic speeds to less than 10 mph for shuttle working lengths up to 50 m. At least one chicane in each direction is required. The minimum size must allow a large vehicle to pass through slowly. Traffic must first be brought to a halt by positive traffic control and then released in small batches. This will be controlled by careful use of ‘STOP/GO’ signs or manually controlled portable traffic signals. This principle is shown in **Plan CH1**.

6.12.2. Where it is not practicable to provide a chicane in one direction, an alternative TTM arrangement should be used in that direction to ensure that traffic speeds are reduced to less than 10 mph.

Plan CH1 Use of chicanes to reduce traffic speeds to 10 mph



NOTES:

1. The signs shown are those specifically required for chicanes and a 10 mph mandatory speed limit. These supplement normal signing for either ‘STOP/GO’ signs or temporary portable traffic signals.

2. The principles in this plan are only appropriate for shuttle working lengths up to 50 m. For longer lengths a convoy working system must be used (see **Section 9**).

3. If the signs are on ‘STOP/STOP’ for any reason, there is a risk that drivers might be able to see both ‘STOP’ and ‘GO’ signs facing them. ‘STOP/GO’ signs should therefore be sited to minimise this risk.

6.13 Use of extended all-red period on traffic signals

6.13.1. On single carriageway roads with low traffic flows (defined in **Appendix A2**) an extended all-red period with portable traffic signals may be used to allow a short period for certain tasks to be carried out on the whole carriageway. Example tasks include:

- installing TTM.
- installing temporary safety barriers.
- road markings.
- tree-felling.

6.13.2. To minimise queuing, the all-red period used should be the minimum needed in order to carry out the task. The design process must establish the likely traffic flow at the site to calculate the maximum number vehicles likely to be delayed in a queue. **Table 6.7** gives example queue lengths for a range of all-red periods, depending on traffic flow.

Table 6.7 Example all red periods and associated queue lengths

Two-way traffic flow (veh/hr)	Maximum all-red period (minutes)	Average queue length (vehicles)
200	5	8
300	4	10
400	3	10
500	2	8
600	2	10

NOTE: The queue length assumes that traffic is flowing equally in both directions. The length represents the average number of vehicles that could be expected to be waiting in each queue by the end of the all-red period.

6.13.3. Queues greater than 15 vehicles should be avoided, as longer queues take longer to disperse and for traffic flow to return to normal. Permission for an extended all-red period will need to be sought from the authority if:

- queues greater than 20 vehicles at one or both ends are likely, or.
- an all-red period of 10 minutes or longer is required (as this will require an order).

6.13.4. Consideration should be given to the effect that queues may have on surrounding roads and junctions.

6.13.5. Manually operated ‘WORKS-STOP’ signs (see **Section 6.9**) should only be used as an alternative to an all-red period at sites where the risk is assessed as low. It is recommended that WORKS-STOP signs be available in case of signal failure.

6.13.6. Where portable traffic signals are used, an operative should be present at each signal head. They should be trained in communication and dispute resolution so they can competently and effectively communicate with motorists who may want an explanation for why they may not proceed. Alternatively, additional prescribed signing can be used to advise waiting motorists that the signals are functioning correctly.

6.13.7. The recommended signing layout for this control type is illustrated in **Plan SC5** (see **Section 6.7**) for a single two-lane carriageway road.

6.13.8. It is essential that works are able to be suspended rapidly to allow access by emergency vehicles.

6.13.9. An extended all-red period may be considered for use on dual carriageway roads up to 40 mph with convoy working, where the one-way hourly traffic flow is less than 300 veh/hr (see **Plan CW2**). Its use is not permitted on motorways.

6.14 Junctions

6.14.1. This section explores methods to control vehicular traffic at road works which include one or more junctions, or where a junction is near enough to the works that it should be included in the TTM.

6.14.2. If it is safe to do so, two-way traffic should be maintained past the obstruction. This may be achieved by providing temporary road markings and 'Give Way' road markings to assist in directing traffic. Turning movements may be temporarily prohibited, subject to an order being obtained by the authority. If suitable alternative routes are available, temporary diversions should be arranged and signed (see **Section 4.24**).

6.14.3. If the road width available to traffic is to be reduced to less than 5.5 m (see **6.1.5**), 'STOP-WORKS' signs or portable traffic signals will be needed (see **Sections 6.7** and **6.10**).

6.14.4. On the main road, 'road works ahead' signs to diagram 7001 (S13-2-9) with distance and direction to hazard plates should be used to warn drivers turning into side roads with two-way flow.

6.14.5. Where the width of road available in the side roads requires one-way traffic, all turns from the main road must be prohibited. The side road will operate one-way traffic past the obstruction. Appropriate mandatory 'no right/left turn' signs to diagram 612 or 613 (S3-2-7 or S3-2-8 respectively; **Figure 6.24**) should be provided instead of the 'road works ahead to left/right' signs to diagram 7001 (S13-2-9) on the main road.



Figure 6.24 Diagram 613 (S3-2-8) and 612 (S3-2-7) No left/right turn

6.14.6. A similar effect to the use of 'no right/left turn' signs to diagrams 612 or 613 may be achieved using the mandatory 'no entry' sign to diagram 616 (S3-2-10; **Figure 6.25**) for prohibiting turns from main roads. A diversion should then be signed to permit access to the side road (see **Section 4.24**). If the side road traffic is very light and there is little risk of traffic on the main road being inconvenienced, it may be possible to operate alternate one-way working past the obstruction in the side-road. This approach must be treated with extreme caution.

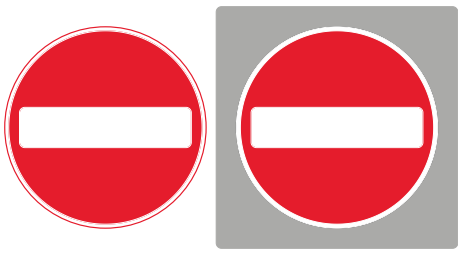


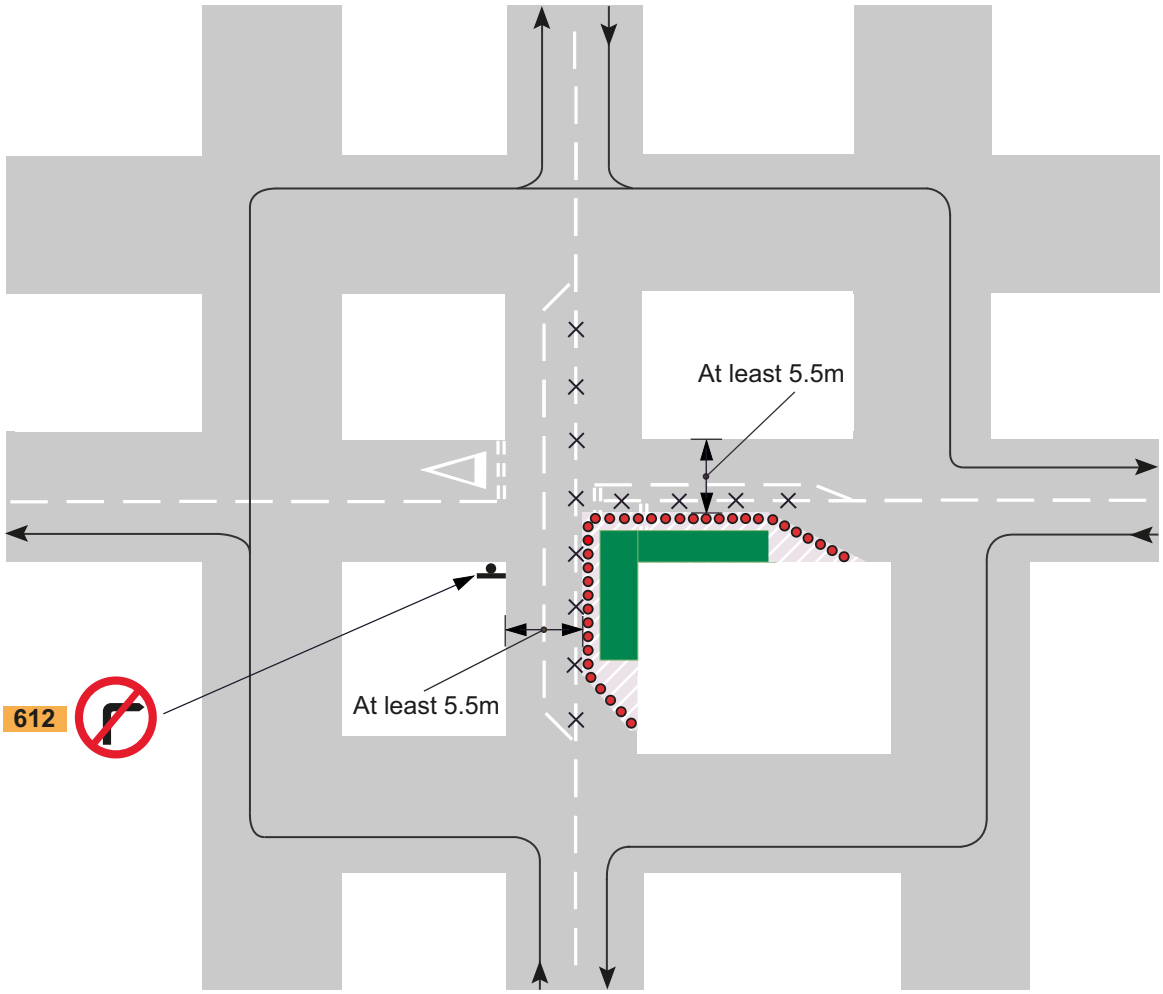
Figure 6.25 Diagram 616 (S3-2-10) No entry with and without backing board

6.14.7. Where the junction is normally controlled by 'GIVE WAY' signs, if the designer decides that the level of traffic or visibility requires the minor road or access to be controlled by signals, then:

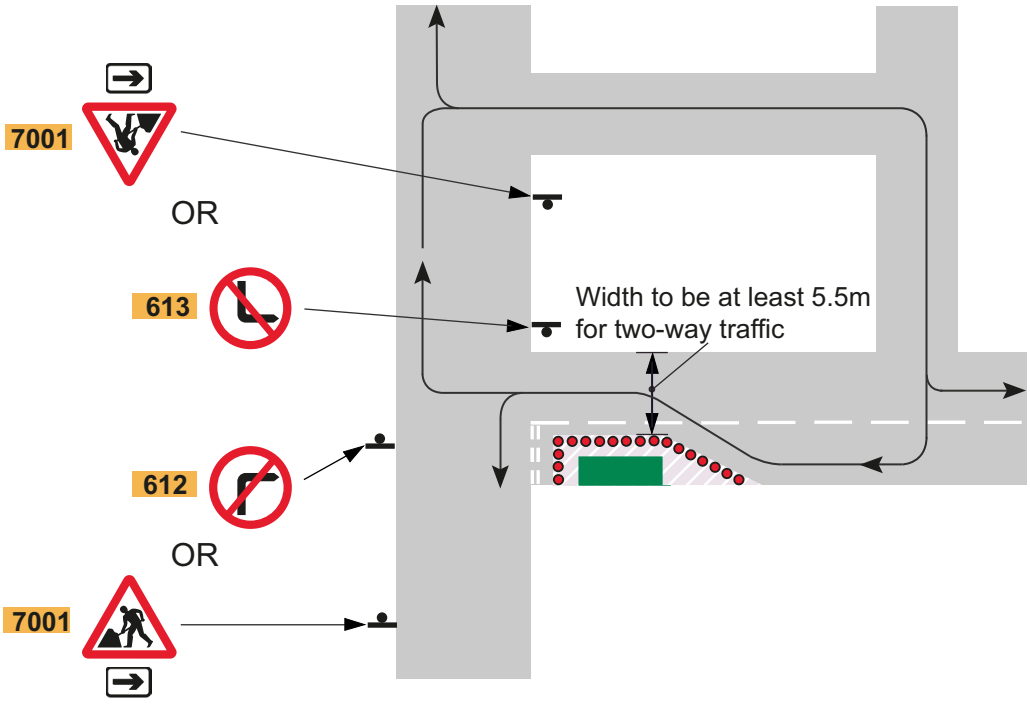
- the junction and the shuttle lane should be controlled by a multiphase portable signal controller,
- the 'GIVE WAY' signs and markings should be temporarily masked or removed.
- any cable crossing protectors should be sited away from turning traffic and where braking and acceleration are unlikely to occur.

6.14.8. **Plans SC9** and **SC10** show indicative locations for prohibition and warning signs in order to advise of road works ahead. These signs are additional to the standard road works signing.

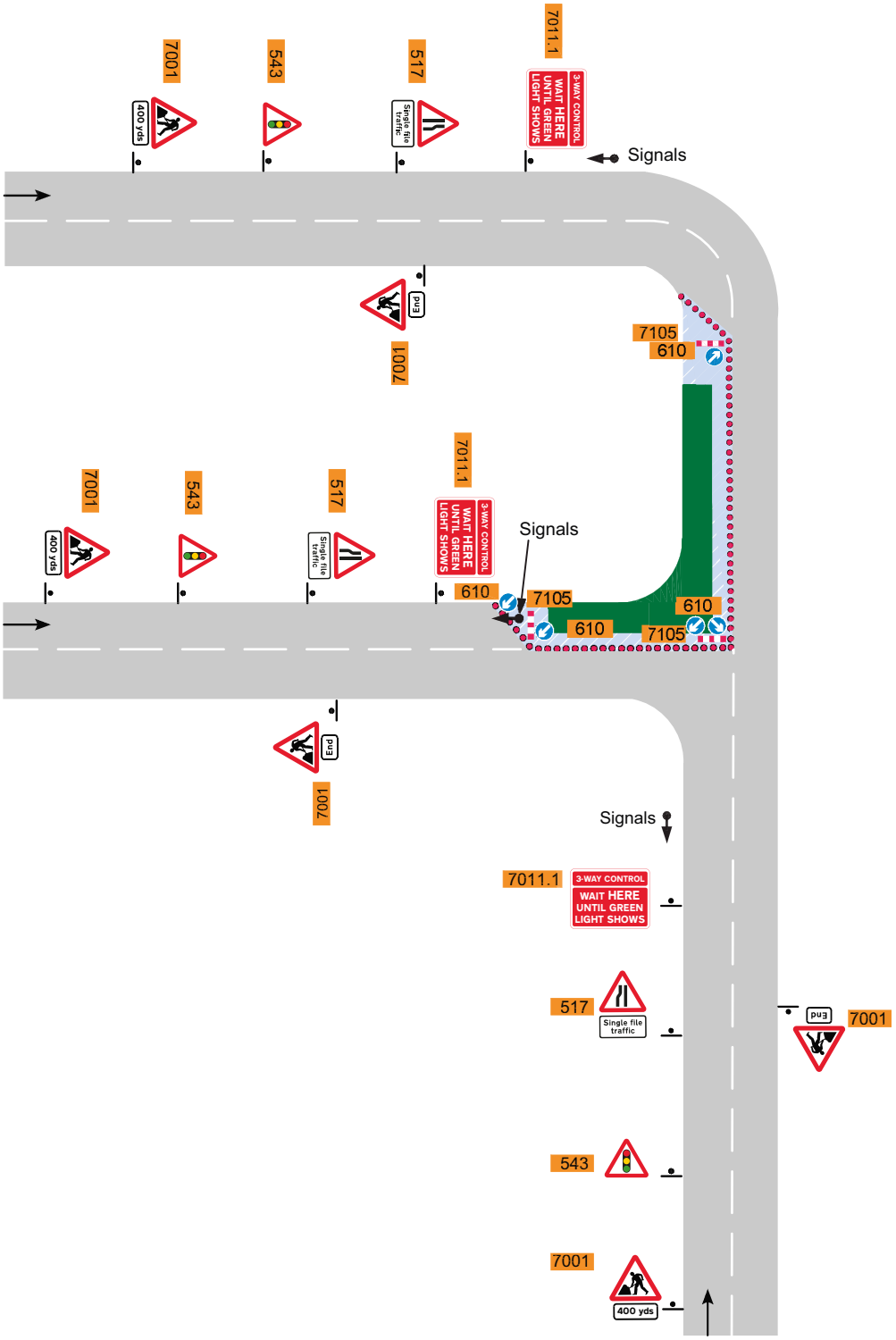
Plan SC9 Road works at a crossroads junction



Plan SC10 Road works at a T junction



Plan SC11 Road works at a T junction – traffic control by means of portable traffic signals



NOTES:

1. The number of advance signs to give adequate warning of the works ahead must be determined by local circumstances. Distance plates can be omitted on roads where the speed restriction is less than 40 mph.

2. Signals should be sited as close to the junction as possible whilst still accommodating the clearance requirements for traffic emerging from side roads.

6.14.9. Signs to diagram 7245 and its variants (S13-6-16: **Figure 6.26**) may be used to show destinations at junctions within road works. Lower panels described in **Section 5.12** may be added.

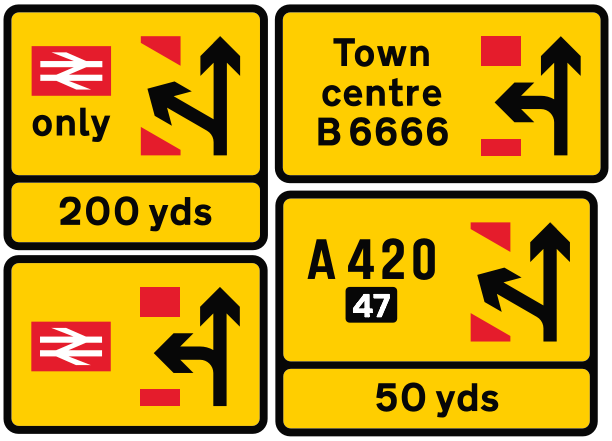


Figure 6.26 Diagram 7245 (S13-6-16) Temporary lane alignment and destinations Alternative examples

6.14.10. Signs to diagrams 7245 (S13-6-16) and its variants show lane configurations at junction entries and exits. Distances may be shown on a lower panel.

6.14.11. Entry slip roads and side roads within road works on dual carriageway roads may be closed (see **Section 7.21**). This option is worth considering, particularly for overnight works. If this is not feasible, TTM at the junction should be designed as closely as possible to the original junction layout. However, it is not mandatory to use the 'STOP' and 'GIVE WAY' signs with the associated road markings. The use of 'GIVE WAY' signs should be determined by a risk assessment.

6.14.12. Traffic may need to be segregated by destination where a junction is within the works area. Advance signs and those indicating a splitting of routes to different destinations should be designed in accordance with diagram 7244 (S13-6-15), or diagram 7243 (S13-6-14) using the design guidance in **Appendix A5**.

6.15 Signal controlled junctions

6.15.1. Where road works include a junction that is normally controlled by permanent signals, the position of the works will determine the appropriate course of action:

- where the permanent vehicle detectors are still effective, a temporary change in the position of the stop line and/or one signal head may suffice.
- where the permanent vehicle detectors are no longer effective (either being located within the area of the works or with traffic being diverted away from them) a permanent demand on the phase affected should be set by the authority traffic controller.
- where the permanent vehicle detectors are no longer effective for more than a few days and delays are likely, alternative detection arrangements should be considered.

6.15.2. Consideration should be given to adjusting signal timings (preferably inbuilt into the controller options e.g. MOVA - or through central control e.g. SCOOT), to minimise queue lengths where the capacity approaching the junction has been reduced for an extended period of time. This may be as a result of one or more lanes being closed.

6.15.3. Permanent signals may need to be temporarily switched off to allow traffic to be controlled either by a multiphase portable signal set or by manual control methods. Permanent signals not in operation must be covered.

6.15.4. The designer should contact the relevant authority before planning necessary TTM, if works are near:

- part-time signals.

- stand-alone crossings at roundabouts, or.
- full-time signal-controlled roundabouts.

6.15.5. Whenever portable traffic signals are to be used to control traffic at road works involving a junction (with or without permanent traffic signals), the traffic authority's written permission must be obtained. The use of portable traffic signals is covered in **Section 6.10**. It is permitted to include temporary pedestrian crossing facilities as part of temporary signals at junctions. Signs to either diagram 7011 (S14-2-58) or diagram 7011.1 (S14-2-59) must be used in these situations. Signs to diagram 7011.2 (S14-2-60) are only prescribed for pedestrian only signals. **Plans SC11** and **SC12** show layouts for traffic control at junctions where the carriageway at the junction is restricted.

6.15.6. Where road works are positioned near to junctions with permanent traffic signals, and the proximity is likely to create delay or other difficulties, multiphase control of the junction and shuttle lane may be required. Any temporary traffic signals used should be to the same standard as the permanent signals (see Chapter 6, previous covered by Local Transport Note 1/98 'The installation of traffic signals and associated equipment'). This will allow for existing pedestrian phases to be used with permanent signals. Portable signals cannot be used with existing pedestrian facilities.

6.15.7. Where the designer considers a junction within a controlled area to be of relatively low importance and does not require separate signalling, the provision of warning signs should be considered. It is essential that clear visibility is available from the side road to both ends of the works if it is not to be signalled separately. This can prevent emerging vehicles from travelling against the flow of traffic.

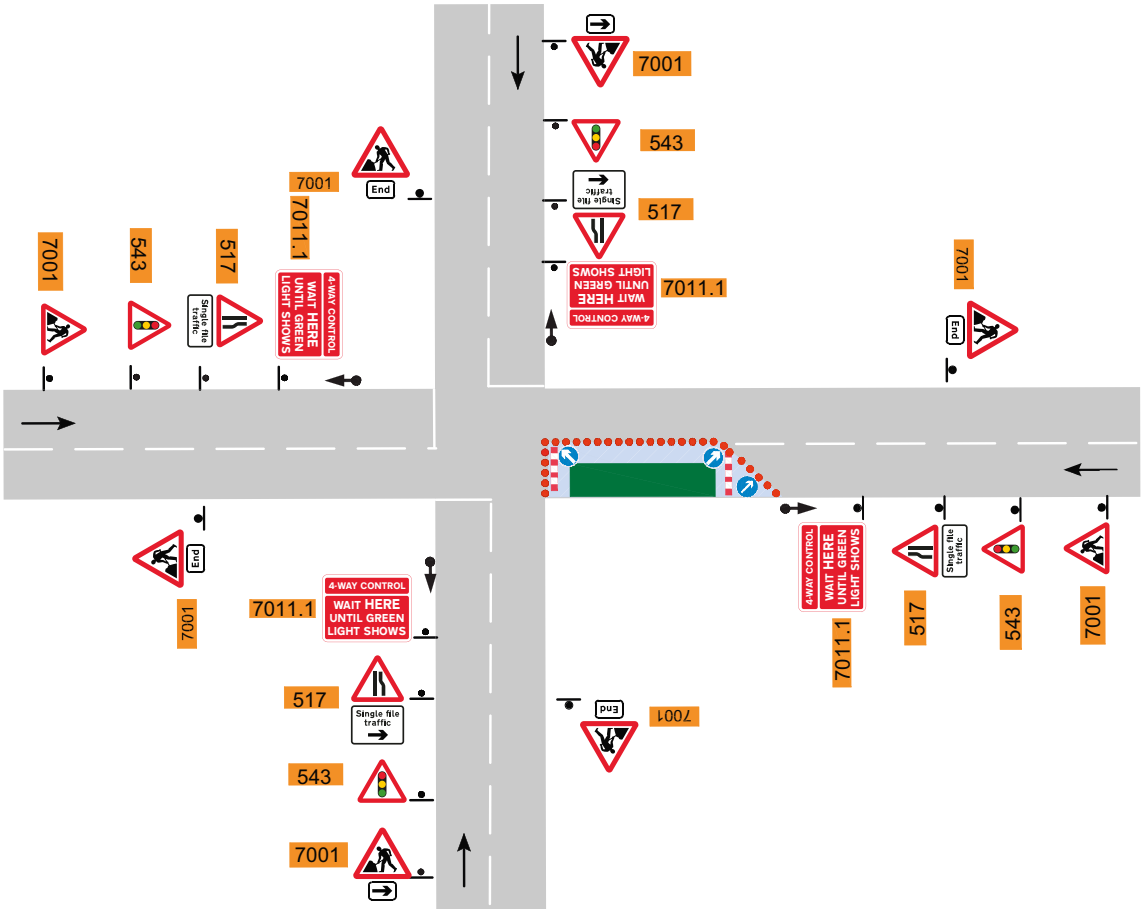
6.15.8. Sign to diagram 7021 (S13-6-62; **Figure 6.27**) with the legend 'TRAFFIC UNDER SIGNAL CONTROL' should be used to provide warning to traffic joining the controlled area from a side road. Sign to diagram 7021 should be used in combination with a 'road works ahead' sign to diagram 7001 (S13-2-9) with both signs being sited no more than 10 m in advance of the point at which traffic emerging from the junction would give way to passing traffic.



Figure 6.27 Diagram 7021 (S13-6-62) Traffic on road ahead is controlled by portable light signals

6.15.9. Sign to diagram 7022 (S14-2-63) with the legend 'JOINING TRAFFIC NOT SIGNAL CONTROLLED' is used to warn traffic proceeding through the controlled area. These signs should be located on each approach to the controlled area, midway between the 'traffic signals ahead' sign to diagram 543 (S14-2-28) and the 'road narrows ahead' sign to diagram 517 (S2-2-14).

Plan SC12 Road works at a crossroads junction with traffic signals



6.16 Roundabouts

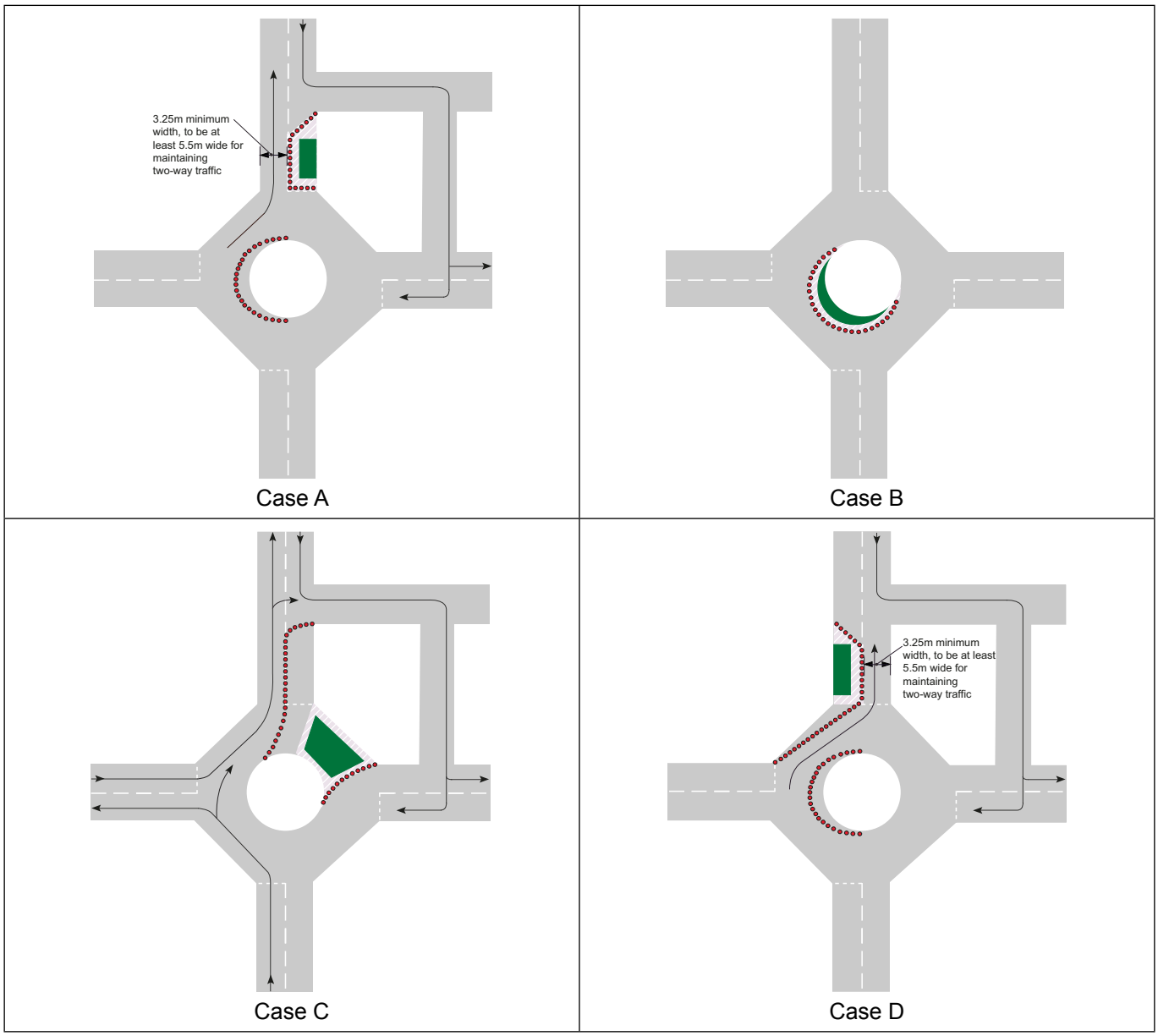
6.16.1. Where road works include a roundabout, the position of the works will determine the appropriate course of action.

6.16.2. Road works at the entrance to a roundabout should be signed, coned and warning lights provided as per **Section 6.2**.

6.16.3. Two-way traffic past the road works should be maintained. If not, entering traffic should be prohibited and a diversion route arranged. In this case, part of the circulatory area should be coned-off as shown in **Plan SC13**, to restrict traffic to one lane going towards the exit. Advance warning should be provided with a 'road narrows ahead' sign to diagram 517 (S2-2-14). If no suitable diversion routes are available, it may be necessary to adopt alternating one-way working.

6.16.4. For works in the circulatory area of a roundabout all movements should be maintained. The road works should be coned, with warning lights and a 'road narrows ahead' sign to diagram 517 (S2-2-14) provided (see **Plan SC13**, Case B).

Plan SC13 Road works at a roundabout



NOTES:

1. Diversion signs are not shown.

2. For roundabouts with two or more lanes, the coning used to restrict carriageway width for circulatory traffic (Cases A and D) may be omitted.

Mini roundabouts

6.16.5. The TTM for road works at a roundabout with the marking to diagram 1003.4 (S9-6-5) instead of a physical central island (i.e. a mini roundabout) should be as for a T-junction or crossroads (see **Section 6.14**).

6.17 Railway level crossings

6.17.1. There are three main types of railway level crossings:

- Automatic level crossings, with or without barriers, which have road traffic signals. The signals display a steady amber light for approximately 3 seconds, followed by twin red flashing lights as a train approaches. In some cases, miniature red and green warning lights activated by trains are provided. Crossings may have full barriers, half-barriers which close the left half of the road, or no barriers at all.

- Manually operated level crossings have gates or barriers which extend across the full width of the road. Some may have warning lights which are normally the same as at automatic crossings. Other locations may have the normal three-aspect traffic signals.
- Open level crossings have neither gates, barriers, nor any form of traffic signal.

6.17.2. Details of the various types of level crossing protection are given in the Office of Rail Regulation (ORR) publication: 'Principles for managing level crossing safety, 2021 https://www.orr.gov.uk/media/10713

6.17.3. It is extremely dangerous to cause road traffic to stop on or move slowly over a level crossing. If works are to be carried out within the Precautionary Area (any part of any road, including side roads, that can be reached by following a route leading away from the centre of the crossing for a distance of 200 m or less) special precautions must be taken to ensure the safe operation of the crossing.

6.17.4. Operators should ensure that traffic does not stop on the crossing. Care must be taken in the traffic control arrangements.

Consultation for work planned near railway level crossings

6.17.5. The local office of the railway or track authority must be consulted when such works are planned, giving as much notice as possible. Police consultation should also be considered. The following points about the procedure are emphasised:

- the railway authority must be consulted regarding all works near the level crossing that may cause congestion over the crossing.
- the works must not proceed until the satisfactory conclusion of the consultation.

Traffic control for works near railway level crossings

6.17.6. At automatic crossings, the promoter of the works should arrange for the provision of a member of railway authority staff to act as a level crossing attendant. This staff member must be sufficiently competent in this role. All train drivers will have been instructed to approach the crossing with caution. The attendant should ensure that the crossing is clear before any train passes over it. An attendant may only be omitted if this is specifically authorised in writing by the railway authority.

6.17.7. If there appears to be danger of traffic stopping on the level crossing after works have already started, the traffic control should be moved immediately to a point on the side of the crossing opposite the works (so that traffic can be stopped before reaching the crossing). The railway authority should then be telephoned from the crossing or the nearest point available.

6.17.8. No cones, signs or signals should be placed on the crossing. The controlling operator of the 'STOP/GO' signs should be positioned closest to the crossing.

6.17.9. Whatever traffic control is used, the works and associated equipment should not obscure permanent traffic signals, advance warning signs or information signs.

6.17.10. The works supervisor must ensure that any provided telephones are working correctly before work starts.

6.17.11. Care should be taken to avoid causing visually or physically impaired pedestrians to move from their usual paths (see **Section 4.17**) and automatic crossings should be attended. Train drivers should be cautioned to approach the crossing at reduced speed. This advice need

not be given for mobile works (e.g. sweeping, hedge-trimming) unless there is the possibility that the highway may be obstructed causing traffic to move slowly over the crossing.

6.17.12. At road works incorporating automatic level crossings, the control signs should be operated in the following manner:

- when the crossing is open to road traffic, the signs should be operated together to control traffic along the length of one-way working.
- when advised by the level crossing attendant or if no attendant is present, both signs should show ‘STOP’ to traffic coming towards the crossing when the crossing’s signals show amber. Where practicable, the level crossing attendant will operate the crossing’s signals (and at automatic half barrier crossings, lower the barriers).
- when the attendant advises, and all traffic signals are extinguished, normal alternate one-way working should be resumed. Any vehicle held in the one-way section during passage of the train should be allowed to clear first.

6.17.13. At road works that incorporate manually controlled level crossings where the barriers, gates and/or signals are controlled by a railway employee (either locally or remotely), the control signs should be operated in the following manner:

- when the crossing is open to road traffic, the signs should be operated together to control traffic along the length of one-way working.
- the temporary manually operated ‘STOP/GO’ signs on each side of the crossing must show ‘STOP’ in both directions as soon as requested by the railway employee controlling the crossing, or as soon as the amber lights at the crossing first show.
- normal alternate one-way working should be resumed after the gates are opened or barriers lifted and signals extinguished. Any vehicle held in the one-way section during passage of the train should be allowed to clear first.
- when the obstruction is on the left-hand side of the road approaching the crossing, the ‘STOP/GO’ sign on the exit side should be sited at least 25 m beyond the crossing. This is to ensure that the crossing signals are not obscured and allows sufficient space for vehicles to return to the left-hand side of the road beyond the crossing.

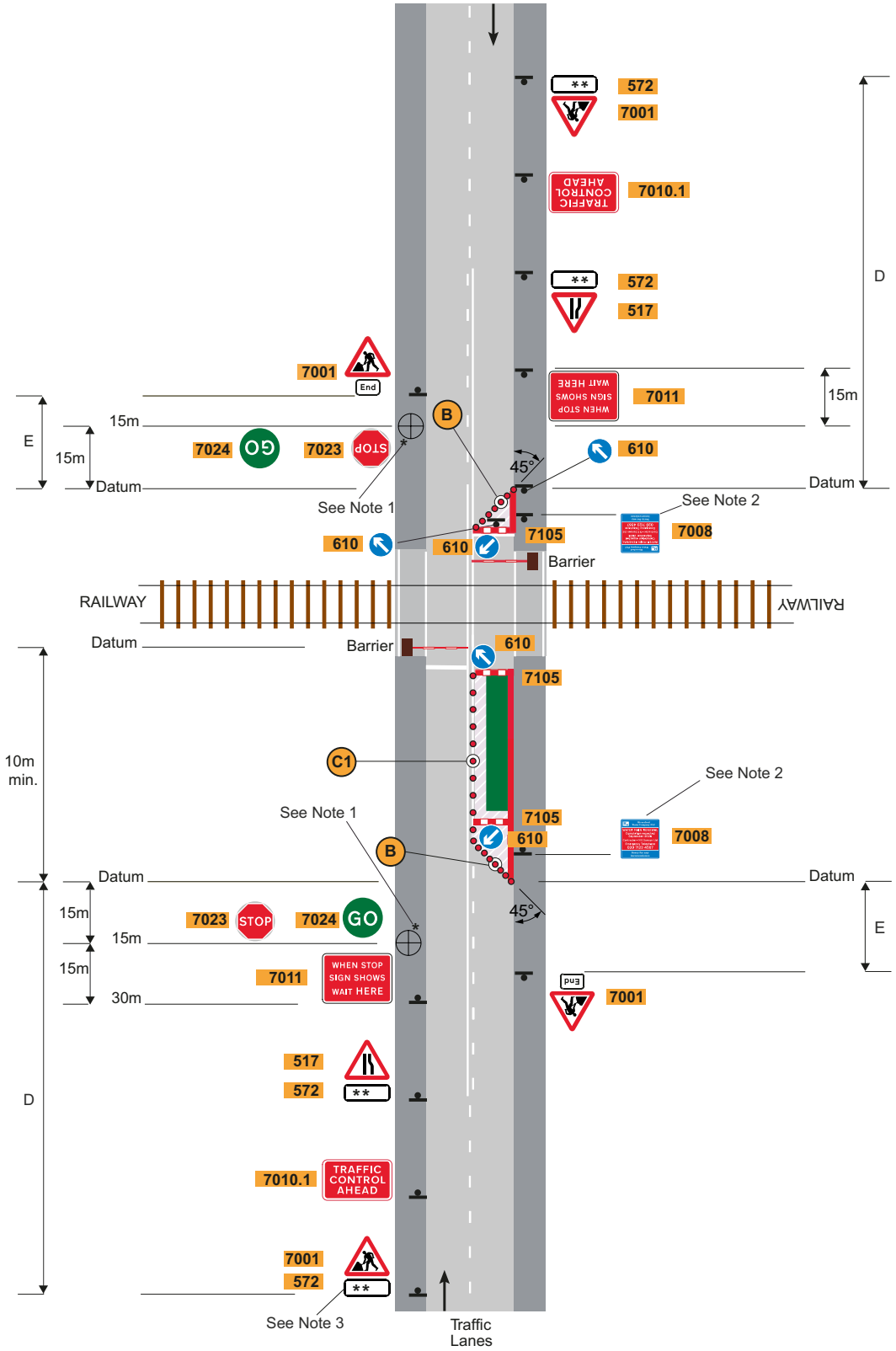
6.17.14. At road works that incorporate open crossings on public roads, the approaches are signed with ‘GIVE WAY’ signs to diagram 602 (S9-2-2) and ‘open level crossing’ plates to diagram 778 (S9-2-4). If works must be undertaken near such a crossing, ‘STOP/GO’ signs are to be used. Care must be taken to ensure that the ‘GIVE WAY’ signs are not obscured by the works. The control signs should be operated in the following manner:

- when there are no trains approaching, the level crossing is open to road traffic. The ‘STOP/GO’ signs should be operated together to control traffic along the length of one-way working.
- when the controlling operator sees a train approaching, they must stop all road traffic ensuring it is never stopped on the crossing.
- care must be taken to ensure that no ambiguous instructions are given to road traffic, as drivers are still obliged to obey the permanent ‘GIVE WAY’ signs.
- normal alternate one-way working may be resumed once the train has passed. Any vehicle held in the one-way section during passage of the train should be allowed to clear first.

6.17.15. Portable signals may only be used for works at or on any railway level crossing when the work being carried out is in relation to that crossing. When portable signals are used, they must be under manual control so that the operator can maintain the all-red period for a sufficient length of time to allow the train to pass.

Traffic management arrangements for work near railway level crossings

Plan SC14 Road works near a level crossing on a single carriageway road with the footway not obstructed



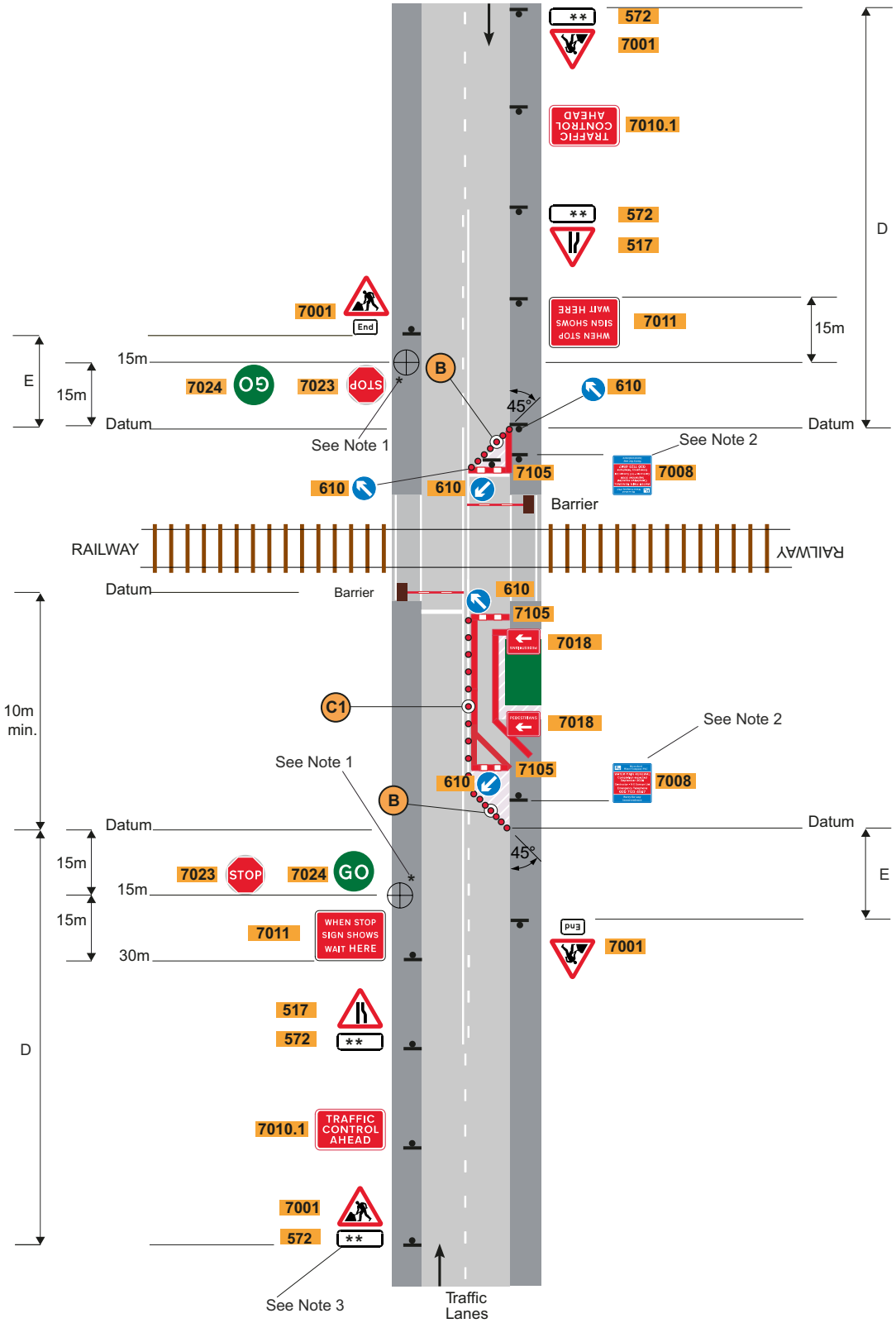
NOTES:

1. The ‘STOP/GO’ sign should be placed in full view of approaching drivers and may be located on either side of the carriageway to achieve this (see **Section 6.7**).

2. These signs are additional to the road works signing. They are provided by the statutory undertakers for pedestrians’ information.

3. Distance plate required for roads with a permanent speed limit of 50 mph and above.

Plan SC15 Road works near a level crossing on a single carriageway road with the footway obstructed



NOTES:

1. The ‘STOP/GO’ sign should be placed in full view of approaching drivers and may be located on either side of the carriageway to achieve this (see **Section 6.7**).

2. These signs are additional to the road works signing. They are provided by the statutory undertakers for pedestrians’ information.

3. Distance plate required for roads with a permanent speed limit of 50 mph and above.

Railway level crossing light failure

6.17.16. Road traffic is controlled by permanent twin red flashing lights or traffic signals at many level crossings. Under usual operation if the twin red flashing lights or traffic signals used to control the road traffic fail, the railway authority would inform the police who would then implement appropriate procedures to control road traffic.

Emergency works near railway level crossings

6.17.17. If it is necessary to carry out emergency works (i.e. works needed to end or prevent a hazardous scenario) near crossings, the following actions are to be taken before works commence:

- where available, use emergency telephones to inform the railway employee monitoring the crossing.
- at manually operated or CCTV controlled level crossings, the railway employee controlling the crossing must be informed directly.
- in either event, works should not proceed until it is safe to do so.

6.18 Works near tramways

6.18.1. Works carried out near a tramway must incorporate safety precautions provided by the relevant track or transport authority and given to those carrying out the works prior to starting.

6.18.2. Tramcars are wider than the tracks on which they run. The path of a tramcar, known as the ‘swept path’ must be left unobstructed. It is usually indicated by a line of yellow discs, a painted line, or a raised kerb.

6.18.3. Operatives, vehicles, plant, pedestrians, signing and guarding equipment must be kept out of the swept path. Where works cause the footway to be diverted into the carriageway, the barrier between the pedestrians and the tramway must be kept at least 0.5 m away from the edge of the swept path.

6.18.4. The transport authority should be consulted where the lateral clearance safety zone would intrude on the swept path. The zone may be reduced to 300 mm and a speed restriction on tramcars and/or a lookout may be imposed.

6.18.5. The works supervisor should liaise with the track or transport authority to identify overhead and underground electrical cables outside the swept path. No equipment, plant, vehicles etc. should be brought within 2 m of any overhead lines. Underground cables should be dealt with using standard safe digging practices.

6.18.6. Tramways that run on a reserved track but cross the road at certain places should be treated as a railway level crossing (see **Section 6.17**).

6.19 Emergency access through works

6.19.1. Access for emergency vehicles must be maintained at all times where practicable. As outlined in **Section 2.10**, the emergency services should be consulted. Proposals for emergency access should be captured in the site-specific risk assessment, consideration must be given to allowing access without compromising any safety zone requirements. If practicable, temporary diversions may need to be arranged and signed (see **Section 4.24**).

7 TTM ON DUAL CARRIAGEWAY ROADS

7.1 General issues

7.1.1. This section deals with TTM design on dual carriageway roads, including motorways, both with and without hard shoulders.

7.1.2. Appropriate TTM arrangements must be determined through a detailed survey of the highway. Precise carriageway widths, edge and drainage conditions and the presence and strength of any hardening of the central reservation will need to be identified.

7.1.3. The designer should review the site's traffic characteristics, including seasonal variations. Maximum flows in each direction should be measured using traffic counts. High proportions of commercial vehicles may prevent the use of some layout designs, specifically those where only one lane in each direction is allocated to vehicles wider than 6'-6' (2.0 m) (wider vehicles).

7.1.4. Safety of cyclists will need to be considered where cycle lanes are affected by road works.

7.2 Hard shoulder use

7.2.1. Where road works may seriously reduce the carriageway capacity, consideration must be given to using the hard shoulder as a temporary running lane. The designer must ensure that this is acceptable to the authority and is discussed with the emergency services.

7.2.2. If the hard shoulder is to be used as a running lane, where a relevant route order is not in place, a separate temporary traffic regulation order will be required (see **Section 3.8**).

7.2.3. If the expected traffic demand is likely to exceed the capacity of the normal traffic lanes left open, the hard shoulder should be used as a running lane provided it:

- is continuous.
- has adequate headroom.
- is strong enough to carry the expected traffic load.

7.2.4. Unless traffic is expected to be light or the duration of the work short, the hard shoulder should be used when:

- the centre and right-hand lanes of a dual three-lane carriageway road are taken out of use, or.
- when the right-hand lane of a dual two-lane carriageway road is taken out of use.

7.2.5. The authority must be consulted on the suitability of any length of hard shoulder considered for use as a running lane. The available clearance should be checked with regards to locations of emergency telephones and permanent signs. Their temporary removal and the installation of new or additional vehicle restraint safety barrier may be necessary.

7.2.6. Hard shoulders used as temporary running lanes carrying heavy traffic during maintenance works need to be structurally adequate to carry the traffic for the period of use. They must have a surface with skidding resistance similar to that of the permanent running lanes.

7.2.7. Adequate assessment of the hard shoulder's surface condition and any remedial work needs to be undertaken well in advance, to avoid affecting the works programme. If advance

treatment of the hard shoulder surface is not possible, it will then be necessary to rely on warning signs.

7.2.8. Adverse cambers likely to cause driving problems should be eliminated if possible. Otherwise, suitable warning signs to diagram 513.1A (S2-3-4, **Figure 7.1**) must be erected to warn drivers. Diagram 513.1 must be used in combination with one of diagram 510 (S2-2-7), 512 (S2-2-8), 512.1 (S2-2-9), 512.2 (S2-2-10), 512.3 (S2-2-11), 513 (S2-2-12) or 523.1 (S2-2-18).

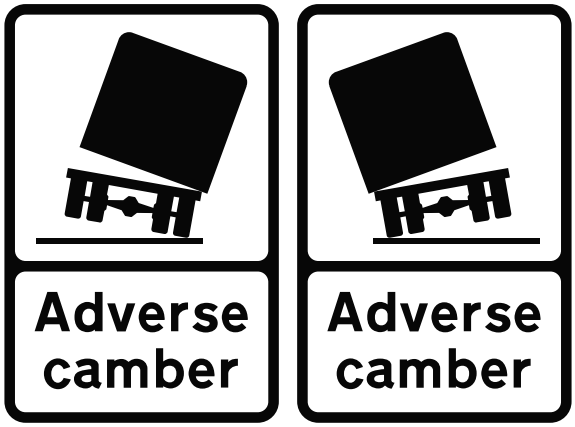


Figure 7.1 Diagram 513.1A (S2-3-4) Risk of lorries overturning on adverse camber with bend to the left/ right

7.2.9. The designer should ensure that features within the hard shoulder (e.g. chambers, manholes) will adequately support the running lane traffic for the duration of the works. Where there is any doubt, the structures should be replaced, strengthened, or temporarily plated over prior to the works.

7.2.10. Special care will be needed when planning works near entry and exit slip roads, including service areas. If it is necessary to close slip roads and service areas and arrange suitable diversions, provision for these should be included.

7.2.11. Where the hard shoulder is used as a running lane, and there is no refuge for any broken-down vehicle, then a recovery vehicle service (available throughout the period of hard shoulder usage) is recommended. The provision of a recovery service should depend on the length of road without hard shoulder or refuge and the implications of a delay in removing of any broken-down vehicles. The recovery vehicle service should be located on the approach to the affected length of hard shoulder so that the broken-down vehicle may be removed as quickly as possible.

7.2.12. The provision of a temporary CCTV system to aid the detection of broken-down vehicles and other incidents should be considered (see **Sections 4.34** and **4.37**). Where the hard shoulder is used as a running lane, the provision of (suitably signed) temporary verge refuges should be considered to allow drivers to pull off the highway beyond the running lanes. These should be provided every 500 m and should be a minimum of 50 m in length. Their length and construction depth needs to be adequate for a loaded HGV.

7.2.13. The carriageway edge condition should be considered when running on the hard shoulder (see **Section 4.47**).

7.2.14. In order to comply with Motorway Regulations, specific signs must be used to indicate to drivers that they may use the hard shoulder. This should be the ‘USE HARD SHOULDER’ panel with a symbolic sign to diagram 7243 (S13-6-14), 7244 (S13-6-15), or 7245 (S13-6-16). The ‘REJOIN MAIN CARRIAGEWAY’ panel, with a symbolic sign to variations of the above

diagrams, should be displayed in advance of the point where use of the hard shoulder should be discontinued. Traffic cones, warning lights and barriers will also be needed to indicate the path traffic should follow at the beginning of the obstruction. 'Keep right' signs variant to diagram 610 (S3-2-3) must be used in conjunction with cones, warning lights and barriers at the end of the affected length to return traffic to the main carriageway, and to cancel the 'USE HARD SHOULDER' message. This setup is shown below (**Figure 7.2**). To advise drivers of the status of the hard shoulder and adjacent lanes, signs to diagrams 7243 (S13-6-14), 7244 (S13-6-15), or 7245 (S13-6-16), with directional arrows denoting the lane arrangements and with distance plates, are to be used at ½ mile intervals up to a distance of 3 miles and 1 mile intervals thereafter. These signs are only provided at Standard works.

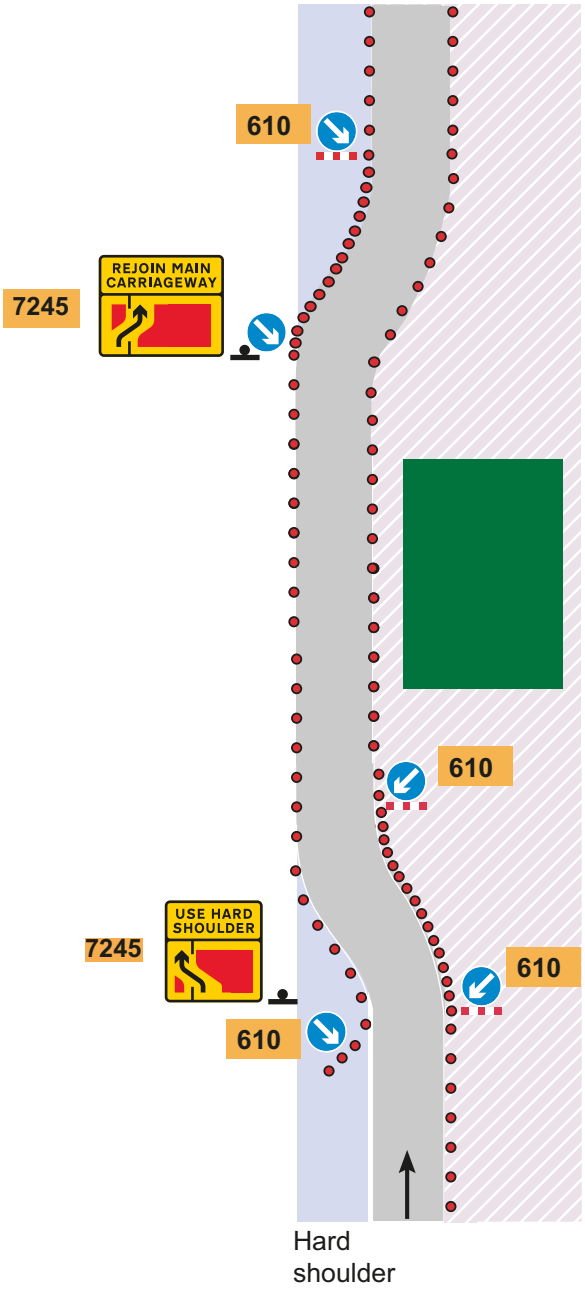


Figure 7.2 Sign setup using signs to Diagram 7245 to advise motorists when to enter and leave the hard shoulder – Single lane of traffic

7.3 Use of narrow lanes

7.3.1. Advance warning should be given where dual carriageway works require traffic lane width to be reduced to less than 3.0 m. In most cases it will be necessary to re-mark the carriageway lanes. If the lane width is less than 3.0 m. the symbol indicating a temporary width

restriction should be included on signs to Diagrams 7243 (S13-6-14) or 7244 (S13-6-15) for the appropriate lane(s). Where the lane reduction is less severe, signs incorporating the 'NARROW LANES' panel may also be used.

7.3.2. The normal motorway lane width is 3.65 m.

- Where the number of wider vehicles allows, narrower traffic lanes can be used to enable more lanes to be provided past the works area.
- Where heavy vehicles (including public service vehicles and caravans) are expected, the lane width may be reduced to 3.25 m (desirable minimum) and, where there is a shortage of space, an absolute minimum of 3.0 m.
- Where the traffic is expected to consist only of cars and other light vehicles, the lane width may be reduced to 2.75 m (desirable minimum) or 2.5 m (absolute minimum).

7.3.3. The operation of a layout using narrow lanes, where there is only one lane suitable for wider vehicles (e.g. HGVs, PSVs) in each direction, is limited by the number of such vehicles using the road. Calculations should be carried out to ascertain the ability to carry anticipated wider vehicle flows prior to using one lane. In the absence of such data, guidance may be found in **Section 7.12**.

7.3.4. Where one lane is insufficient to carry the number of wider vehicles using the site, a second 3.0 m wide lane may be provided if the carriageway can accommodate it. Carriageway widening may also be an option. Where two lanes are required to carry the expected number of wider vehicles, the nearside lane will need to be a minimum of 3.25 m wide.

7.3.5. Where a temporary mandatory speed limit is applied at road works, there may be scope to reduce the set-back and extend the paving to the central reservation or verge (see **4.2.32**). Any reduction in set-back will depend on the requirements of CD 377 'Requirements for road restraint systems' and CD 127 'Cross-sections and headrooms'. Paving which has been extended to the central reservation or verge should be strong enough to carry the expected traffic load.

7.3.6. Narrow lanes require a raised level of driver concentration which should be considered when determining the maximum length of the scheme. Where the authority has agreed to a works site longer than 4km, the maximum continuous length of a narrow lane section should be no more than 4 km (see also **Section 4.5**).

7.3.7. There should be no difference in the surface characteristics between any parts of the carriageway. Reconfiguration of the carriageway may place longitudinal joints or the original road studs within the new lanes and potentially in line with the vehicle wheel tracks. Road studs must be removed (this would apply to inset for depressible studs). Road stud bases for depressible studs should also be removed where the designer considers that they may cause problems for motorists. This should be done before traffic is introduced to the narrow lane layout. A special traffic arrangement may be required to achieve this.

7.3.8. Where the permanent speed limit is more than 40 mph, lane delineation markings should be to diagram 1004.1 (6 m mark, 3 m gap) (S11-4-3). Where the permanent speed limit is 40 mph or less, lane delineation markings should be to diagram 1004 (4 m mark, 2 m gap), see **Figure 7.3**.

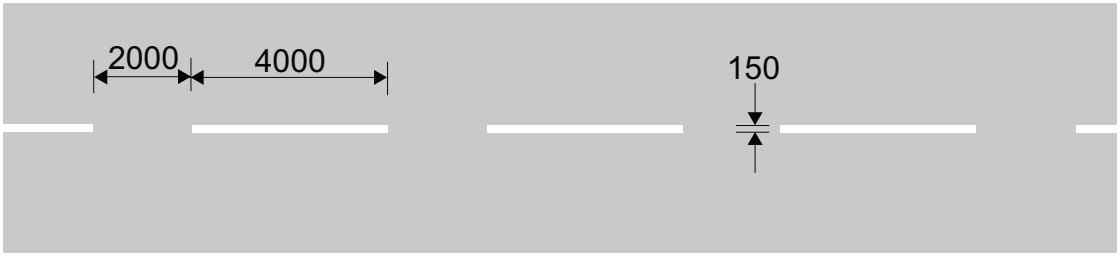


Diagram 1004 (speed limit 40 mph or less)

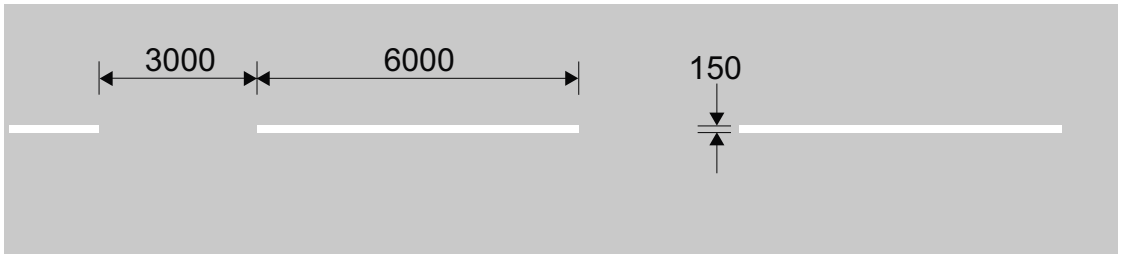


Diagram 1004.1 (speed limit > 40 mph)

Figure 7.3 Road markings to diagram 1004 (S11-4-2), 1004.1 (S11-4-3)

7.3.9. Original road markings that do not form part of the temporary lane markings must be thoroughly removed before the carriageway is re-marked to the new temporary configuration. The hard shoulder/lane 1 continuous marking does not need to be removed where it aligns with temporary lane markings. Sections at changeover positions, where traffic has to traverse it, should be removed for standard works and crossovers.

7.3.10. Contraflow systems may need the existing markings from the secondary carriageway to be removed and re-marking it into reduced-width lanes (see **Plan DZD5**). **Section 4.21** provides information on temporary road markings and studs. **Section 4.3** provides information on minimum acceptable lane widths through contraflows. **Section 7.5** provides information on the design of crossovers.

7.3.11. Narrow lane in contraflows can even out the disruption to traffic on the two carriageways. However, it may be necessary to change lane allocations where there is an imbalance in directional flows during peak periods, or if there are slow-moving vehicles travelling up an incline. This can be done by restricting ‘primary’ traffic to two lanes, while allowing the full three lanes for ‘secondary’ traffic.

7.4 Contraflow operation

7.4.1. The authority must agree to the use of a contraflow operation. Traffic regulation orders are required to close carriageways and/or install two-way operation.

7.4.2. During contraflow, the opposing traffic streams should be physically separated by means of a buffer zone or lane. Buffer zones may be delineated by a line of cylinders with a line of temporary road studs either side as shown in Details H and K (see **Table A1.5** (**Appendix A1**). Alternatively, a temporary vertical restraint safety barrier may be used (see **Section 4.16** and in CD 377 ‘Requirements for road restraint systems’), this should only be considered where there is a minimum of two lanes in each direction. In no circumstances should a single lane be adopted if continuously bordered both sides by a vehicle restraint system unless an enhanced level of vehicle recovery is implemented which can remove an obstruction within 20 minutes from call out.

7.4.3. Contraflow sections of road should be designed to the principles of highest safe speed but as several aspects, such as the geometry of crossovers are limited to speeds below the national speed limit they will need normally be subject to a temporary reduced mandatory speed limit (see **Section 4.9**).

7.4.4. Contraflows should have a continuous, well-defined, and unobstructed route through the site available for use by emergency vehicles at all times (see **Section 7.7**).

7.4.5. The signing arrangements required to operate two-way traffic on dual carriageways are shown in **Sections 7.15** to **7.19**.

7.4.6. Signs to diagram 7245 (S13-6-16; **Figure 7.4**) and its variants are used to show the diversion of one or more lanes from the primary carriageway on to the secondary carriageway. Each sign may have upper or lower panels added to describe particular characteristics (see **Section 5.12**).

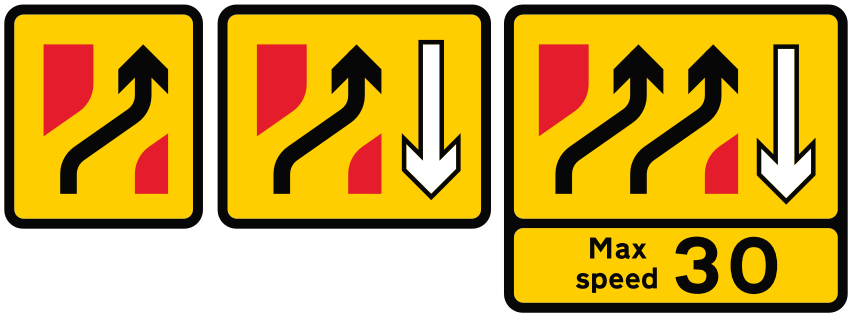


Figure 7.4 Diagram 7245 (S13-6-16) Traffic diverted onto the secondary carriageway (L-R examples) Single lane with barrier between opposing flows, Single lane with cylinders between opposing flows, two lanes with cylinders between opposing flows where the crossover is designed to a speed less than the mandatory speed limit in operation

7.4.7. A sign to diagram 7245 (S13-6-16; see **Figure 7.5**) and its variants are used to show the diversion from the secondary carriageway back on to the primary carriageway. Each sign may have upper or lower panels added to describe particular characteristics (see **Section 5.12**).



Figure 7.5 Diagram 7245 (S13-6-16) Traffic diverted back onto the primary carriageway (L-R examples) Single lane with barrier between opposing flows, Single lane with cylinders between opposing flows, two lanes with barrier, single lane returning where the crossover is designed to a speed less than the mandatory speed limit in operation, two lanes returning 100 yards ahead

7.4.8. Where a contraflow is to be introduced on an all-purpose dual carriageway, the need for signing, lighting and temporary barriers for pedestrians should be assessed (see **Section 4.31**).

7.4.9. Designers should consider whether additional signing is necessary to warn pedestrians of unusual or changed traffic movements. The use of barriers should also be considered to restrict crossing points. If two-way working is to be introduced on a former one-way street, then a ‘PEDESTRIANS LOOK BOTH WAYS’ sign to working drawing 7017 (S13-9; **Figure 7.6**) is required. The need for road markings to diagram 1029 (S11-4-18; **Figure 7.7**) ‘LOOK LEFT’ or ‘LOOK RIGHT’ should be considered, to warn pedestrians that traffic may be approaching from an unexpected direction. Carriageway marking will also need to be amended.



Figure 7.6 sign to working drawing 7017 (S13-9) Pedestrians look both ways

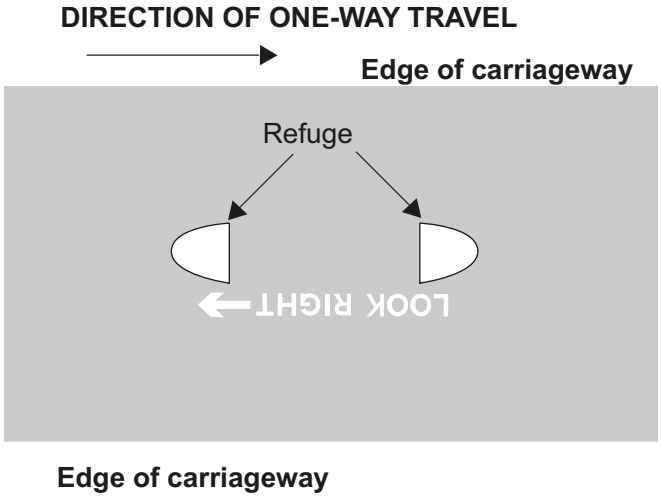


Figure 7.7 Road markings to diagram 1029 (S11-4-18) Extract of TSM Chapter 5 11.5 Look left / look right

7.4.10. The designer must consider the effect of contraflow working on signalised pedestrian, equestrian and cycle crossings.

7.4.11. Where it is necessary for traffic on one carriageway to be diverted on to the other carriageway, the transition or temporary crossover should be designed in accordance CD 192 'The design of crossovers and changeovers' (see **Section 7.5**).

7.4.12. Signs to diagram 7243 (S13-6-14) and prescribed variants, may be used to show the temporary road layout with lane restrictions, for example, width or height restrictions, see **Figure 7.8**.

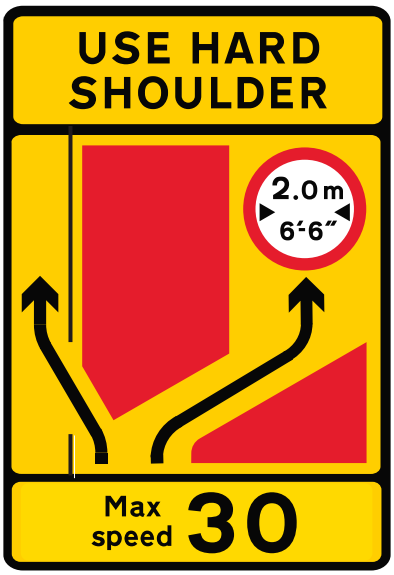


Figure 7.8 Diagram 7243 (S13-6-14) Width restricted lane of traffic diverted onto the secondary carriageway (Mandatory in Northern Ireland)

7.4.13. Signs to diagram 7245 (S13-6-16) and prescribed variants are used to:

- direct traffic to use the hard shoulder or re-join the main carriageway.
- direct one lane on the hard shoulder with the other lane(s) being directed to the right-hand side of the carriageway.
- show the diversion of lanes across the carriageway, without use of the hard shoulder.
- indicate the start and end of a section of narrow lanes, or.
- indicate access to a destination reached from a junction.
- indicate entry or exit crossovers at contraflows.
- indicate the length of road works.

7.4.14. Opposing flows may be separated by a buffer zone, a buffer lane, or a vehicle restraint safety barrier. Signs to diagram 7243 (S13-6-16), diagram 7244 (S13-6-16), and diagram 7245 (S13-6-16) may be used as appropriate. Signs to diagram 7243 (S13-6-16) and diagram 7244 (S13-6-16), or their variants, should be used where:

- opposing lanes of traffic are separated by a buffer zone (see **7.4.2**).
- there are lane width restrictions and opposing lanes of traffic are indicated by a single reverse white arrow with black outline symbol, or.
- a hard shoulder is used as a running lane and the hard shoulder/lane 1 continuous road marking remains.

To indicate the presence of an adjacent opposing lane, these signs should be provided at ½ mile intervals up to 3 miles and 1 mile intervals thereafter. The bottom panel to diagram 7245 (S13-6-16) may be used to indicate the distance over which the contraflow applies.

7.4.15. A sign to diagram 7245 (S13-6-16; **Figure 7.9**) must be used where opposing traffic lanes are separated by a buffer lane or temporary vehicle restraint safety barrier (see **7.4.2** and **Plan DZD3**).



Figure 7.9 Example of sign to diagram 7245 (S13-6-16) with traffic separated by a buffer lane, carriageway traffic with traffic on the hard shoulder with Diagram 1012.1 road marking remaining, primary traffic on the secondary carriageway

7.4.16. The overall width of the contraflow buffer zone may be reduced from 1.2 m to 0.9 m. However, 1.2 m should be used where possible and at least desirable minimum lane widths provided achieved (see **7.3.2**).

7.4.17. A site-specific risk assessment may permit a relaxation case for a single lane crossover (**Plan DZD6**) which enables part-time or short-term contraflow operation. The risk assessment may also allow existing road markings and studs to be retained.

7.5 Crossovers

7.5.1. CD 192 'The design of crossovers and changeovers' provides advice and requirements on the design speed for crossovers.

7.5.2. The design speed of a transition or temporary crossover must be acceptable based on the design speed of adjacent sections and the vehicles expected to use the crossover. Mandatory or advisory speed restrictions need to be set accordingly. **Tables 7.1** to **7.4** provide crossover lengths for some commonly used layouts (see **7.5.7**). A smooth 'S' shaped curve which suits site conditions should be used. The layout of vehicle restraint systems may need changing, including appropriate terminals. Carriageway lighting may also need to be provided to match the design of the adjacent section of carriageway.

7.5.3. The design of crossovers should take account of the following:

- curvature of swept paths and vertical alignment considerations. It is essential that radii and crossfalls are consistent with anticipated speeds and speed limits.
- position in relation to existing road layout, street furniture, gantries and lighting columns.
- surface condition and skid resistance.
- removal or covering of existing road markings where appropriate.
- required construction depth in relation to existing central reservation construction.
- blanking off bases from removed lighting columns, safety fence post sockets and illuminated signs.
- severance of existing safety barrier and space required for temporary anchorages – terminal ends should be anchored in accordance with CD 377 'Requirements for road restraint systems' – attempting to secure dropped ends of safety fence lengths with sandbags is not acceptable and is likely to cause serious injury in the event of vehicle impact.
- communication and electricity cables in the central reservation.
- temporary drainage of the crossover surfacing.
- reuse for future maintenance.
- illumination requirements (see **Sections 7.5.6** and **4.42**).
- arrangements for access to roads and properties within the closed section.

7.5.4. Keep left/right' signs to diagram 610 (S3-2-3; **Figure 7.10**) and 'lane closed' barriers to diagram 7105 (S13-6-8; **Figure 7.11**) should be used behind the coning to mark the crossover.

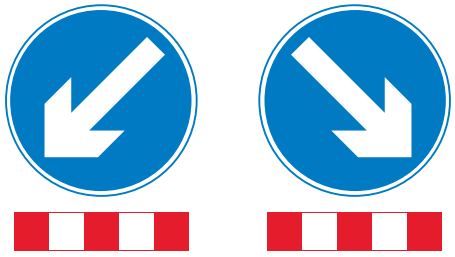


Figure 7.10 Diagram 7105 (S13-6-8) Lane closed barrier combined with Diagram 610 (S3-2-3) keep left or keep right



Figure 7.11 Diagram 7105 (S13-6-8) Lane closed barrier

7.5.5. If the design speed of the crossover is 10 mph (or more) lower than the proposed speed limit for the works, then the speed limit should be reduced for the length of the crossover, typically less than 800m (Where the design speed is up to 10 mph less than the proposed

speed limit, an advisory limit should be considered). In these cases, ‘turn left/right’ signs to diagram 606 (S3-2-1; **Figure 7.12**) and ‘sharp deviation of route’ signs to diagram 7104 (S13-6-7; **Figure 7.13**) should be used behind the coning to mark the crossover.

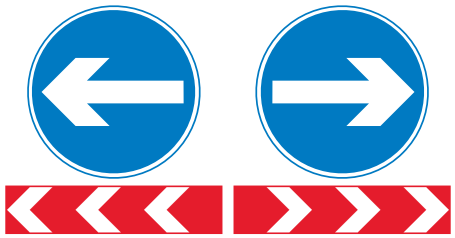


Figure 7.12 Diagram 7104 (S13-6-7) Sharp deviation of route combined with Diagram 606 (S3-2-1) Turn left / Turn right



Figure 7.13 Diagram 7104 (S13-6-7) ‘Sharp deviation of route’

7.5.6. It is preferable to locate a crossover within a lit section of road. Where existing lighting columns may hinder having a crossover in such a location, these may be removed. Temporary replacement lighting will then be required to supplement remaining carriageway lighting. Temporary lighting normally consists of conventional lighting columns and lanterns and should match existing lighting as much as possible. Application of temporary lighting to the crossover and approach areas should be considered on unlit roads, where horizontal or vertical alignments, or the road surface through the crossover, are below standard (see also British Standard BS5489-1:2020). Floodlighting should only be considered where conventional carriageway lighting is impractical. Retention of verge lighting for future use should be considered in the case of permanent crossovers.

7.5.7. Detailed arrangements for crossovers are shown in Plans:

- **DZC6** (single-lane crossover on a two-lane dual carriageway).
- **DZC7** (two-lane crossover on a three-lane dual carriageway).
- **DZC8** (crossover for three narrow lanes).

7.5.8. The crossing should be closed and the vehicle restraint system re-instated once the work is completed (see also CD 377).

7.5.9. Crossover lengths may be calculated using CD 192 or **Tables 7.1** to **7.4**. Where an offside lane goes into an offside lane, the paved length is equal to the crossover length.

7.5.10. The step increase is defined on a range from 0 to 4, with the greater step increase reflecting more adverse parameters at the site. The ‘0 step increase lengths’ in **Tables 7.1** to **7.4** may be used if the following parameters have the values given:

- worst case resultant camber less than 2.5%.
- no change from assisting superelevation to adverse camber through entry or exit curve.
- crest K value is ‘desirable’.
- there is not an approach bend with a superelevation larger than 2.5%.
- absolute change in camber less than 5%.

7.5.11. If any of the information given in **7.5.10** is not available, the ‘3 step increase lengths’ should be used. These figures are valid where:

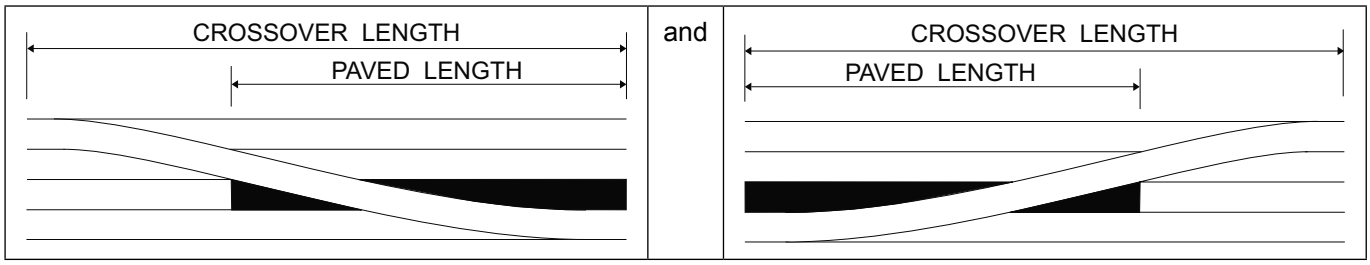
- maximum adverse crossfall less than 7%.

- maximum adverse camber from downhill gradient-crossfall combination less than 7%.
- absolute change in camber less than 10%.

7.5.12. If any of the values for the 3 step increase lengths are exceeded, then the site is not a suitable location for a crossover.

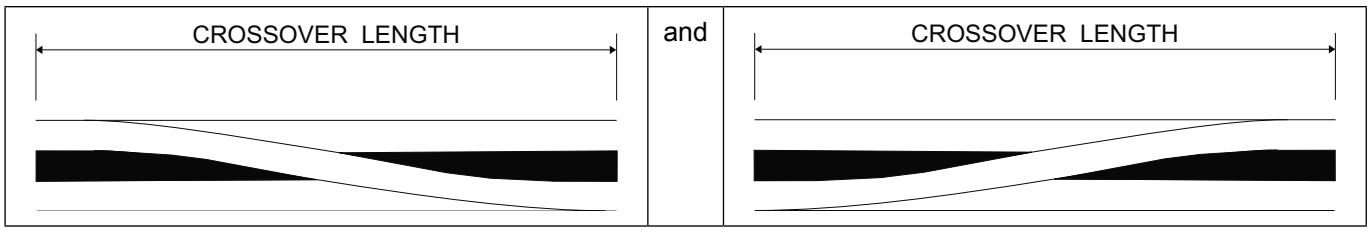
7.5.13. If the characteristics of the road do not match those covered by **7.5.9** to **7.5.12**, or if site constraints mean that a shorter crossover is required, then the advice from CD 192 should be used.

Table 7.1 Lane 1 or 2 into opposing offside lane



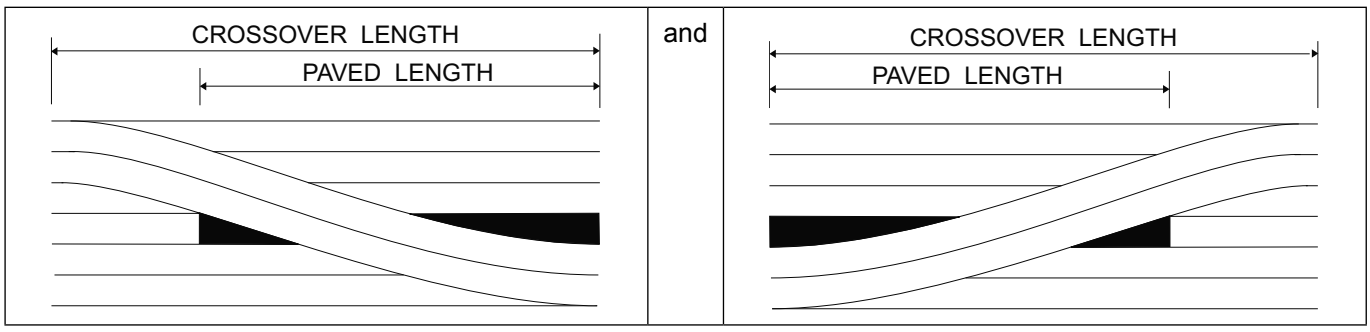
	Temporary mandatory speed limit							
	30 mph		40 mph		50 mph		60 mph	
Step increase	Crossover length (m)	Paved length (m)	Crossover length (m)	Paved length (m)	Crossover length (m)	Paved length (m)	Crossover length (m)	Paved length (m)
0	108	72	135	81	153	99	216	135
3	180	108	216	135	261	153	306	180

Table 7.2 Offside lane into opposing offside lane



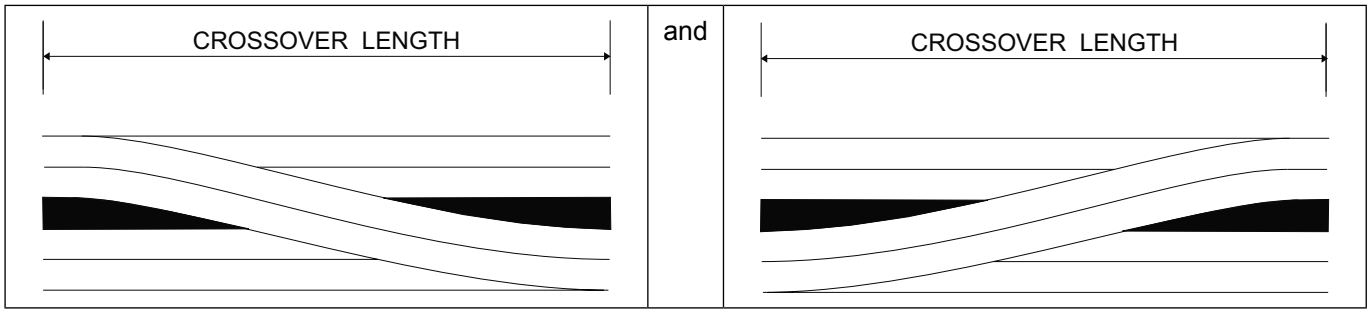
	Temporary mandatory speed limit			
	30 mph	40 mph	50 mph	60 mph
Step increase	Crossover length (= paved length) (m)	Crossover length (= paved length) (m)	Crossover length (= paved length) (m)	Crossover length (= paved length) (m)
0	90	108	126	180
3	153	180	216	252

Table 7.3 Lanes 1 & 2 into opposing lanes 3 & 2



	Temporary mandatory speed limit							
	30 mph		40 mph		50 mph		60 mph	
Step increase	Crossover length (m)	Paved length (m)	Crossover length (m)	Paved length (m)	Crossover length (m)	Paved length (m)	Crossover length (m)	Paved length (m)
0	126	90	153	99	180	117	252	162
3	207	135	252	162	297	198	351	234

Table 7.4 Lanes 2 & 3 into opposing lanes 3 & 2



	Temporary mandatory speed limit			
	30 mph	40 mph	50 mph	60 mph
Step increase	Crossover length (= paved length) (m)	Crossover length (= paved length) (m)	Crossover length (= paved length) (m)	Crossover length (= paved length) (m)
0	108	126	153	216
3	180	216	261	306

7.6 Changeovers

7.6.1. Advice on changeover design is given in CD 192 ‘The design of crossovers and changeovers’. Changeover speed is directly related to the temporary mandatory speed limit of the road.

7.6.2. **Table 7.5** should be used to calculate the changeover length required for roads with a permanent speed limit of 50 mph or more. If a shorter changeover is required, then advice from CD 192 should be used. A smooth ‘S’ shaped curve to suit the site conditions should be used.

Table 7.5 Changeover lengths (m) based on the temporary mandatory speed limit for roads with a permanent speed limit of 50 mph or more

	Temporary mandatory speed limit				
Number of lanes changed	30 mph	40 mph	50 mph	60 mph	70 mph
1	63	81	90	108	126
2	90	108	126	153	180
3	108	126	153	180	216

7.6.3. **Table 7.6** should be used for roads with a permanent speed limit of less than 50 mph. A straight ‘taper’ layout, or smooth ‘S’ shaped curve, to suit site conditions should be used.

Table 7.6 Changeover lengths (m) based on the temporary mandatory speed limit for roads with a permanent speed limit of less than 50 mph

	Temporary mandatory speed limit	
Number of lanes changed	**30 mph or less**	**40 mph**
1	66	78
2	90	108
3	108	126

7.7 Emergency access through the works

7.7.1. On motorways and dual carriageways, major reconstruction works may require provision of a site access lane (see **4.27** and **Figure 4.11**). It should be a minimum of 3 m in width to allow access by large vehicles.

7.7.2. Police may request a site access lane to be used by general traffic in the event of an accident or incident. Where a site access lane is not being provided, or is not continuous throughout the works site, the design must make suitable provision for emergency access through the works area. In a full contraflow, it is essential that a route through the site is always available for use by emergency vehicles. This route should be continuous, well-defined and unobstructed. Emergency route proposals need to be discussed with the emergency services early in the design (see **Section 2.10**).

7.8 Tapers

7.8.1. The recommended lengths of lead-in tapers and the number of cones required are set out in **Table A1.3** (**Appendix A1**). Exit tapers should be at 45° to the edge of the road where provided.

7.8.2. The initial lane closure taper will normally impose a merge-to-the-left manoeuvre. A merge-to-the-right manoeuvre will normally only be permitted on works for which a relaxation applies (see **Section 2.3**) when:

- lane 1 of a three or more-lane dual carriageway is being closed.
- lanes 1 and 2 of a three or more-lane dual carriageway are being closed where the road is lightly trafficked, or.
- lane 1 of a two-lane dual carriageway is being closed where the road is lightly trafficked.

‘Lightly trafficked’ in the context of this paragraph means not more than 1200 veh/hr per traffic lane left open throughout the works period.

7.8.3. For hard shoulder running on two-lane carriageways, initially the offside lane should be closed. The remaining lane should then be moved to run on the hard shoulder as appropriate. Where a hard shoulder forms part of the running lanes, the number of lanes on the main carriageway should be reduced to match those being diverted prior to the changeover.

7.8.4. On carriageways with three or more lanes, the initial taper of cones in advance of works should be continuous (see **Plan DZB7**). On carriageways with four or more lanes, more than two lanes may be closed by one continuous taper providing traffic flows are low. Closing all lanes with a direct taper to allow hard shoulder running is not permissible.

7.8.5. Whilst generally not recommended, if stepped tapers are being considered (**Plan DZB8**, **Section 7.16**), the following should be accounted for:

- the additional length of TM necessary.
- the extra equipment required.
- time needed for installation and removal.
- the use of sequential flashing warning lights on the second taper.

7.8.6. The use of backlit sequentially flashing warning lights to highlight taper coning in both daylight and darkness should be considered (see **4.22.8**).

7.8.7. Backlit sequentially flashing warning lights must be used on motorways and dual carriageway trunk roads, with a permanent speed limit of 50 mph or more, to highlight both lead-in and intermediate stepped tapers within the works.

7.9 Guide islands

7.9.1. Guide islands should be provided where traffic is to be merged to the left prior to a left lane closure and traffic is transferred to the right-hand lanes (see **Plan DZC2** and **DZC3**; **Section 7.17**). Lengths of guide islands, excluding tapers are as follows:

- 200 m on roads with a permanent speed limit of more than 50 mph.
- 100 m on roads with a permanent speed limit of 50 mph or less.

7.9.2. Carriageway markings will need modifying where a guide island is to be used and two or more lanes have to be switched to the right to pass a left lane closure. This ensures that traffic lanes are continuous at the changeover.

7.9.3. Where traffic is to be merged to the right prior to a right lane closure and traffic is transferred to the left-hand lanes, guide islands and modified lane markings may be omitted where relaxations apply. The appropriate lane restriction signs to diagram 7202.1 (S13-6-13; see **Figure 7.14**) should be provided where guide island and modified lane markings are omitted.

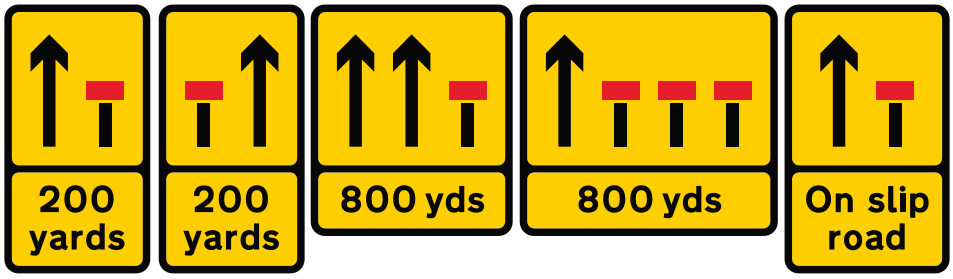


Figure 7.14 Diagram 7202.1 (S13-6-13) Examples

7.10 Hard shoulder working

7.10.1. The guidance in this section applies to closures for construction, maintenance and other activities needing traffic management. GG 117 Appendix B (previously GG115 'Requirements for works on the hard shoulder and roadside verges on high speed dual carriageways') contains guidance covering stops for other reasons on the hard shoulder and verges of up to 90 minutes.

7.10.2. **Plan DC1** shows hard shoulder signing requirements. Signs advising drivers to use a coned-off area in the event of an emergency must not be used. However, designers should consider the need for refuge area(s) within the coned-off area of the hard shoulder for motorists in difficulty.

7.10.3. The length of the coned off area should be limited to that required to provide safe access, working space and site exit. Excessive lengths of coning between discontinuous sites

as a works link access route should be avoided. When there is no works activity, consideration should be given to reducing the length of coned-off hard shoulder.

7.10.4. The risks associated with extending hard shoulder closures should consider both the need to provide safe refuge for motorists in trouble and safe haulage of plant between the sites. Risks should be compared with those for separate hard shoulder closures.

7.10.5. If temporary vehicle restraint safety barriers are being considered for use, refer to **Section 4.16** and CD 377 'Requirements for road restraint systems'.

7.10.6. If only the hard shoulder is closed or to be occupied by the works, the 'NO HARD SHOULDER FOR x mile(s)' sign to working drawing 7015 (S13-9, see **Figure 7.15**) or variant should be used in advance of the closure.



Figure 7.15 Sign to working drawing 7015 (S13-9) No hard shoulder with distance

7.10.7. Provision of a free recovery service should be considered where the hard shoulder is removed from service for a length greater than 1.5 km (see **Sections 4.34**, **7.2** and **5.12**).

7.10.8. Temporary mandatory speed limits are not normally used on hard shoulder only works. The impact on capacity and road user behaviour would be a net disbenefit. Occasionally the impact of the works on the clear viability to permanent signing or issues relating to working widths (where a VRS barrier is provided) may justify a mandatory reduced speed limit (This for where active works are being undertaken, where this relates to a temporary situation related to a nearside feature then the TTM will be required to be designed to be safe at the permanent speed limit). If so, the following signs are required:

- the initial temporary speed limit signs to diagram 670 (S10-2-1; **Figure 7.16**), located 100 m in advance of the initial closure of the hard shoulder.
- speed limit repeater signs throughout the works (see **Table 4.4** in **Section 4.8**).
- a 'road works ahead' sign to diagram 7001 (S13-2-9; **Figure 7.17**), with supplementary distance plate (**Figure 7.18**) showing '1 mile' on the nearside and offside one mile in advance of the initial closure of the hard shoulder.
- a 'road works ahead' sign to diagram 7001.1 (S13-2-9) with plate 'On hard shoulder' placed on the nearside, 800 m in advance of the initial closure of the hard shoulder (as shown in **Plan DC1**).
- an 'end of road works' sign to diagrams 7001 (S13-2-9) on the nearside and offside.



Figure 7.16 Diagram 670 (S10-2-1) Temporary mandatory speed limit



Figure 7.17 Diagram 7001 (S13-2-9) Road works ahead with supplementary distance plate 1 mile



Figure 7.18 Diagram 7001 (S13-2-9) Road works ahead with supplementary plate informing on hard shoulder

7.10.9. If works on the hard shoulder are undertaken within 500 m of exit slip roads, additional protection from diverging vehicles may be required for the workforce. To minimise the conflict between exiting works vehicles and main carriageway traffic, the closure may need extending to include the slip road hard shoulder (where one exists).

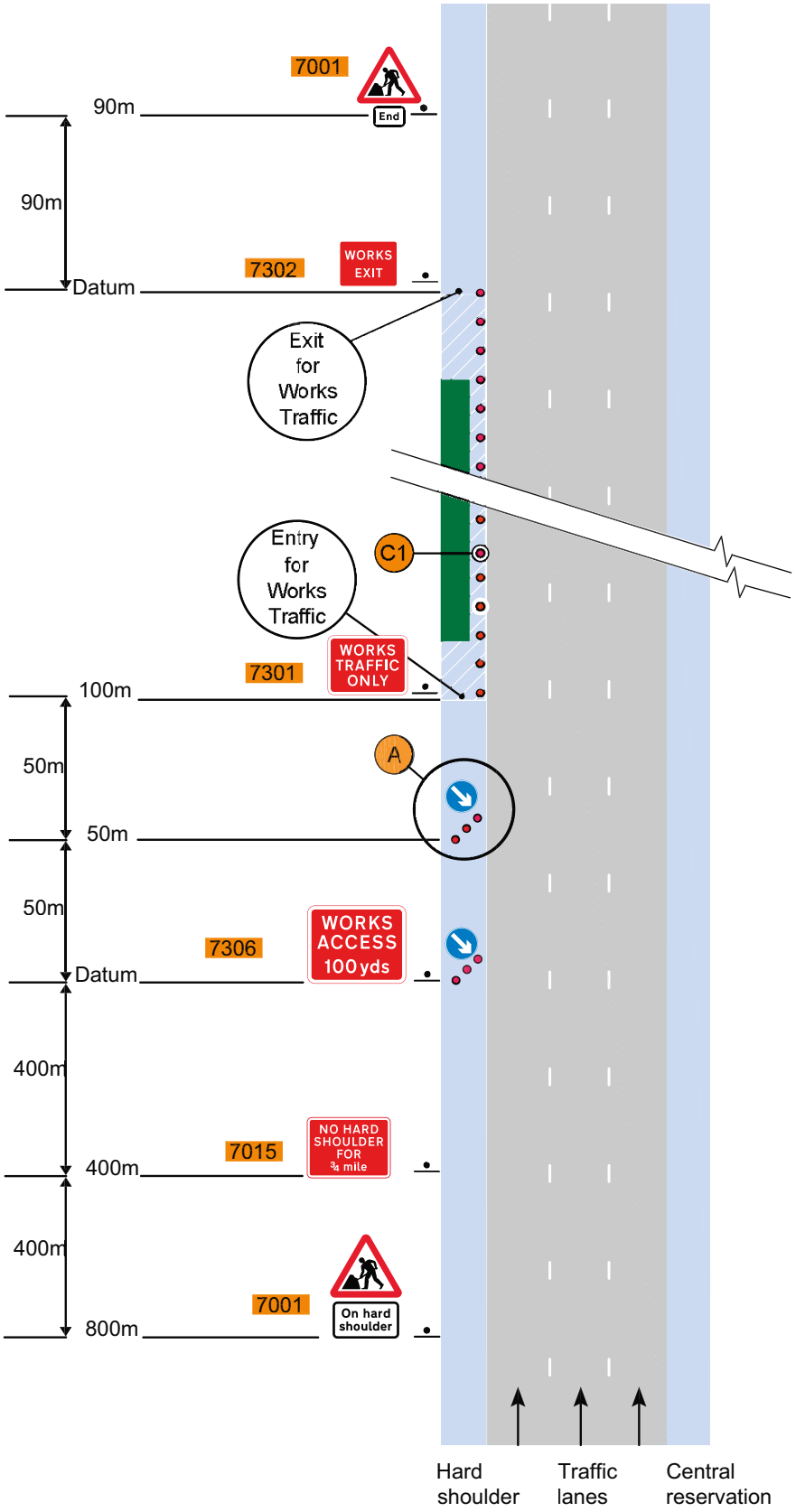
Plan DC1: Dual carriageway road, hard shoulder closure only

7.10.10. The principles are:

- a ‘NO HARD SHOULDER FOR ¾ MILE’ sign to working drawing 7015 (S13-9) on the nearside only, placed 400 m in advance of the initial closure of the hard shoulder. The distance shown may be varied but must be expressed to the nearest 10 yards for distances less than ½ mile, and to the nearest ¼ mile for distances of ½ mile or more, but less than 3 miles. For distances over 3 miles, distances must be shown to the nearest mile. The distance must be expressed as ‘YARDS’, ‘MILE’ or ‘MILES’.
- a ‘WORKS ACCESS ONLY 100 yds’ sign to working drawing 7306 (S13-9) on the nearside only, adjacent to initial closure of the hard shoulder.
- signing to Detail A on the hard shoulder 100 m in advance of the first cone of longitudinal coning to Detail C1, repeated 50 m from the first cone.
- a ‘WORKS TRAFFIC ONLY’ sign to working drawing 7301 (S13-9) located on the nearside only adjacent to the first cone of longitudinal coning to Detail C1.
- coning to Detail C1 adjacent to the works area. Coning to Detail D (18 m) may be used beyond the works area on long straight lengths parallel to the line of traffic, where coning is required for safety reasons.
- a ‘WORKS EXIT’ sign to working drawing 7302 (S13-9) on the nearside only at the end of the coning.
- at the end of the works, a ‘road works ahead’ sign to diagram 7001 (S13-2-9) in combination with sign ‘End’ placed on the nearside of the carriageway, 90 m from the end of the works.

If a temporary mandatory speed limit is imposed, then additional signing will be required (**7.10.8**).

Plan DC1 Dual carriageway, hard shoulder closure only



NOTE: This plan does not show additional signs required on both sides of the carriageway when a temporary mandatory speed limit is in place (see principles).

7.11 Island sites

7.11.1. Island sites are those in which live traffic travelling in the same direction passes on both sides of the works area. In general, they should not be used on dual carriageways if workers would need to work between lanes of live traffic.

7.11.2. If an extra lane is required to maintain traffic capacity, an island site may be necessary. Unless the workforce is physically protected on both sides, this is normally only appropriate at times of no work (e.g. curing concrete). In such cases, suitable measures must be taken to split the traffic and protect the isolated area.

7.11.3. The approach to an island site on a dual carriageway should divert traffic either side of the closed lane(s) using a sign to diagram 7243 (S13-6-14) or 7245 (S13-6-16; see **Figure 7.19**), with suitable TTM.

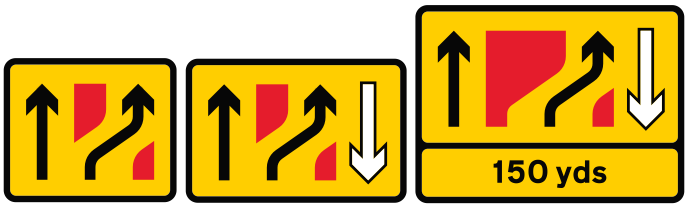


Figure 7.19 Diagram 7245 (S13-6-16) Movement of traffic to the right either side of an island area (Examples of alternative types)

7.11.4. Suitable coning with appropriate variant signs to diagram 7243 (S13-6-14), 7244 (S13-6-15), or 7245 (S13-6-16; **Figure 7.20**) is needed to avoid conflict arising as traffic joins together at the end of the island site.

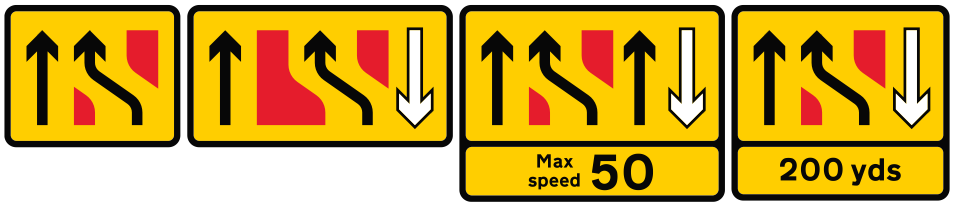


Figure 7.20 Sign to diagram 7245 (S13-6-16) Movement of traffic to the left at the end of an island site or in the middle of a system (Examples of alternative types)

7.12 Restriction of heavy goods vehicles / wide vehicles

7.12.1. Where there are only two lanes, HGVs and other wide vehicles may be restricted to the left-hand lane. Where there are three or more lanes, they should be restricted to the nearside two left-hand lanes, except where:

- the flow of HGVs is expected to exceed 850 veh/hr per lane, in any hour, or.
- a site investigation shows there is insufficient clearance for HGVs under any structure in the nearside lane **7.12.3**).
- at locations where vehicles need to use offside lanes for turning movements e.g. roundabouts.

7.12.2. Where a lane is required to have a weight, height, length and/or width restriction, a sign to diagram 7243 (S13-6-14) or 7244 (S13-6-15) incorporating the appropriate restriction symbol should be used to restrict those types of vehicles. Unless vehicles are physically limited from using these lanes e.g. where they are too narrow, additional terminal signs will be needed at the start of any restriction (to be able to enforce any order). Environmental HGV restriction symbols are not suitable for use to restrict used of specific lane in place of weight, height, length or width restrictions.

7.12.3. The limit of 850 HGVs per hour per lane may need to be reduced where an entry slip road joins a two-lane contraflow. Such situations require a detailed design risk assessment to confirm that all risks have been addressed.

7.13 Wider carriageways on motorways

7.13.1. The key issues associated with implementing TTM on wider carriageways (defined as four lanes or more in each direction, including lane drops or lane gains) are:

- personnel accessing the offside of the carriageway.
- availability and reliability of roadside signals.
- sign obscuration.
- sign size and lateral space availability.
- reduced number of places of relative safety.

7.13.2. Static road works signs located on the hard shoulder / verge and in the central reservation (if sufficient space is available) are likely to be obscured much of the time where there are high traffic flows, particularly for drivers travelling in the centre lanes where there are five or six lanes of traffic. Therefore, some of the recommended options may only be usable in some conditions, or specific road layouts.

7.13.3. The guidance in this paragraph should be considered on carriageways with four or five lanes, where the works require closure of the nearside or offside lane. The principles for this are based on those shown in **Plans DZB6**, **DZB7**, and **DZB8**. For nearside closures the central reservation wicket signs to diagram 7202.1 (S13-6-13) **Figure 7.21** are omitted for nearside closure. For an offside closure verge signs are omitted. This technique can also be applied for closure of the nearside two lanes on six lanes carriageway. It should only be considered where the total traffic volume on the lanes remaining open does not exceed 2,400 veh/hr.

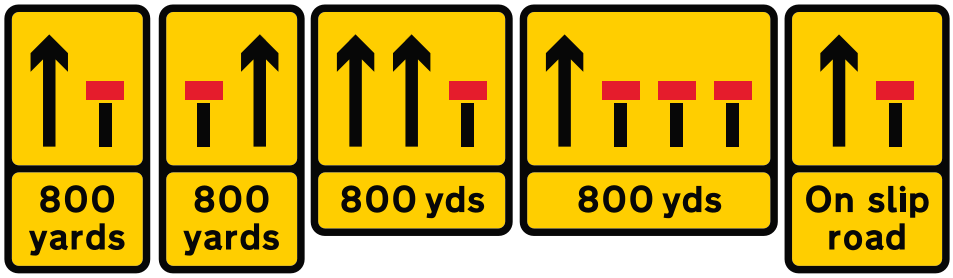


Figure 7.21 Diagram 7202.1 (S13-6-13) Examples

7.13.4. The size of these signs on wider carriageway will need to be larger than identified in Table A1.1 to ensure adequate readability in closest open lane adjacent to the closure. Recommended sizes for wider carriageways can be found in **Appendix A7**.

7.13.5. Installing signs and cones for these lane closure is likely to require the use of an MLC (**Section 10**) or mobile carriageway closure (**Section 11**). Additional signing can then be implemented in the closed lanes without obscuration and sign size being a problem.

7.13.6. Permanent provision for mounting remotely controlled signs may be used to minimise the need for personnel to cross the carriageway. For preference these should be under the direct control of the contractor and not via a control centre. These signs should be adequately protected from collision. Any gantry signing can then be used for advising road users of incidents and accidents. It can also provide advice about static and mobile TTM.

7.13.7. As an alternative, suitable signal systems e.g. MS4, may be able to display the relevant lane usage aspects and may avoid problems with sign obscuration. The relevant sign aspect is diagram 6008.2 (S15-2-6), **Figure 7.22**. Normally, these aspect will need to be displayed on three signals before the start of the static TM closure (see **Section 7.20**). This requires the

relevant S.I. or order to allow signals to be used in planned works to display aspects under RTRA 1984 Section 64/65.

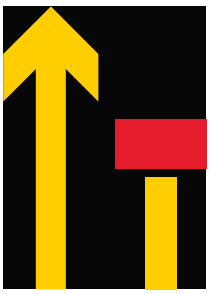


Figure 7.22 Diagram 6008.2 (S15-2-6) Closure of one lane of a two-lane carriageway ahead

7.13.8. To use this option, the reliability of both the power and control systems will need to be taken into account. The requirements for resilience of power and control system are in **Section 5.2**. Signals that do not meet the requirements in **5.2.34**, **5.2.35** and **5.2.46** may be used as part of the approach signing along with compliant signals and fixed sign. If signals not meeting these requirements are the only signs on the approach then this may be an acceptable option if the physical protection identified in **5.2.35** is provided. At least one IPV with operating light arrow, within the taper safety zone or protecting a works vehicle or working space/works area, would be required for the duration of the works to be part of this physical protection to provide the required level of safety as well as warning and information to road users.

7.13.9. The failure to display the required signs or message (including where the setting of the correct aspect is delayed) must not result in either workers or road users being exposed to risk higher than that if the works was signed to the guidance this document identifies for using fixed plate signs.

7.13.10. Discussions should be held with the control centre to identify an appropriate signing plan if work is planned on wider carriageways using signals. This may include systems such as Motorway Incident Detection and Automatic Signalling (MIDAS) and vehicles detection technology.

7.13.11. As an alternative, to allow normal TTM signing to be used, lane closures may be required at the start of a wider carriageway to reduce the number of lanes upstream of the wider carriageway section to a maximum of four open lanes. This will allow normal TTM signing layouts to be implemented, including creating space to install signs fully compliant with **Appendix A7**. Lanes already closed at the location of a lane usage sign in the lane change zone are not included on diagram 7202.1 (S13-6-13) signs.

7.13.12. Workers must be protected by mobile or static carriageway or lane closure techniques if signalling systems are used to provide advance signing and lane control.

7.14 Static traffic management

7.14.1. The following sections cover the principles and plans which guide the design of TTM arrangements. The design is divided into five zones, these are:

- The approach zone starts at the first sign and continues to 100 m upstream of the first sign requiring a lane-change decision.
- The lane-change zone starts 100 m upstream of the first sign requiring a lane-change decision and continues to the point at which all lane changes should have been completed.
- The lead-in zone starts at the point at which all lane changes should have been completed and continues to the beginning of the longitudinal safety zone.

- The works zone starts at the beginning of the longitudinal safety zone and continues to the end of the works area.
- The end-of-works zone starts at the end of the works area and continues to the last sign.

7.14.2. The five zones are shown in **Figure 7.23**.

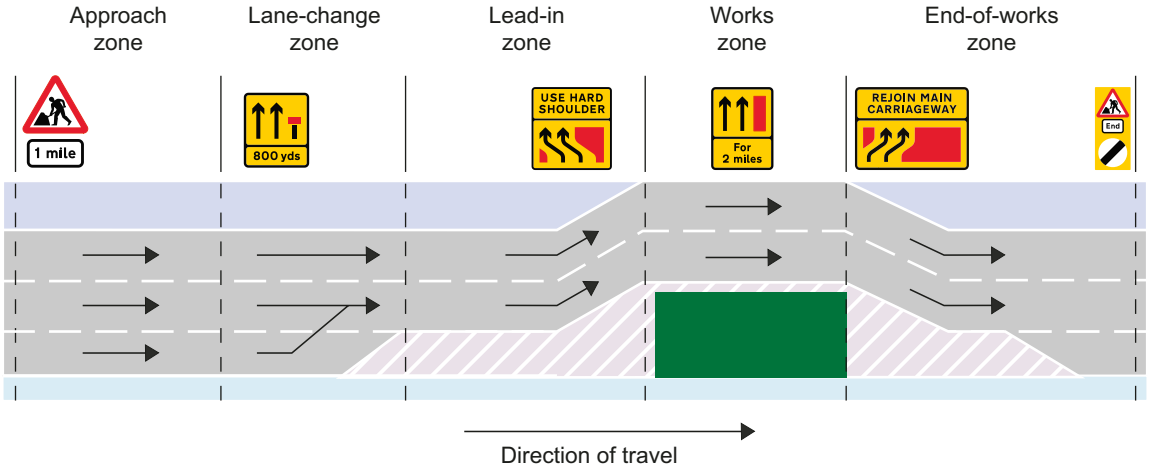


Figure 7.23 Dual carriageway traffic management design zones

7.14.3. **Table A1.4** (**Appendix A1**) provides a key to the areas shown in the plans in the following sections. **Table A1.5** (**Appendix A1**) explains Details A to K in the plans, it also includes details of cone and cylinder height and spacing. Details of cone spacing are also specified in **Table A1.3** (**Appendix A1**).

7.14.4. Note that some plans (e.g. tidal flow) show signing and coning demonstrating lane closures and lane changes in the opposing (secondary) direction. The principles for the design of TTM arrangements apply to both the primary and secondary direction. Appropriate application will be required.

7.15 Approach zone

7.15.1. The distances on the supplementary plates within the approach zone refer to the location of the initial cone of the works lead taper.

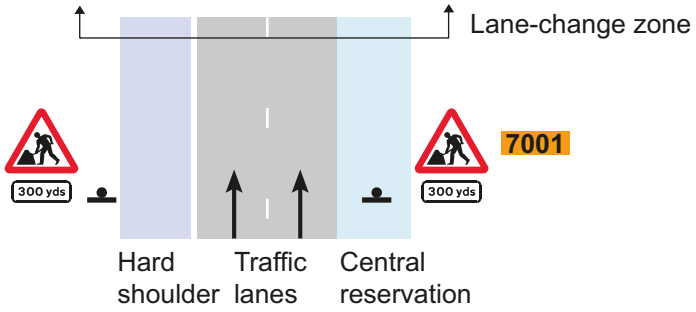
Principles of design for the approach zone

Plan DZA1: Approach zone for a dual carriageway road with a permanent speed limit of 40 mph or less

The principles for advance signing are:

- ‘road works ahead’ signs to diagram 7001 (S13-2-9) with distance plate on the nearside and the offside, placed 300 m in advance of the works.
- where the speed limit is 30 mph or less the distance plates may be omitted.

Plan DZA1 Approach zone for a dual carriageway road with a permanent speed limit of 40 mph or less



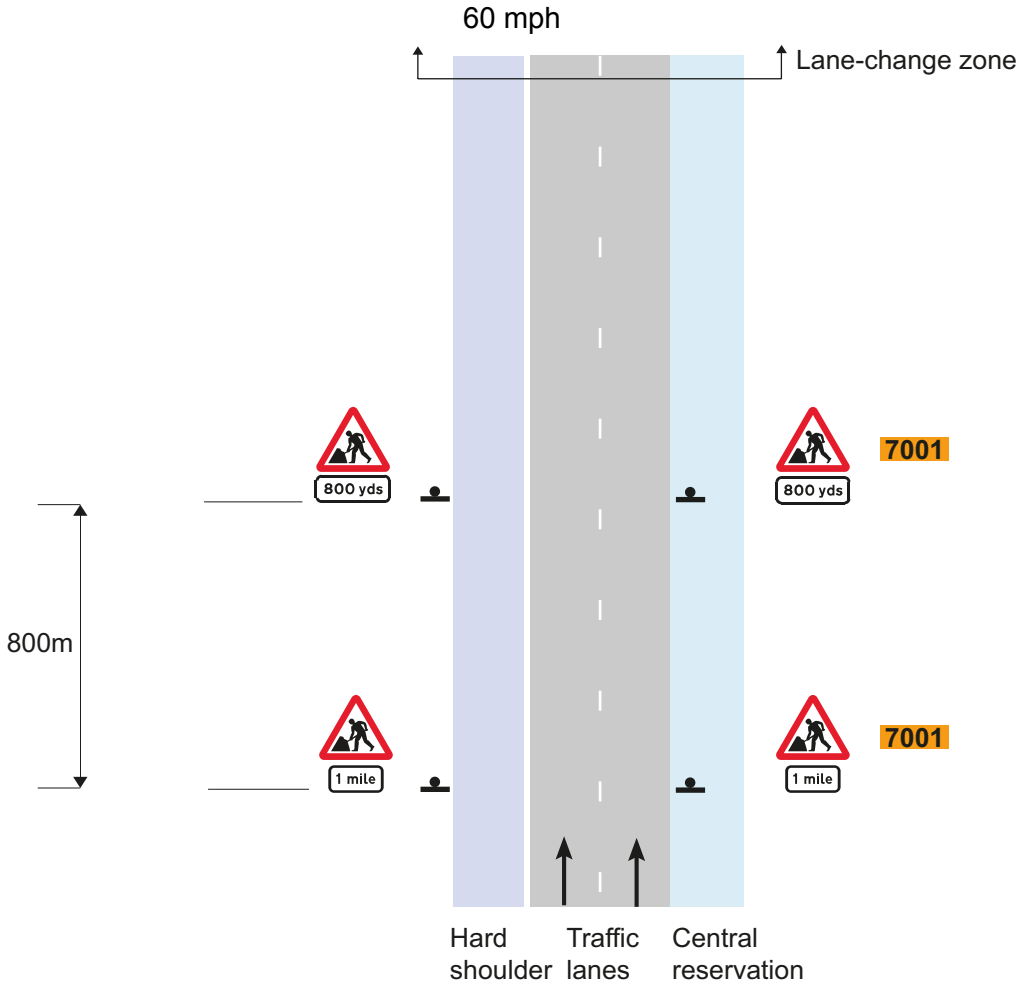
NOTE: The distance on the supplementary plate refers to the location of the initial cone of the works lead taper.

Plan DZA2: Approach zone for a dual carriageway road with a permanent speed limit of 50 mph or 60 mph

The principles for advance signing are:

- ‘road works ahead’ signs to diagram 7001 (S13-2-9) with distance plate ‘1 mile’ on the nearside and the offside, placed one mile in advance of the works lead taper. These signs are always required on motorways. Works on all-purpose dual carriageways for which relaxations apply do not require them.
- ‘road works ahead’ signs to diagram 7001 (S13-2-9) with distance plate ‘800 yds’ on the nearside and the offside, placed 800 m in advance of the works lead taper. These signs are not required for works on all-purpose dual carriageways or motorways that require 800 yds wicket signs to diagram 7202.1 (S13-6-13) at 800 m.

Plan DZA2 Approach zone for a dual carriageway road with a permanent speed limit of 50 mph or 60 mph



NOTE: On roads with a permanent speed limit of 50 mph, the 1 mile ‘road works ahead’ signs to diagram 7001 (S13-2-9) are only required where congestion is likely.

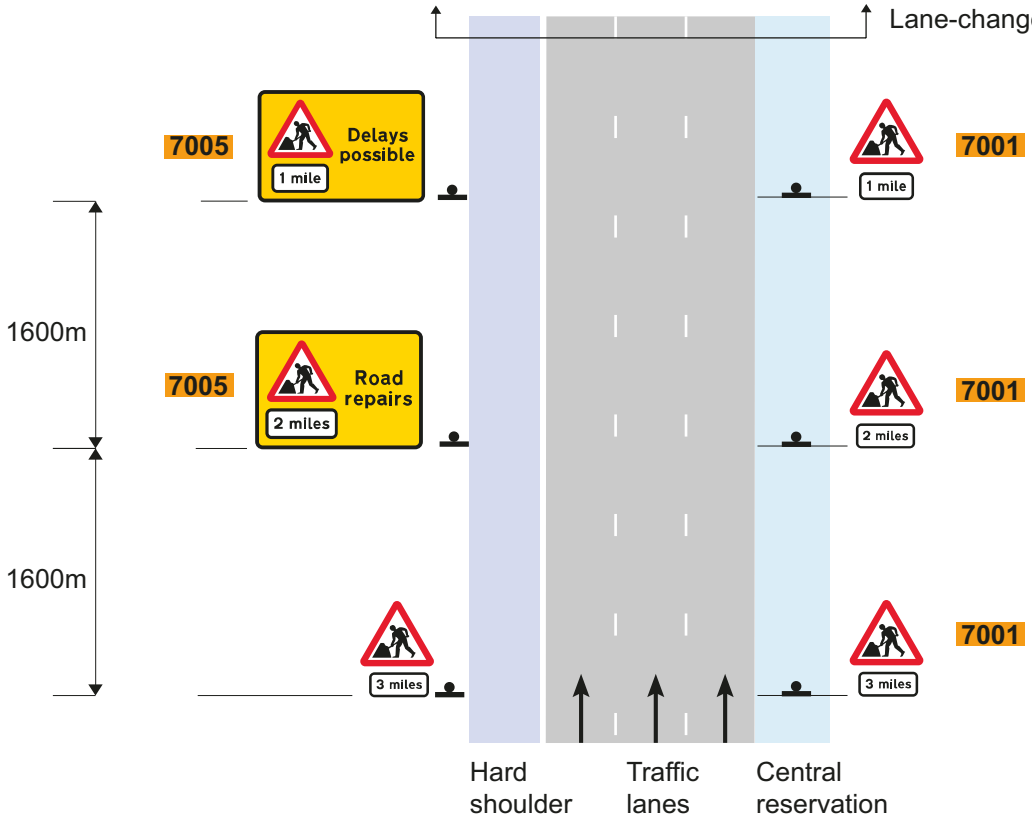
Plan DZA3: Approach zone for a dual carriageway road for which the national speed limit applies, where queuing is expected

The principles for advance signing are:

- if queues are expected to extend more than two miles from the works, ‘road works ahead’ sign 7001 (S13-2-9) with supplementary distance plate ‘3 miles’ on the nearside and the offside, placed three miles in advance of the works. If queues are expected to extend further, signs with appropriate distance plate (e.g. ‘4 miles’) should be placed as appropriate.
- a ‘road works ahead’ sign to diagram 7005 (S13-6-43), with distance plate ‘2 miles’ on the nearside and, two miles in advance of the works, a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary distance plate on the offside.
- a ‘road works ahead’ sign to diagram 7005 (S13-6-43), with distance plate ‘1 mile’ on the nearside and, one mile in advance of the works, a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary distance plate on the offside.

When the works require closure of the nearside lane(s) on dual carriageways with five lanes or more, subject to certain flow limits (see **7.3.11**), the ‘road works ahead’ sign to diagram 7001 (S13-2-9) on the offside of the carriageway may be omitted.

Plan DZA3 Approach zone for a dual carriageway road for which the national speed limit applies



NOTES:

1. Where queuing is not expected, the 3 mile ‘road works ahead’ signs are not required. In addition, where a relaxation applies, the advance signs at 2 miles may be omitted. In this situation the 1 mile ‘road works ahead’ signs to diagram 7001 (S13-2-9) may replace signs to diagram 7005 (S13-6-43), as shown on **Plan DZA2**.

2. Where this layout is installed as part of enhanced ETM (see **2.4.3**) signs to diagram 7001 (S13-2-9), may replace signs to diagram 7005 (S13-6-43).

7.16 Lane change zone

7.16.1. The distances on the supplementary plates refer to the location of the initial cone of the works lead taper.

7.16.2. Where speed control is required and there is no speed limit order, advisory speed signs to diagram 7294 (S13-6-41; **Figure 7.24**) should be placed at the same locations as shown for mandatory speed limit signs.



Figure 7.24 Diagram 7294 (S13-6-41) Advisory maximum speed limit in mph (variants)

Keys to the plans are provided in **Tables A1.4** and **A1.5** (**Appendix A1**).

Principles of design for the lane change zone

Plan DZB1: Entry taper for a dual carriageway road with a permanent speed limit of 40 mph or less

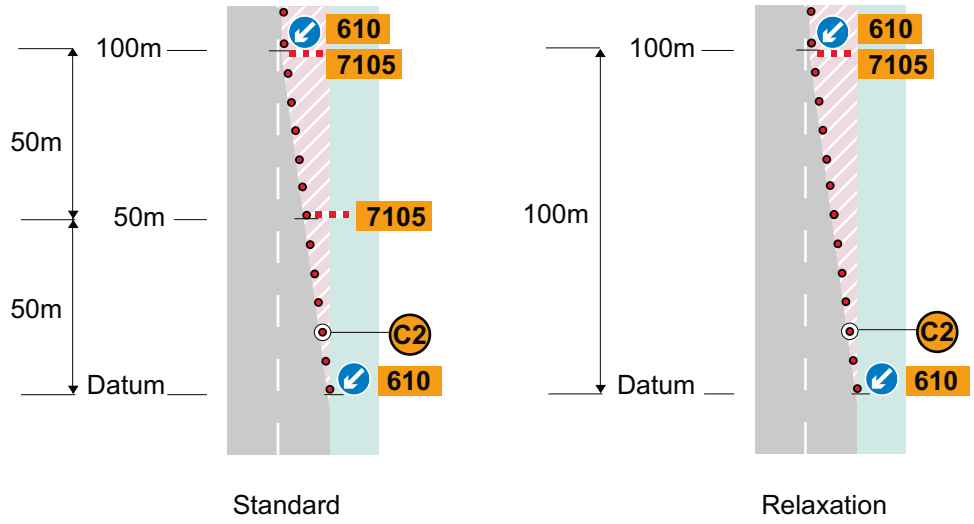
Principles for entry tapers are:

- length of taper is 100 m/lane closed.
- coning to 3 m spacing (Detail C2; **Table A1.5** of **Appendix A1**).
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the taper.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each closed lane of the taper.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light midway along the length of each closed lane of the taper.

Principles for entry tapers for works for which relaxations apply are as for standard works except:

- the ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light midway along the length of each closed lane of the taper may be omitted.

Plan DZB1 Entry taper for a dual carriageway road with a permanent speed limit of 40 mph or less



Plan DZB2: Entry taper for a dual carriageway road with a permanent speed limit of 50 mph or 60 mph

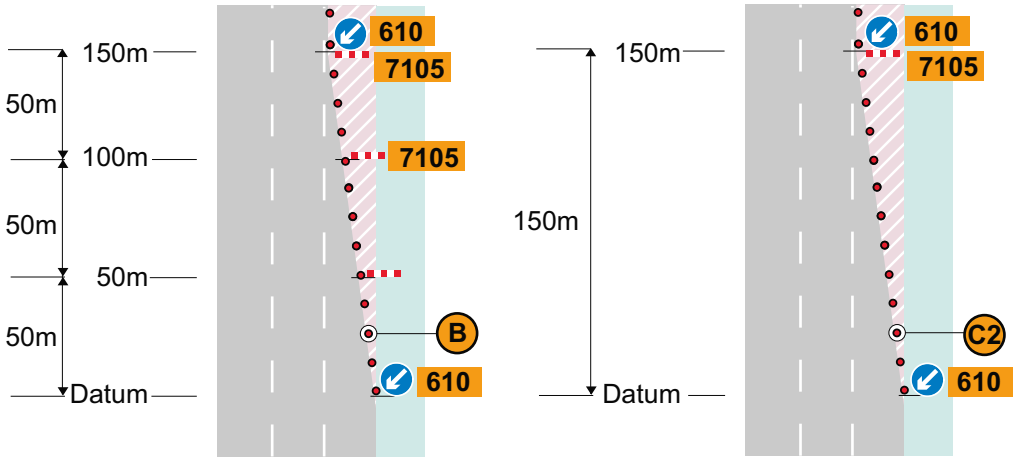
Principles for entry tapers are:

- length of taper is 150 m/lane closed.
- coning to 1.5 m spacing (Detail B; **Table A1.5** of **Appendix A1**).
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the taper.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each closed lane of the taper.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light every 50 m along the length of each closed lane of the taper.

Principles for entry tapers for works for which relaxations apply are as for standard works except:

- coning to 3 m spacing (Detail C2).
- the ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light every 50 m along the length of each closed lane of the taper may be omitted.

Plan DZB2 Entry taper for a dual carriageway road with a permanent speed limit of 50 mph or 60 mph



Plan DZB3: Entry taper for a dual carriageway road for which the national speed limit applies

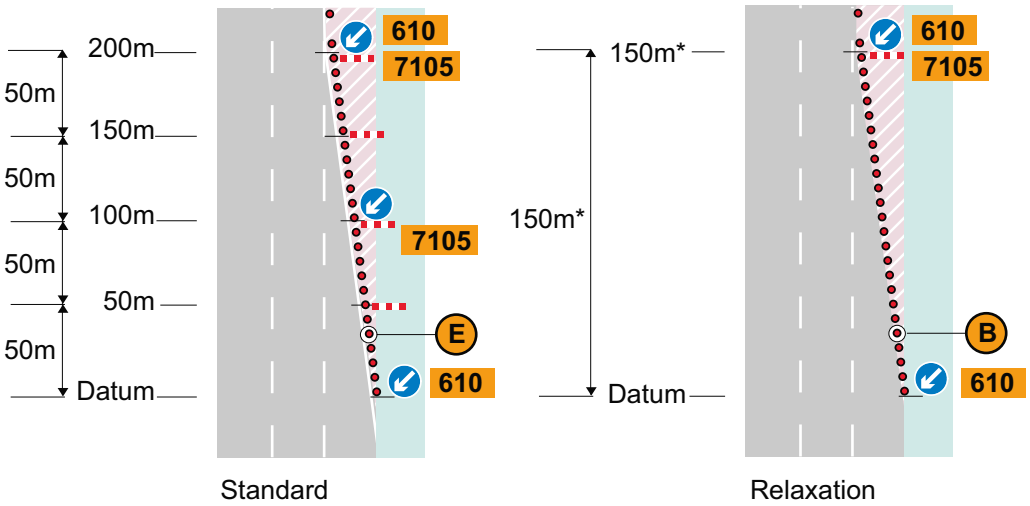
Principles for entry tapers are:

- length of taper is 200 m/lane closed.
- where space limitations may apply a 150m/lane closed taper may be used subject to a scheme specific risk assessment. To consider this option full Stopping Sight Distance (295m) needs to be achieved in all lanes.
- coning to 1.5 m spacing with marking to Detail E.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the taper.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each closed lane of the taper.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light every 50 m along the length of the taper. The barrier midway along the length of each closed lane to have a ‘keep left/right’ sign to diagram 610 (S3-2-3).

Principles for entry tapers for works for which relaxations apply are as for standard works except:

- length of taper is 150 m/lane closed. However, it is recommended that the length of taper installed should be 200 m/lane closed to facilitate an upgrade to standard works where it is anticipated that site conditions may change to such an extent that it may become necessary to enhance the taper (see ‘150 m*’ in **Plan DZB3**).
- coning to 3 m spacing (Detail B).
- the ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light every 50 m along the length of the taper, the barrier midway along the length of each closed lane with the ‘keep left/right’ sign to diagram 610 (S3-2-3) may be omitted.

Plan DZB3 Entry taper for a dual carriageway road for which the national speed limit applies



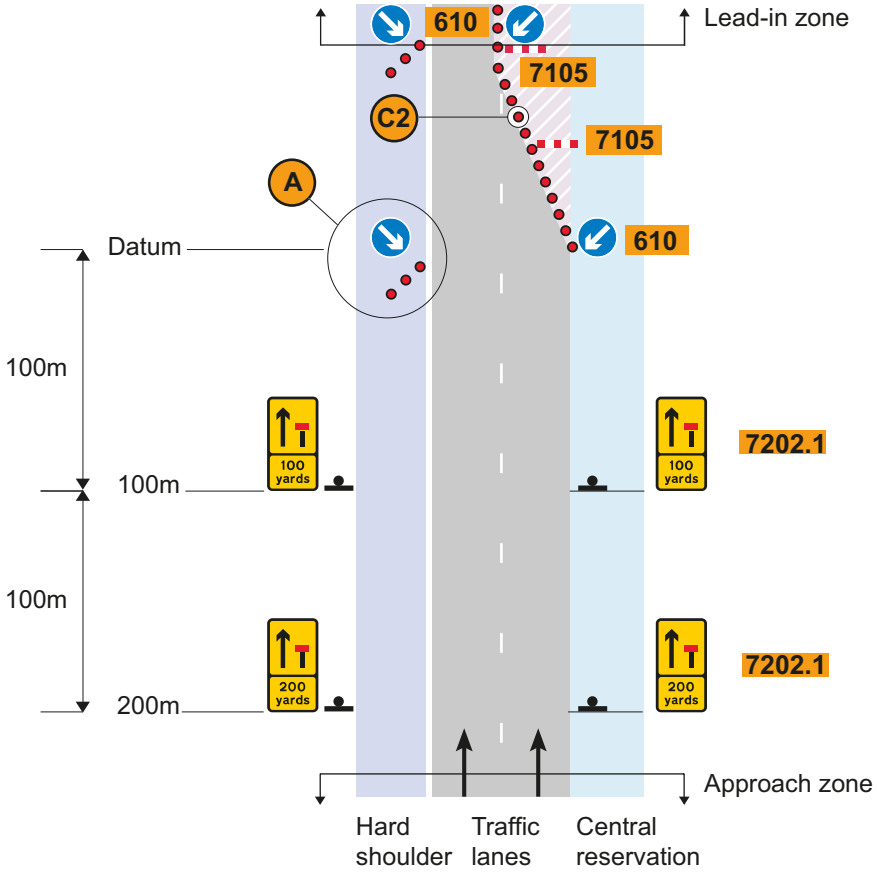
Plan DZB4: Lane-change zone for a single lane closure on a dual carriageway road with a permanent speed limit of 40 mph or less

Two pairs of advance signs are required at 100 m intervals:

- wicket signs indicating the closed lane to diagram 7202.1 (S13-6-13) with distance panel ‘200 yards’ on the nearside and the offside, placed 200 m in advance of the works lead taper.
- the wicket signs with distance plate ‘100 yards’ are repeated 100 m in advance of the works lead taper.

For entry taper details, including relaxations, see **Plan DZB1**.

Plan DZB4 Lane-change zone for a single lane closure on a dual carriageway road with a permanent speed limit of 40 mph or less



NOTES:

1. Where no hard shoulder is present, no signing to Detail A is required.
2. On roads with a permanent speed limit of 30 mph or less, the distance plates may be omitted.

Plan DZB5: Lane-change zone for a single lane closure on a dual carriageway road with a permanent speed limit of 50 mph or 60 mph

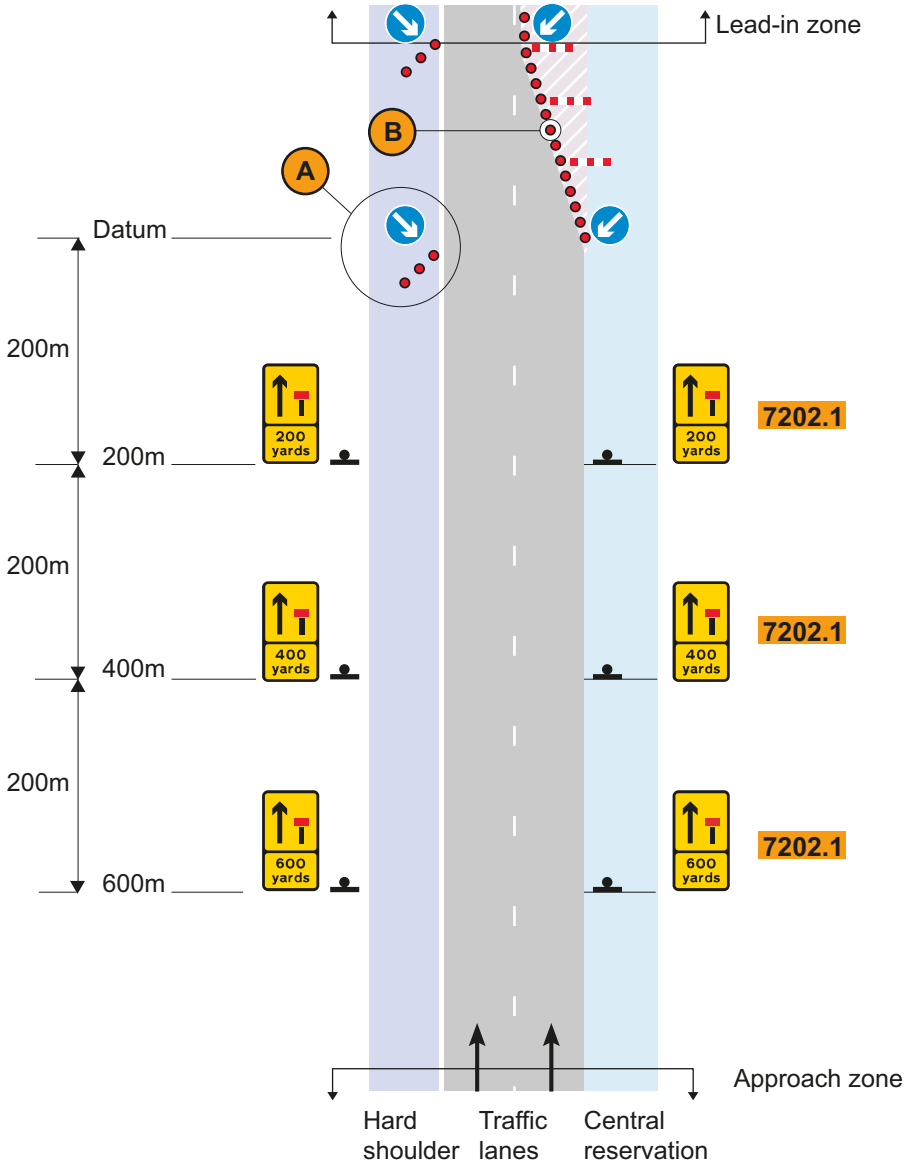
Three pairs of advance signs are required at 200 yard intervals:

- wicket signs indicating the closed lane to diagram 7202.1 (S13-6-13) with distance panel ‘600 yards’ on the nearside and the offside, placed 600 m in advance of the works lead taper.
- the wicket signs with appropriate distance panel (400 yards and 200 yards) are placed at 400 m and 200 m in advance of the works lead taper.

For entry taper details, including relaxations, see **Plan DZB2**.

- Where a speed limit lower than the permanent speed limit is required, signs to diagram 670 (S10-2-1) should be placed as shown on **Plan DZB6**.

Plan DZB5 Lane-change zone for a single lane closure on a dual carriageway road with a permanent speed limit of 50 mph or 60 mph



NOTE: Where no hard shoulder is present, no signing to Detail A is required.

Plan DZB6: Lane-change zone for a single lane closure on a dual carriageway road for which the national speed limit applies

Four pairs of advance lane closure signs are required:

- wicket signs indicating the closed lane to diagram 7202.1 (S13-6-13) with distance panel ‘800 yards’ on the nearside and the offside, placed 800 m in advance of the works lead taper. These signs, with appropriate distance plates, are placed at 600 m, 400 m and 200 m in advance of the works lead taper.
- on dual carriageway roads of five lanes when the works require closure of the nearside lane, and on dual carriageway roads of six lanes when the closure of two nearside lanes is required, subject to certain flow limits (see **7.13.11**), the wicket signs to diagram 7202.1 (S13-6-13) indicating the closed lane on the offside of the carriageway may be omitted.

Where a temporary mandatory speed limit is in place, one pair of temporary speed limit signs is required, followed by repeater signs:

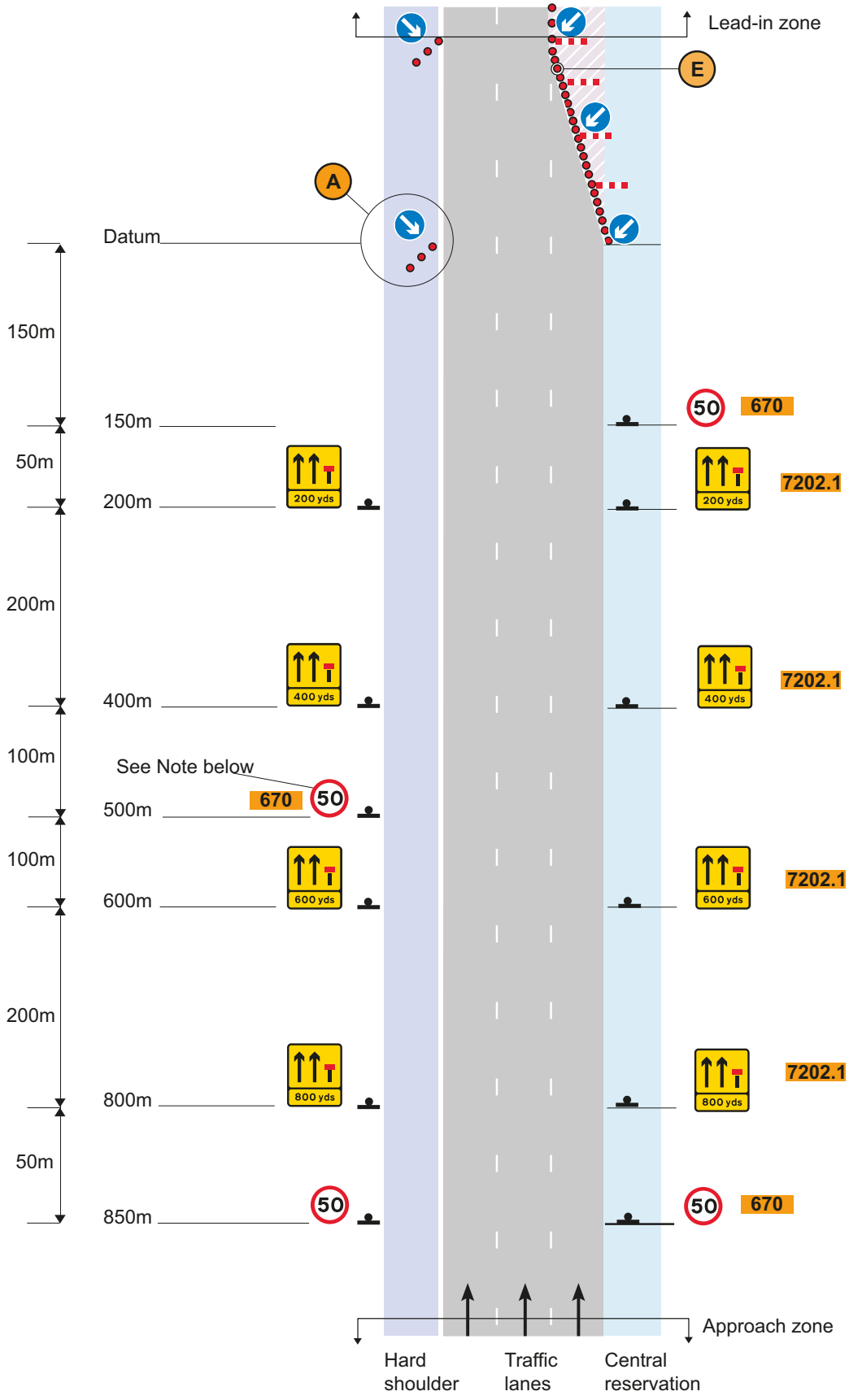
- the temporary speed limit sign to diagram 670 (S10-2-1) is to be placed on the nearside and on the central reservation 50 m in advance of the first sign indicating lane closures or restrictions.
- the distance between successive repeater signs, on the same side of the carriageway and those on alternate sides, must not exceed those shown in **Table 4.5** in **4.8.27**.

For entry taper details, including relaxations, see **Plan DZB3**.

Signing to Detail A is located on the hard shoulder opposite the ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start and end of the taper.

For works where relaxations apply, the size of signs to diagram 7202.1 (S13-6-13) in the left-hand side of the carriageway should be as given in **Tables A1.1** and **A1.2** (**Appendix A1**). Signs on the central reservation may be reduced to 1350 mm. The x-height on the supplementary distance plate should be reduced proportionally.

Plan DZB6 Lane-change zone for a single lane closure on a dual carriageway road for which the national speed limit applies



NOTES:

1. For the spacing of speed limit repeater signs see **Table 4.5** in **4.8.27**.
2. Where no hard shoulder is present, no signing to Detail A is required.

Plan DZB7: Lane-change zone for a two-lane closure (direct taper) on a dual carriageway road for which the national speed limit applies

Four pairs of advance lane closure signs are required:

- wicket signs indicating the closed lane to diagram 7202.1 (S13-6-13) with distance panel ‘800 yards’ on the nearside and offside, placed 800 m in advance of the works. These signs are repeated, with the appropriate distance plate at 600 m, 400 m and 200 m.
- on dual carriageway roads of five lanes or more when the works require closure of the nearside lane(s), subject to certain flow limits (see **7.13.11**), the wicket signs to diagram 7202.1 (S13-6-13) indicating the closed lane on the offside of the carriageway may be omitted.

Where a temporary mandatory speed limit is in place, one pair of temporary speed limit signs is required, followed by repeater signs:

- the temporary speed limit sign to diagram 670 (S10-2-1) is to be placed on the nearside and on the central reservation 50 m in advance of the first sign indicating lane closures or restrictions.
- the distance between successive repeater signs, on the same side of the carriageway and those on alternate sides, must not exceed those shown in **Table 4.5** in **4.8.27**.

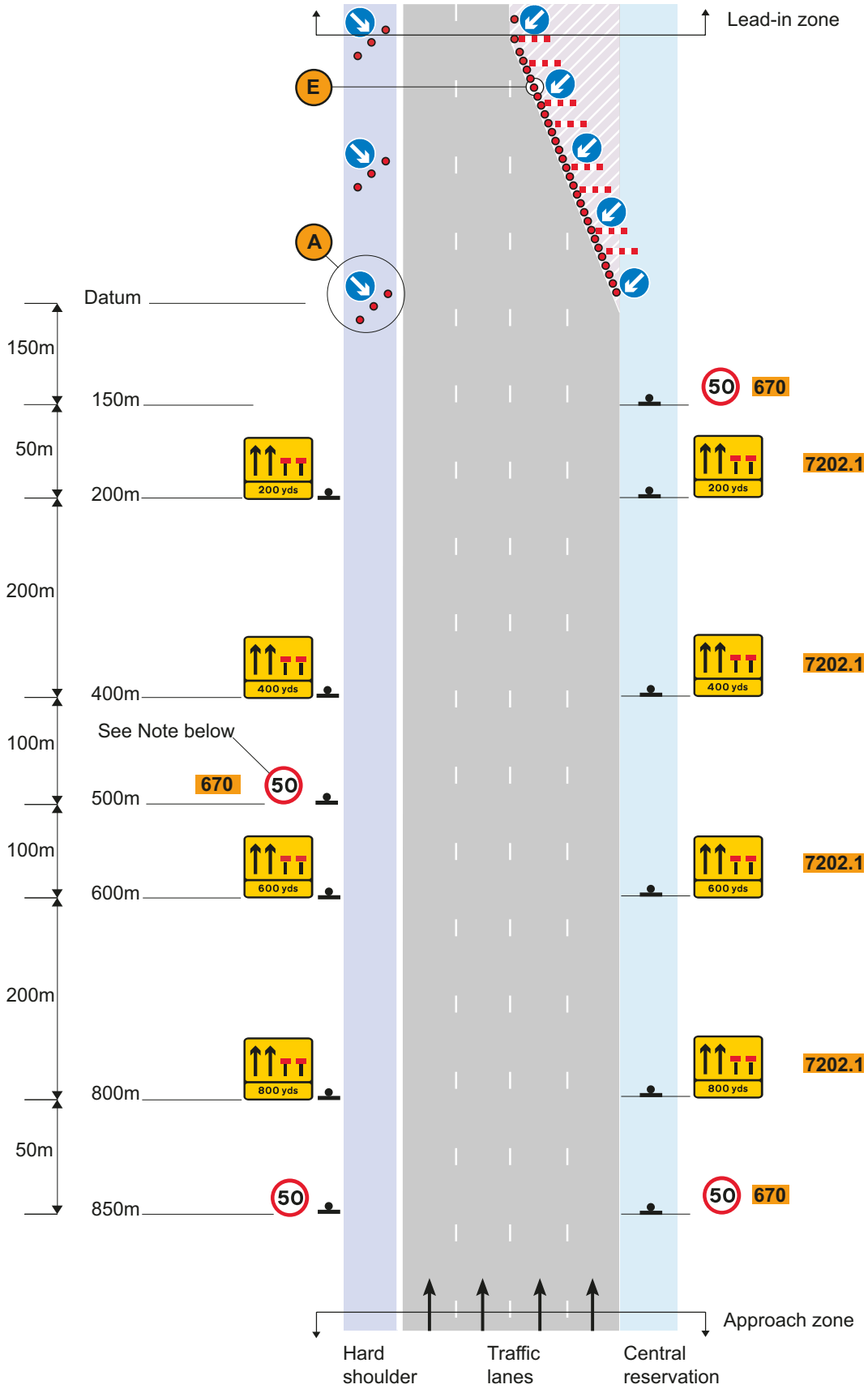
For entry taper details, including relaxations, see **Plan DZB3**.

Signing to Detail A is located on the hard shoulder opposite the ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the taper and opposite the ‘lane closed’ barrier to diagram 7105 (S13-6-8) and ‘keep left/right’ sign to diagram 610 (S3-2-3) at the end of each closed lane.

A direct lane closure of nearside lanes 1 and 2 on a three or more-lane dual carriageway is permitted at low traffic flows. For a definition of ‘low traffic flows’, see Glossary (Appendix A2).

For works where relaxations apply, the size of signs to diagram 7202.1 (S3-2-3) in the left-hand side of the carriageway should be as given in **Tables A1.1** and **A1.2** (**Appendix A1**). Signs on the central reservation may be reduced to 1350 mm. The x-height on the supplementary distance plate should be reduced proportionally.

Plan DZB7 Lane-change zone for a two-lane closure (direct taper) on a dual carriageway road for which the national speed limit applies



NOTES:

1. For the spacing of speed limit repeater signs see **Table 4.5** in **4.8.27**.
2. Where no hard shoulder is present, no signing to Detail A is required.

Plan DZB8 Lane-change zone for a stepped taper closure on a dual carriageway road for which the national speed limit applies

The principles are:

- when stepped taper lane closures are used, the minimum distance between the closures is 800 m.
- a second set of wicket signs indicating the closed lane to diagram 7202.1 (S13-6-13) with distance plate ‘800 yards’ on the nearside and offside, is placed 800 m in advance of the works. These signs are repeated with the appropriate distance plate at 600 m, 400 m, and 200 m.
- on dual carriageway roads of five lanes or more when the works require closure of the nearside lane(s), and subject to certain flow limits (see **7.13.11**), the wicket signs to diagram 7202.1 (S13-6-13) indicating the closed lane on the offside of the carriageway may be omitted.

Where a temporary mandatory speed limit is in place, one pair of temporary speed limit signs is required, followed by repeater signs:

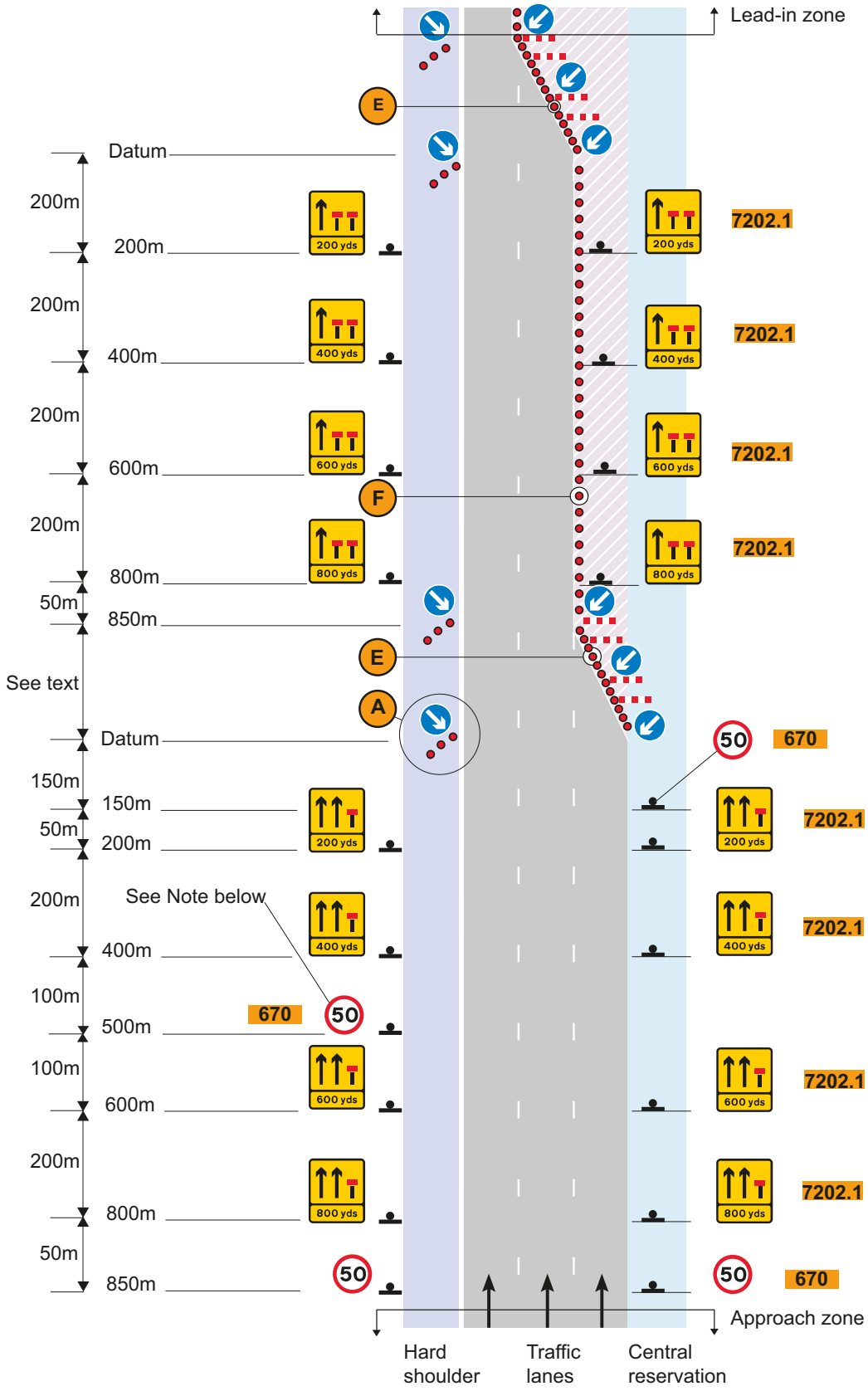
- the temporary speed limit sign to diagram 670 (S10-2-1) is to be placed on the nearside and on the central reservation 50 m in advance of the first sign indicating lane closures or restrictions.
- the distance between successive repeater signs, on the same side of the carriageway and those on alternate sides, must not exceed those shown in **Table 4.5** in **4.8.27**.

For entry taper details, including relaxations, see **Plan DZB3**. Consider using backlit sequentially flashing warning lights on the tapers to highlight the taper coning and distinguish it from the long straight stretches of coning (see **4.22.8**).

Signing to Detail A is located on the hard shoulder opposite the ‘keep left/right’ sign to diagram 610 (S3-2-3) at both the start and end of the taper.

For works where relaxations apply, the size of signs to diagram 7202.1 (S13-6-13) in the left-hand side of the carriageway should be as given in **Tables A1.1** and **A1.2** (**Appendix A1**). Signs on the central reservation may be reduced to 1350 mm. The x-height on the supplementary distance plate reduced proportionally.

Plan DZB8 Lane-change zone for a stepped taper closure on a dual carriageway road for which the national speed limit applies



NOTES:

1. For the spacing of speed limit repeater signs see **Table 4.5** in **4.8.27**.
2. Where no hard shoulder is present, no signing to Detail A is required.

Plan DZB9: Lane-change zone for a lane closure and lane width restriction ahead on a dual carriageway road for which the national speed limit applies

Four pairs of advance signs are required:

For lane restrictions (other than simple lane closures), the ‘Restrictions ahead’ signs variations to 7244 (S13-6-15) are used:

- 800, 600, 400 and 600 yards signs – Bottom panel ‘800/600/400/200 yards’ on the nearside and offside, placed 800/600/400/200 m in advance of the works.

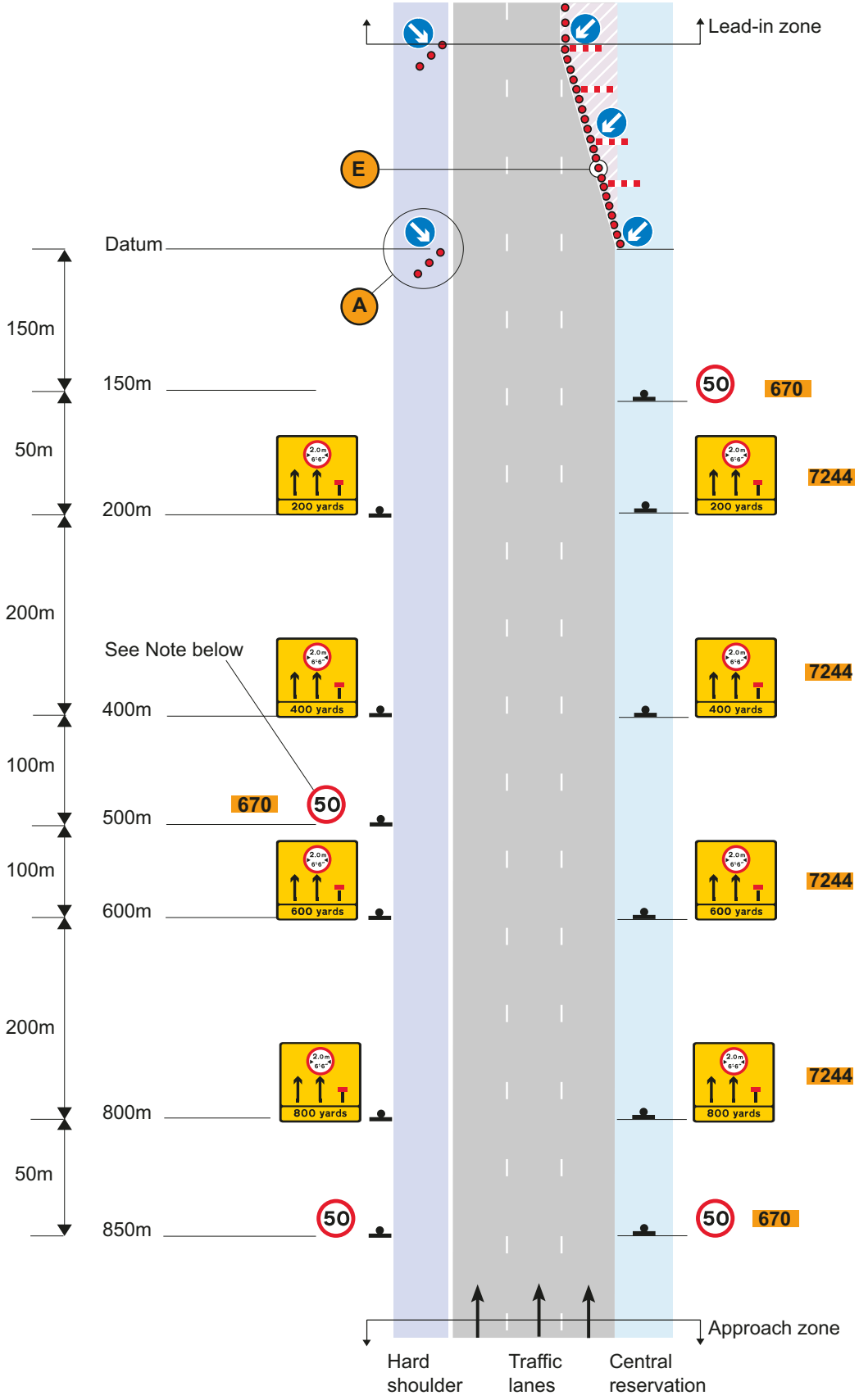
Where a temporary mandatory speed limit is in place, one pair of temporary speed limit signs is required, followed by repeater signs:

- the temporary speed limit sign to diagram 670 (S10-2-1) is to be placed on the nearside and on the central reservation 50 m in advance of the first sign indicating lane closures or restrictions.
- the distance between successive repeater signs, on the same side of the carriageway and those on alternate sides, must not exceed those shown in **Table 4.5** in **4.8.27**.

For entry taper details, see **Plan DZB3**. Consider using backlit sequentially flashing warning lights on the tapers to highlight the taper coning and distinguish it from the long straight stretches of coning (see **4.22.8**).

Signing to Detail A is located on the hard shoulder opposite the ‘keep left/right’ sign to diagram 610 (S3-2-3), both at the start and end of the taper.

Plan DZB9 Lane-change zone for a lane closure and lane width restriction ahead on a dual carriageway road for which the national speed limit applies



NOTE:

1. For the spacing of speed limit repeater signs see **Table 4.5** in **4.8.27**.
2. Where no hard shoulder is present, no signing to Detail A is required.

Plan DZB10: Lane-change zone for a narrow lane layout with no lane closures on a dual carriageway road for which the national speed limit applies

Three pairs of advance signs are required:

- 600 and 400 yards signs: the ‘restrictions ahead’ sign to diagram 7244 (S13-6-15) is used incorporating variant width symbols and a bottom panel ‘600/400 yards’ on the nearside and offside, placed 600 m and 400 m in advance of the works.
- 200 yards sign: the ‘narrow lanes’ sign to diagram 7245 (S13-6-16) is used with, if the hard shoulder is to be used, a top panel ‘USE HARD SHOULDER’. A bottom panel ‘200 yards’ on the nearside and offside placed 200 m in advance of the works is also used. If the hard shoulder is to be used, then this sign is replaced by the ‘move to the hard shoulder’ sign to diagram 7244 (S13-6-15).

Where a temporary mandatory speed limit is in place, one pair of temporary speed limit signs is required, followed by repeater signs:

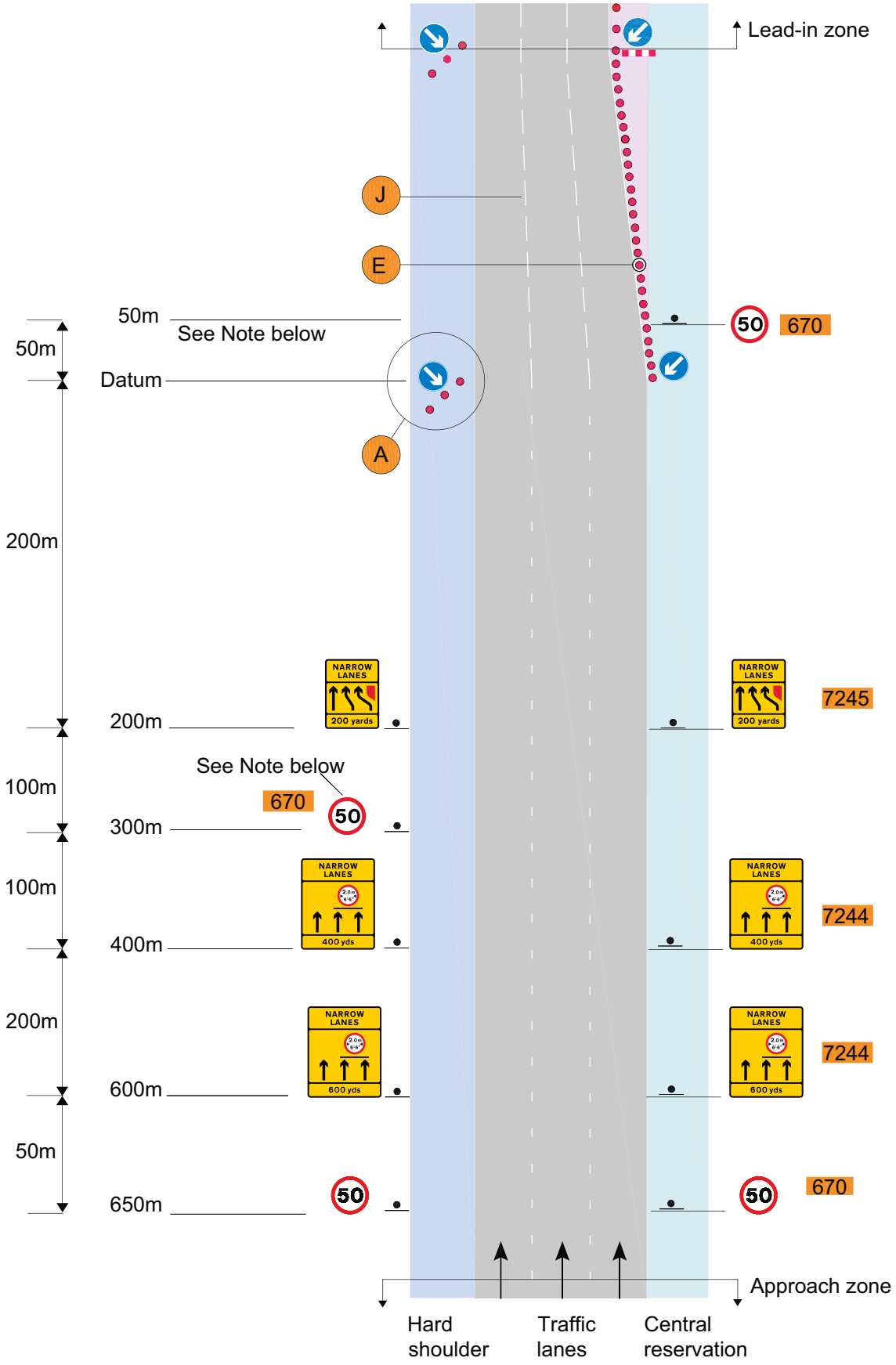
- the temporary speed limit sign to diagram 670 (S10-2-1) is to be placed on the nearside and on the central reservation 50 m in advance of the first sign indicating lane closures or restrictions.
- the distance between successive repeater signs, on the same side of the carriageway and those on alternate sides, must not exceed those shown in **Table 4.5** in **4.8.27**.

For narrowing the lanes:

- the length of the taper will depend on the rate of taper, see **Table A1.3** (**Appendix A1**), and the width of the restriction.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the narrowing.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3) at the end of the narrowing.
- for tapers of 100 m or greater, additional ‘lane closed’ barriers to diagram 7105 (S13-6-8) with high intensity warning lights are required at 50 m spacing.
- coning to 1.5 m spacing with marking to Detail E (see **Table A1.5** (**Appendix A1**).
- signing to Detail A located on the hard shoulder opposite the ‘keep left/right’ sign to diagram 610 (S3-2-3), both at the start and end of the narrowing.
- white lining or temporary studs to Detail J used as road markings between lanes from the start of the narrowing.

No relaxations apply.

Plan DZB10 Lane-change zone for a narrow lane layout with no lane closures on a dual carriageway road for which the national speed limit applies



NOTES:

1. For the spacing of speed limit repeater signs see **Table 4.5** in **4.8.27**.
2. Where no hard shoulder is present, no signing to Detail A is required.

Amendments to approach and lane change zone signing for relaxation closures

7.16.3. **Section 5**, **4.7** and **4.12** provide guidance on using permanently mounted remotely controlled signs to minimise the need for personnel to cross the carriageway. This may be applied to narrower carriageways subject to a scheme-specific risk assessment. The following guidance and requirements should also be considered.

7.16.4. A reduced level of nearside or offside distance signs from that shown in **Plans DZA3** and **DZB6** may be considered, subject to the following guidance.

7.16.5. TTM arrangements should not increase road user risk to any group of users, nor road user comprehension. Adequate guidance must be provided for road users by use of temporary signs that are suitably sized and readable (see **5.4.1** and **5.5.1**, and **Table A1.5** of **Appendix A1**). This is particularly important where only nearside signing is provided, as it is more likely to become obscured.

7.16.6. Removing the need to install offside signs for nearside closures at relaxation scheme works saves time and decreases risk to road workers and road users. This must be considered in the risk-based design but removing the need to cross a live carriageway must not be the sole justification for omission of offside signs (the use of Mobile Lance Closures and Enhanced Mobile Carriageway Closures allow offside signs to be installed without crossing the road). Reduced signing must not adversely affect road user safety. Where there are offside closures, offside signs should be provided (using the same, or similar, method to install the offside taper). Installing nearside only fixed plate signs for offside lane closures is not recommended.

7.16.7. The alternative techniques identified below must be considered within a risk-based design as an option for implementation of relaxation works (as defined in **Section 2.3**). These must be considered alongside the full signing layouts shown in **Plans DZB6**, **DZB7**, and **DZB8**. These are not appropriate for Standard works (as defined in **2.3.2**). However, they may be used within or to establish Standard work sites.

7.16.8. Within the site-specific risk assessment for a relaxation scheme, the contractor should determine the most appropriate TTM layout. Generic risk assessments may be used to develop safe systems of work for installing TTM layouts. However, a site-specific risk assessment must be used to determine the design and layout used. This must consider the risk to road workers and road users, and any relevant factors detailed in **Section 2.3**.

7.16.9. The site-specific risk assessment will need to detail contingency arrangements for if conditions on site change to cause relaxation scheme TTM to no longer be appropriate. These should cover the potential need to immediately remove works, enhance advance signing, or otherwise protect the closure. The site-specific risk assessment requires validation before works start. If relaxation scheme works are not appropriate for conditions, then works should be aborted, or TTM suitable for the conditions should be installed. The works should always be monitored to ensure approach signing remains appropriate for the conditions.

7.16.10. Where a nearside taper on a three lane or wider dual carriageway leaves only the outside lane open, an appropriate order must be in place to permit restricted vehicles to use the outside lane on the approach to the lane closure. An additional sign must also be provided which indicates that restricted vehicles may use the outside lane. The risk-based design for this option must demonstrate that restricted vehicles will be able to move from the inside lane to the outside lane in the distance from the first wicket sign to a point 100m from the first cone of the taper. An offside taper (using the protection of IPVs) and a changeover may be considered if additional signing cannot be installed. Stepped tapers are not recommended.

7.16.11. In summary the options below should only be considered if all of the following eligibility criteria are met:

- the scheme is a relaxation scheme, as defined in **Section 2.3**.
- backlit sequentially flashing warning lamps are installed on the lead-in, see **4.22.8**.
- the traffic flow past the site is less than that defined in **Appendix A2** and sign obscuration is not likely to be an issue.
- the contractor has carried out a suitable site-specific risk assessment which indicates that it is safe to implement.
- signs of a sufficient size to be read by approaching road users can be installed and are available for use.

7.16.12. Reduced levels of sign provision may be made on lower speed roads subject to the above criteria.

7.16.13. A reduction in the level of signing provision for Standard schemes is not permitted as part of the guidance of this section.

7.16.14. **Figure 7.25** shows the normal relaxation layout. **Figure 7.26** to **Figure 7.28** show examples of various reduced levels of signing provision. They are neither exhaustive nor prescriptive. Other signing combinations may be used, providing the criteria in **Appendix A7** is met.

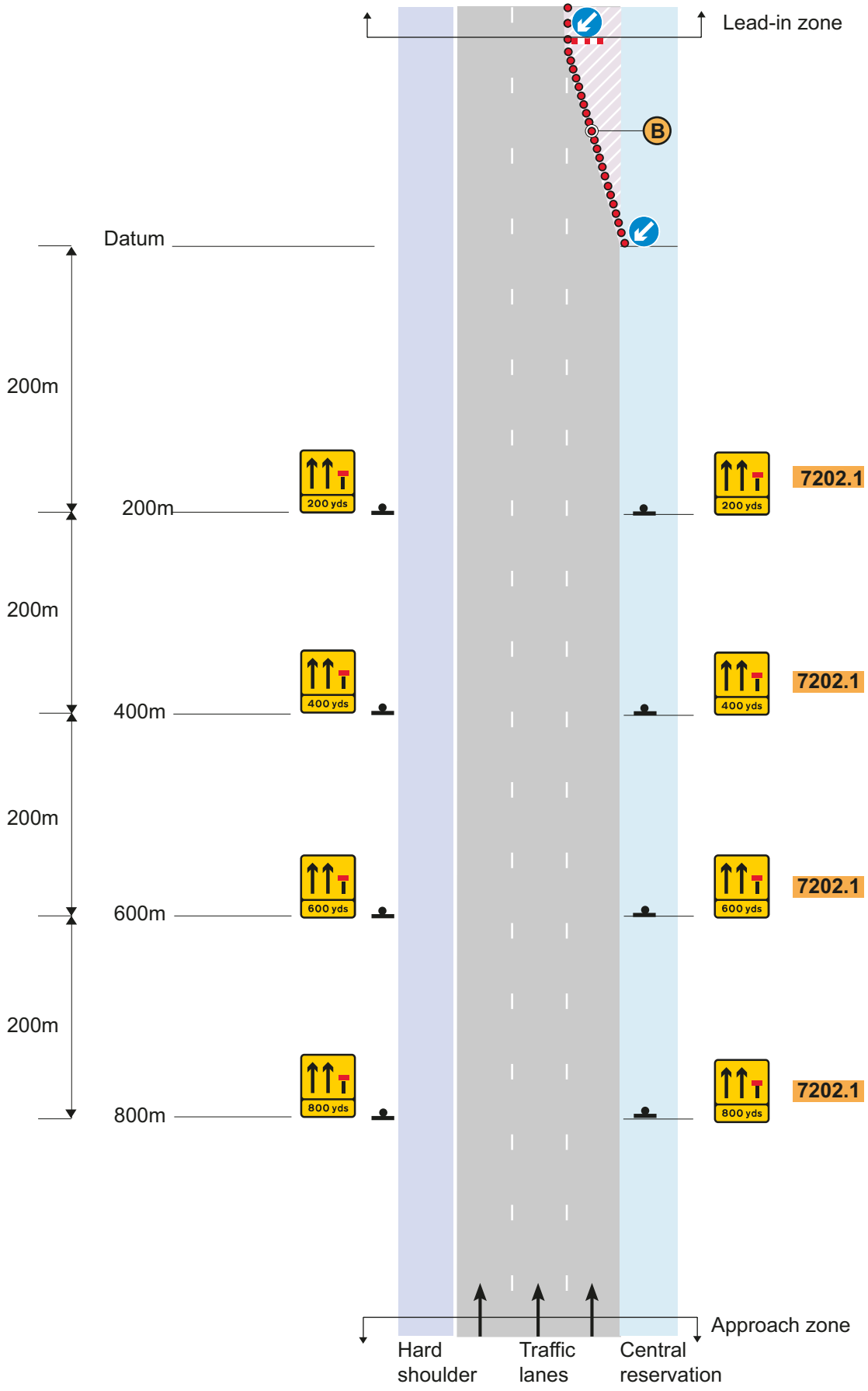


Figure 7.25 Normal levels of signing provision for relaxation schemes

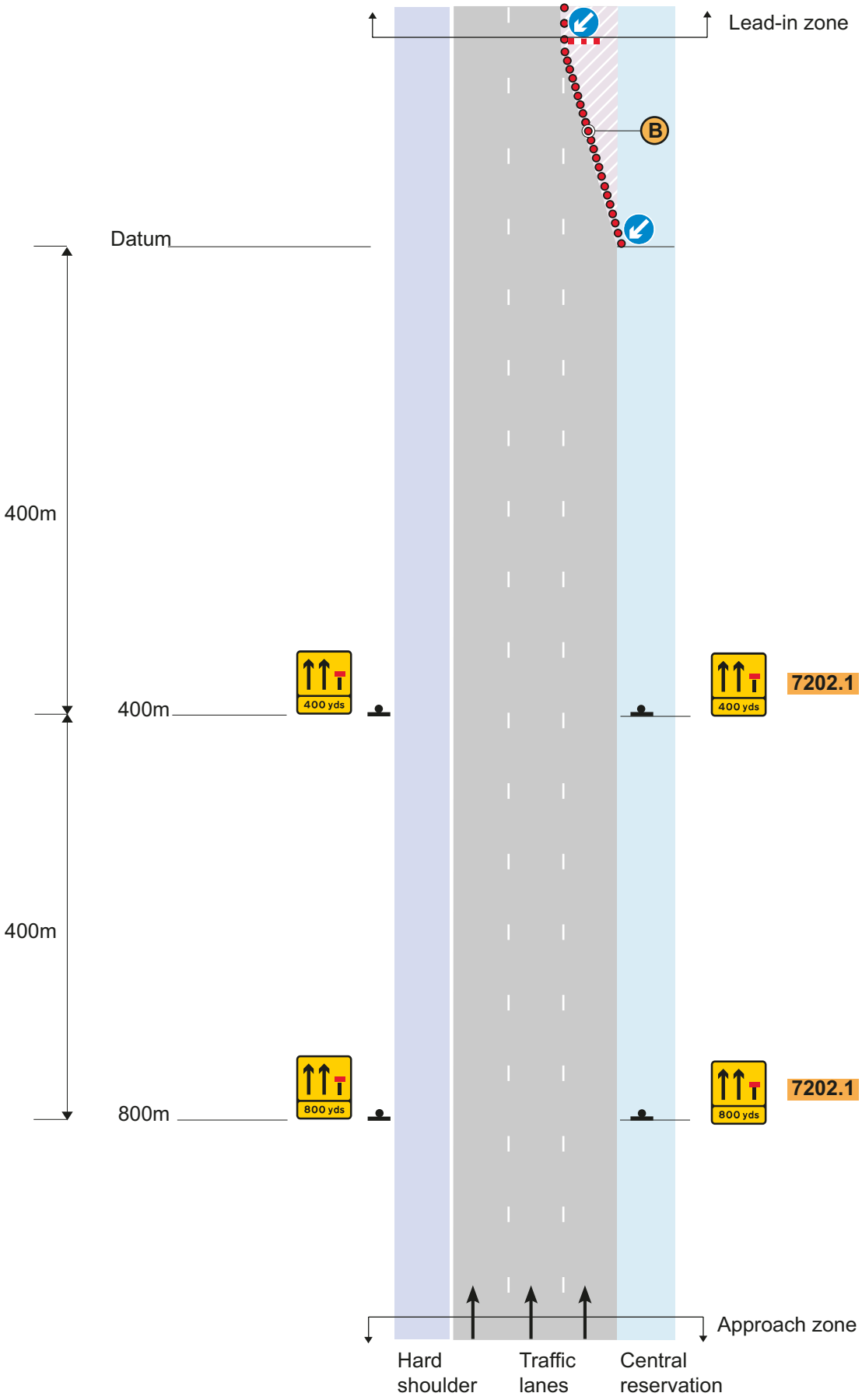


Figure 7.26 Example of reduced levels of signing provision for relaxation schemes with a nearside or offside taper (offside shown), with the removal of 200 and 600 yds signs

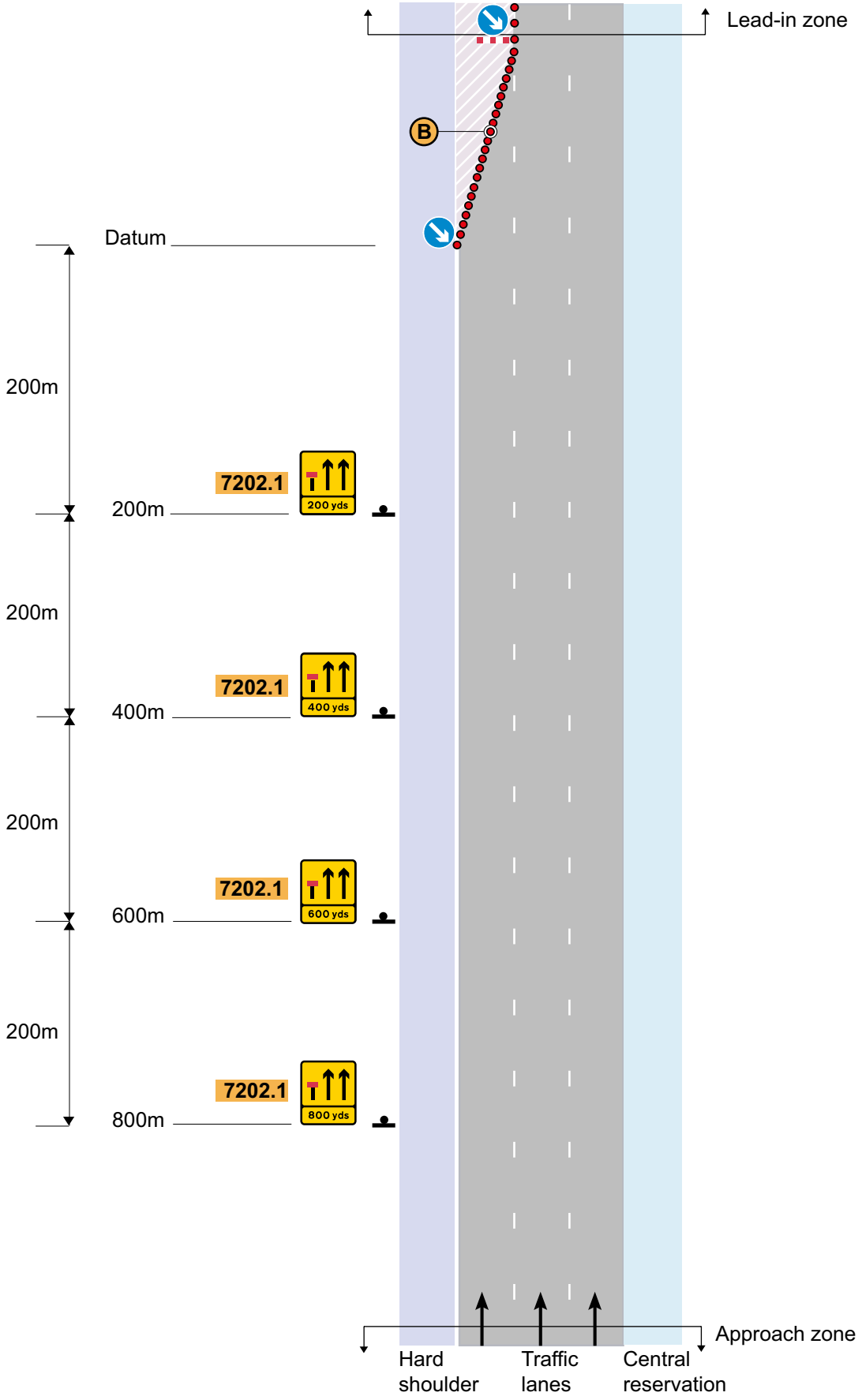


Figure 7.27 Example of reduced levels of signing provision for relaxation schemes with a nearside taper, where the offside signs are removed

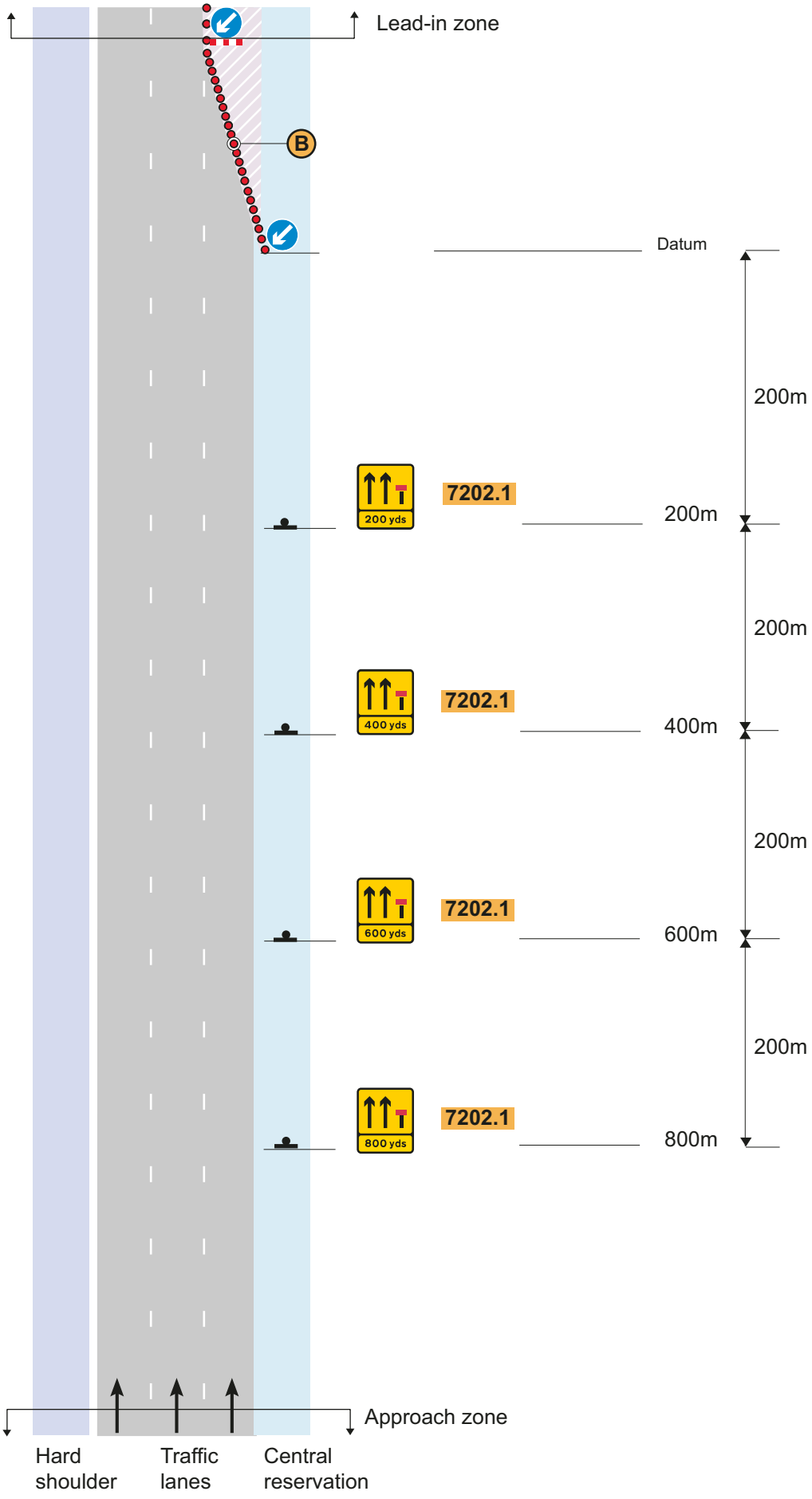


Figure 7.28 Example of reduced levels of signing provision for relaxation schemes with an offside taper, with the removal of the nearside signs

The alternative entry taper – application and use

7.16.15. Where conditions are suitable, the alternative entry taper layout described below (see **Figure 7.29**) may be used as a direct replacement for the relaxation scheme entry taper shown in Plan DZB3 (see **Figure 7.30**). This is subject to the outcomes of an appropriate risk assessment.

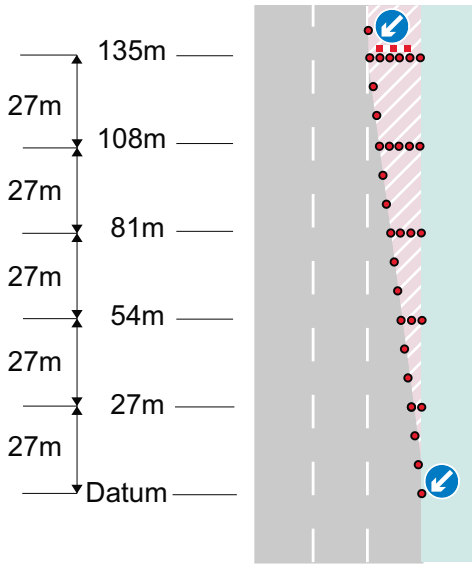


Figure 7.29 Alternative layout for an entry taper for relaxation scheme works on a dual carriageway

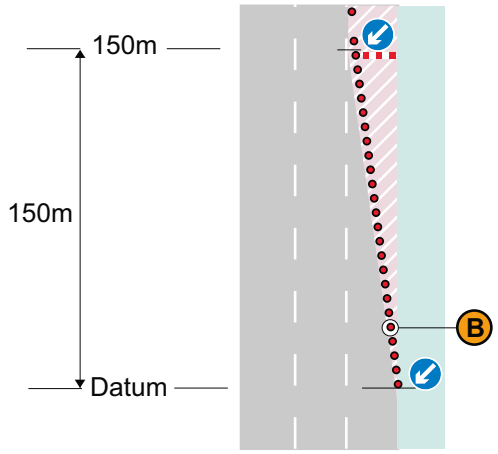


Figure 7.30 Relaxation scheme entry taper layout (from **Plan DZB3**)

7.16.16. The alternative entry taper layout may be used for relaxation scheme TTM at road works on dual carriageways, where single or multiple lane closures are to be installed on the offside or nearside. Where more than one lane is closed, to avoid a visual gap, the first two perpendicular lines of cones on the second and subsequent lanes will need to be formed of at least four cones.

7.16.17. The alternative entry taper arrangement consists of five rows of cones placed perpendicular to the normal axis of travel at 27 m centres. Each successive row in the direction of travel has one additional cone, with two intermediate cones placed at 9 m centres between the perpendicular rows.

7.16.18. Sequentially flashing road danger lamps are placed on the outer cones of each perpendicular row and on the intermediate cones between the perpendicular rows. This configuration is repeated in each lane closed.

7.16.19. This layout slightly shortens the relaxation scheme entry taper to 135 m per lane. The impact of this needs to be considered when applying the entry taper. A 135 m taper may

be suitable for use where the permanent speed limit is 50 mph and above and where lane line modules are 9 m long. Where the speed limit is 40mph or less and lane line modules are 6 m in length, a 90 m taper per lane (with the spacing identified above reduced by a third) may be acceptable subject to a site-specific risk assessment. A Stopping Sight Distance of 140 m will need to be achieved for all permanent speed limits up to 40 mph.

7.16.20. The type of taper used must be given particular consideration during the planning stage to ensure that risk is adequately controlled for both road users and road workers.

7.16.21. Road conditions must be accounted for when deciding to adopt the alternative entry taper layout (see **Sections 2.3** and **4.7**).

7.16.22. If the alternative entry taper layout is inappropriate, the entry taper layout shown in Plan DZB3 should be specified for relaxation works (see **Figure 7.30**). The alternative entry taper is unlikely to be suitable for use with automatic cone laying machines.

7.17 Lead in zone

7.17.1. Keys to the plans are given in **Tables A1.4** and **A1.5** of **Appendix A1**.

7.17.2. The lead-in zone starts at the point at which all lane changes, if required, should have been completed and continues to the beginning of the longitudinal safety zone.

Principles of design for the lead in zone

Plan DZC1: Lead-in zone for a single-lane changeover on a dual carriageway road with a permanent speed limit of 40 mph or less

Guidance on the design of the changeover is given in **Section 7.6**.

Principles for the guide island are:

- coning to Detail F is used to guide traffic past the island – if existing carriageway markings are suitably located and in good condition then Detail C1 may be used.
- the length of the guide island, excluding tapers, is 100 m.

Principles for the guide island for which relaxations apply are as for standard works except:

- coning to Detail C1 is used to guide traffic past the island.

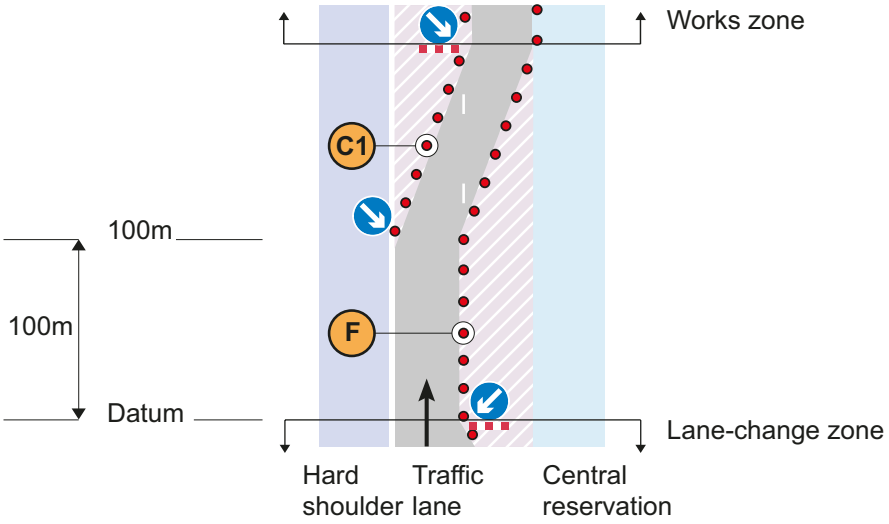
Principles for the changeover are:

- straight ‘taper’ or smooth ‘S’ shaped curve layout.
- length of changeover as detailed in **Table 7.6**.
- coning to 9 m spacing either side of the changeover (Detail C1).
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the crossover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the changeover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed.
- if a temporary mandatory reduced speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lane change zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

Where the changeover is below standard, a sign to diagram 7245 (S13-6-16) should be considered for single-lane changeovers.

Plan DZC1 Lead-in zone for a single-lane changeover on a dual carriageway road with a permanent speed limit of 40 mph or less



NOTE: For changeover length see **Table 7.6**.

Plan DZC2: Lead-in zone for a single-lane changeover on a high-speed dual carriageway road

Guidance on the design of the changeover is given in **Section 7.6**.

Principles for the guide island are:

- coning to Detail F is used to guide traffic past the island – if existing carriageway markings are suitably located and in good condition then Detail C1 may be used.
- the length of the guide island, excluding tapers, is 200 m.

Principles for the guide island for which relaxations apply are as for standard works except:

- coning to Detail C1 is used to guide traffic past the island.

Principles for a single-lane changeover are:

- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the changeover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the changeover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed.
- coning to Detail E is used on the nearside.
- coning to Detail F is used on the offside.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lane-change zone onwards. For the spacing of speed limit repeater signs, see **Table 4.5** in **4.8.27**.

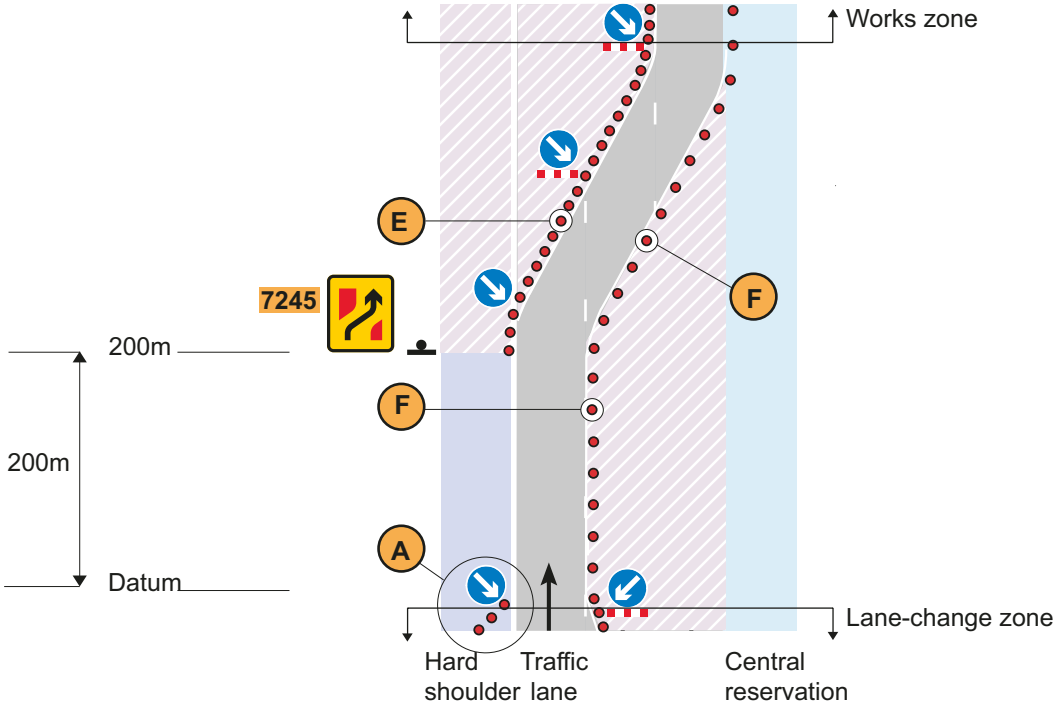
Principles for a single-lane changeover for works for which relaxations apply are as for standard works except:

- coning to Detail B is used on the nearside.
- coning to Detail C1 is used on the offside.

The sign to diagram 7245 (S13-6-16) at the start of the changeover may be omitted.

Where the hard shoulder is not used for a works entry, and works access signs are not in place, an additional Detail A should be placed at the start of the coning blocking the hard shoulder.

Plan DZC2 Lead-in zone for a single-lane changeover on a high-speed dual carriageway road



Plan DZC3: Lead-in zone for a two-lane changeover

Guidance on the design of the changeover is given in **Section 7.6**.

Principles for the guide island are given in **Plan DZC2**.

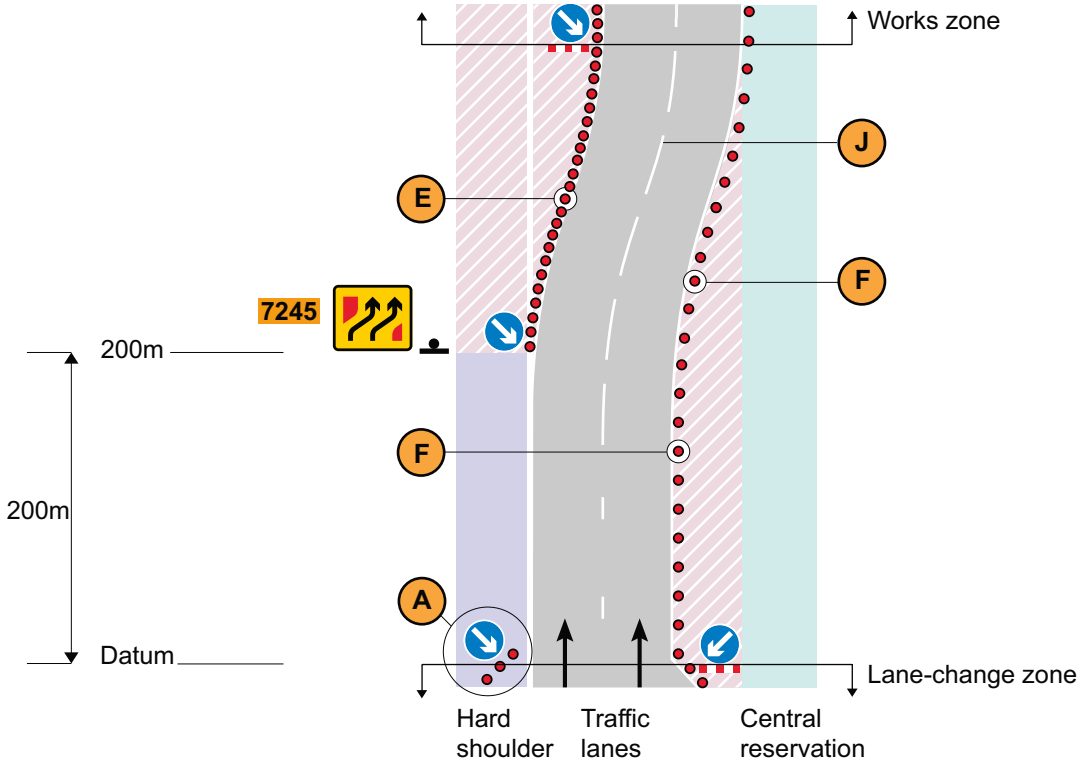
Principles for the changeover are:

- a ‘lane alignment’ sign to diagram 7245 (S13-6-16) is located on the nearside at the start of the changeover.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the changeover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier (to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the changeover.
- one ‘lane closed’ barrier (to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed.
- coning to Detail E is used on the nearside.
- coning to Detail F is used on the offside.
- lane markings to Detail J are used between the two lanes.
- if a temporary mandatory reduced speed limit is in place, signs to diagram 670 (S10-2-1) should be placed from the lane-change zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

Where the hard shoulder is not used for a works entry, and works access signs are not in place, an additional Detail A should be placed at the start of the coning blocking the hard shoulder.

Plan DZC3 Lead-in zone for a two-lane changeover



Plan DZC4: Lead-in zone for a single-lane changeover onto the hard shoulder

Guidance on the design of the changeover is given in **Section 7.6**.

The principles for moving a lane to the hard shoulder are:

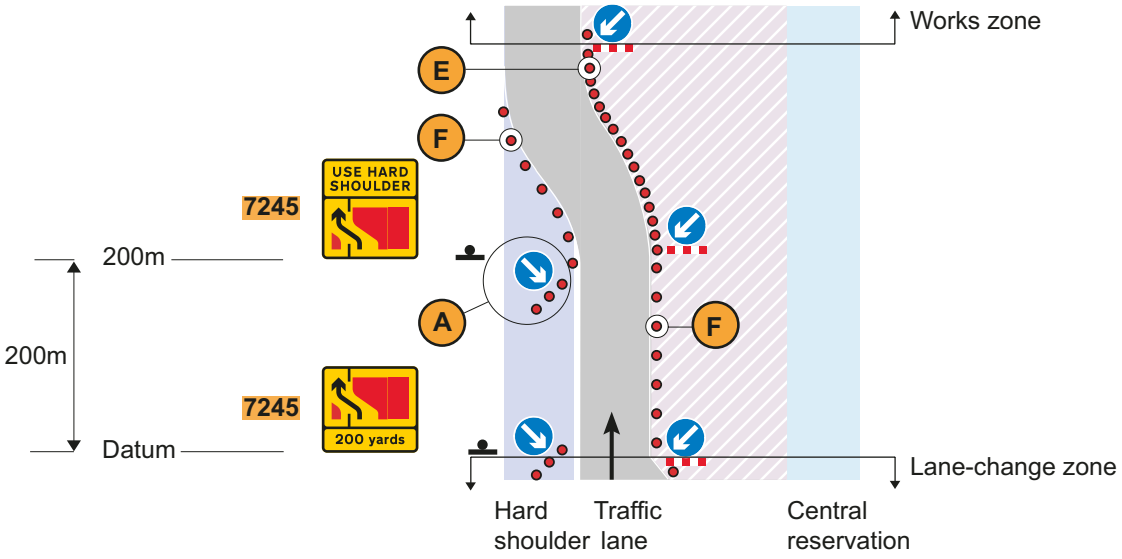
- the minimum signing requirement is the ‘use hard shoulder’ sign to diagram 7245 (S13-6-16), with the top panel ‘USE HARD SHOULDER’, at the start of the changeover in advance of the coning. Consider placing the ‘use hard shoulder’ sign variation to diagram 7245, with the bottom panel ‘200 yds’, 200 m in advance of the start of the changeover.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the changeover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3) at the end of the changeover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed.
- coning to Detail F is used on the nearside.
- coning to Detail E is used on the offside.
- signing to Detail A is used on the hard shoulder at the start of the lane move in advance of the coning.
- if a temporary mandatory reduced speed limit is in place, signs to diagram 670 (S10-2-1) should be placed from the lane-change zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

For signs where the lanes are split in advance of the hard shoulder running, between hard shoulder and secondary carriageway, see **Plan DZC9**.

The principles for works for which relaxations apply are as for standard works except:

- coning to Detail C1 is used on the nearside.
- coning to Detail B is used on the offside.
- subject to the outcomes of a risk assessment, the hard shoulder/lane 1 raised rib marking may be retained at the changeover.

Plan DZC4 Lead-in zone for a single-lane changeover onto the hard shoulder



Plan DZC5: Lead-in zone for a two-lane changeover with narrow lanes using the hard shoulder

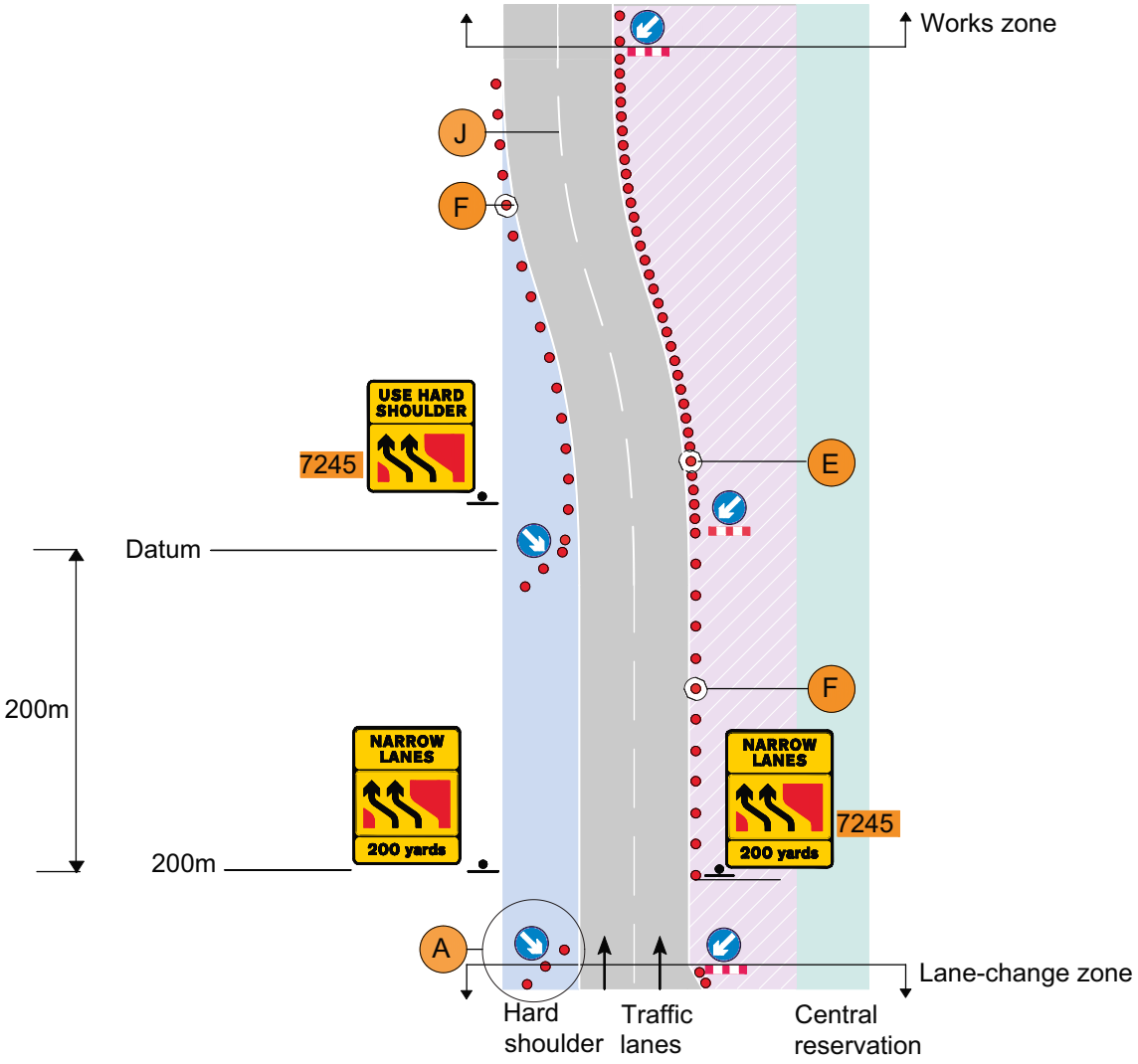
Guidance on the design of the changeover is given in **Section 7.6**.

The principles for the changeover are:

- a ‘move to the hard shoulder’ sign to diagram 7245 (S13-6-16) with top panel ‘NARROW LANES’ and bottom panel ‘200 yds’, on the nearside and offside placed 200 m in advance of the changeover. This sign may be located in the lane-change zone if the lane move is the first manoeuvre of the road works as in the secondary direction of a partial contraflow system.
- a ‘move to the hard shoulder’ sign to diagram 7245 (S13-6-16), with top panel ‘USE HARD SHOULDER’, on the nearside placed at the start of the changeover.
- coning to Detail F is used on the nearside.
- coning to Detail E is used on the offside.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the changeover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier (to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3) at the end of the changeover.
- one ‘lane closed’ barrier (to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed.
- white lining or temporary studs to Detail J is used as road marking between lanes.
- signing to Detail A is used on the hard shoulder at the start of the changeover.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

Plan DZC5 Lead-in zone for a two-lane changeover with narrow lanes using the hard shoulder



Plan DZC6: Lead-in zone for a single-lane crossover

Guidance on the design of the crossover is given in **Section 7.5**.

Principles for the crossover are:

- a sign to diagram 7245 (S13-6-16) located on the offside at the start of the crossover.
- coning to Detail E is used on the nearside.
- coning to Detail F is used on the offside.
- if a buffer zone is present, the coning to Detail F on the offside is followed by cylinders and studs to Detail H (as shown). Detail K is used if narrow lanes are present. If a buffer lane is present, then the coning to Detail F is followed by coning to Detail C1.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the crossover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the crossover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed. The central reservations should be signed the same as one or two lanes depending on its width.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

Principles for a single-lane crossover for works for which relaxations apply are as for standard works except:

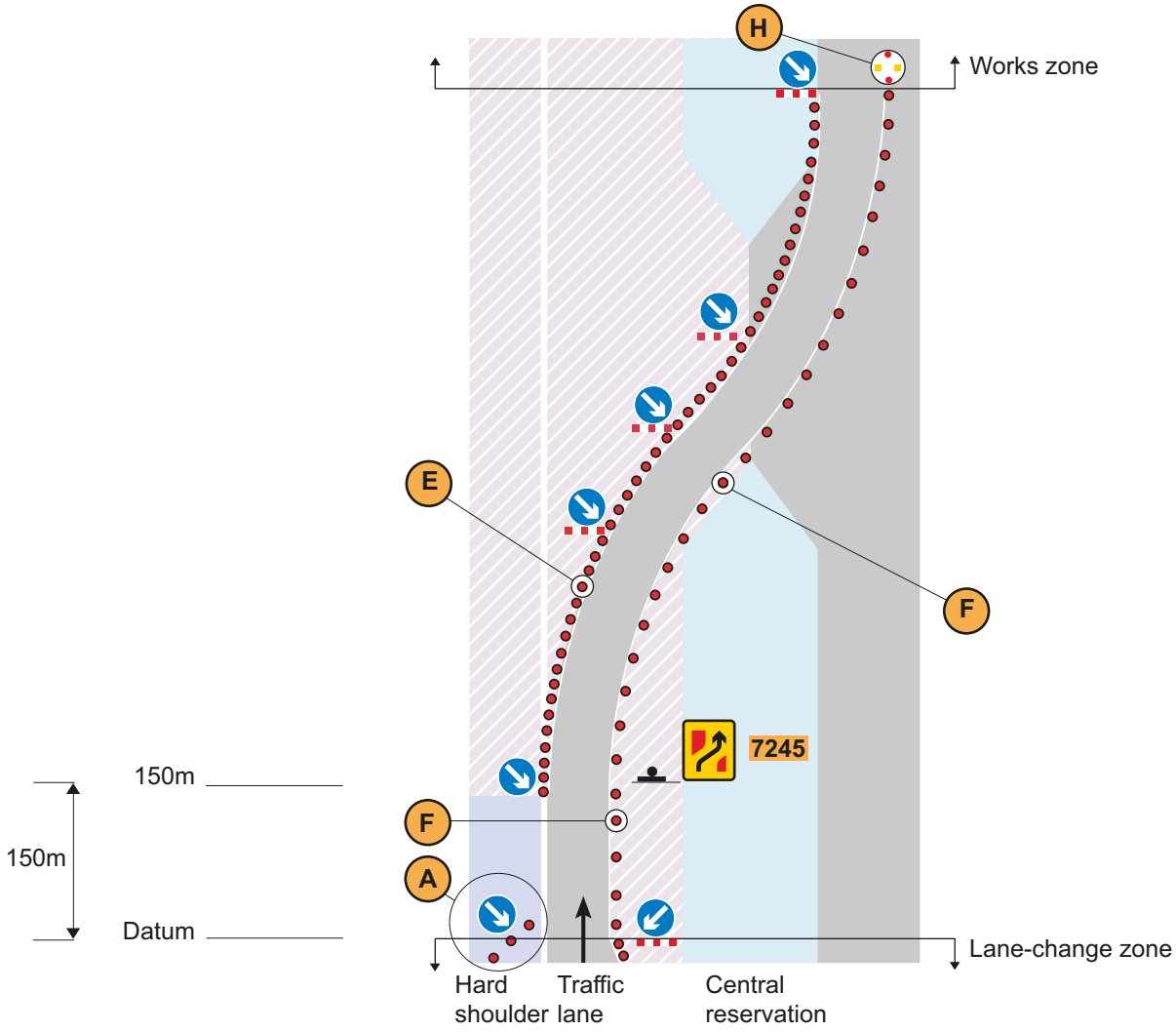
- coning to Detail B is used on the nearside.
- coning to Detail C1 is used on the offside.

For crossovers with a sharp deviation (see **7.5.9**), ‘sharp deviation of route’ signs to diagram 7104 (S13-6-7), with ‘turn left/right’ signs to diagram 606 (S3-2-1), should replace the ‘lane closed’ barriers to diagram 7105 (S13-6-8) and ‘keep left/right’ signs to diagram 610 (S3-2-3).

Where the hard shoulder is not used for a works entry, and works access signs are not in place, an additional Detail A should be placed at the start of the coning blocking the hard shoulder.

For dual carriageways without hard shoulders, it may be appropriate for traffic to be in lane 2 or 3 approaching the crossover to enable works access from lane 1.

Plan DZC6 Lead-in zone for a single-lane crossover



Plan DZC7: Lead-in zone for a two-lane crossover

Guidance on the design of the crossover is given in **Section 7.5**.

Principles for the crossover are:

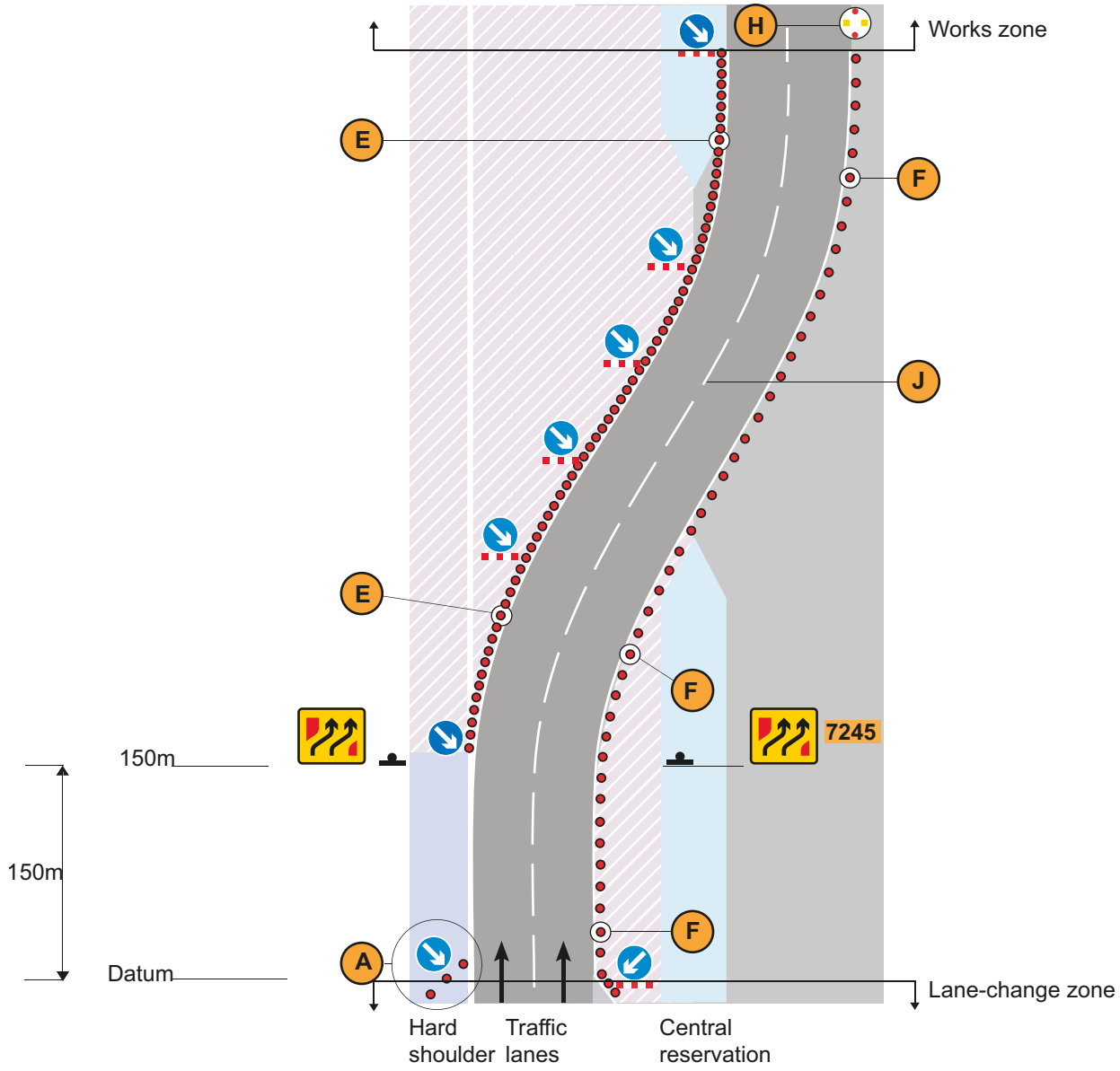
- two ‘diversion of lanes onto the other carriageway’ signs to diagram 7245 (S13-6-16), located on either side of the carriageway at the start of the crossover.
- coning to Detail E is used on the nearside.
- coning to Detail F is used on the offside.
- if a buffer zone is present, the cylinders and studs to Detail H (as shown) are placed on the offside following coning to Detail F. Detail K is used instead for narrow lanes. If a buffer lane is present, coning to Detail C1 should follow the coning to Detail F on the offside.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the crossover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the crossover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed. The central reservations should be signed the same as one or two lanes depending on its width.
- white lining or temporary studs to Detail J used as road marking between lanes.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

An additional Detail A should be placed at the start of the coning to block the hard shoulder if it is not used for a works entry and works access signs are not in place.

In order to enable works access from lane 1, for works on dual carriageways without hard shoulders, it may be appropriate for traffic to be in lanes 2 and 3 approaching the crossover.

Plan DZC7 Lead-in zone for a two-lane crossover



Plan DZC8: Lead-in zone for a three-lane crossover with narrow lanes

Guidance on the design of the crossover is given in **Section 7.5**.

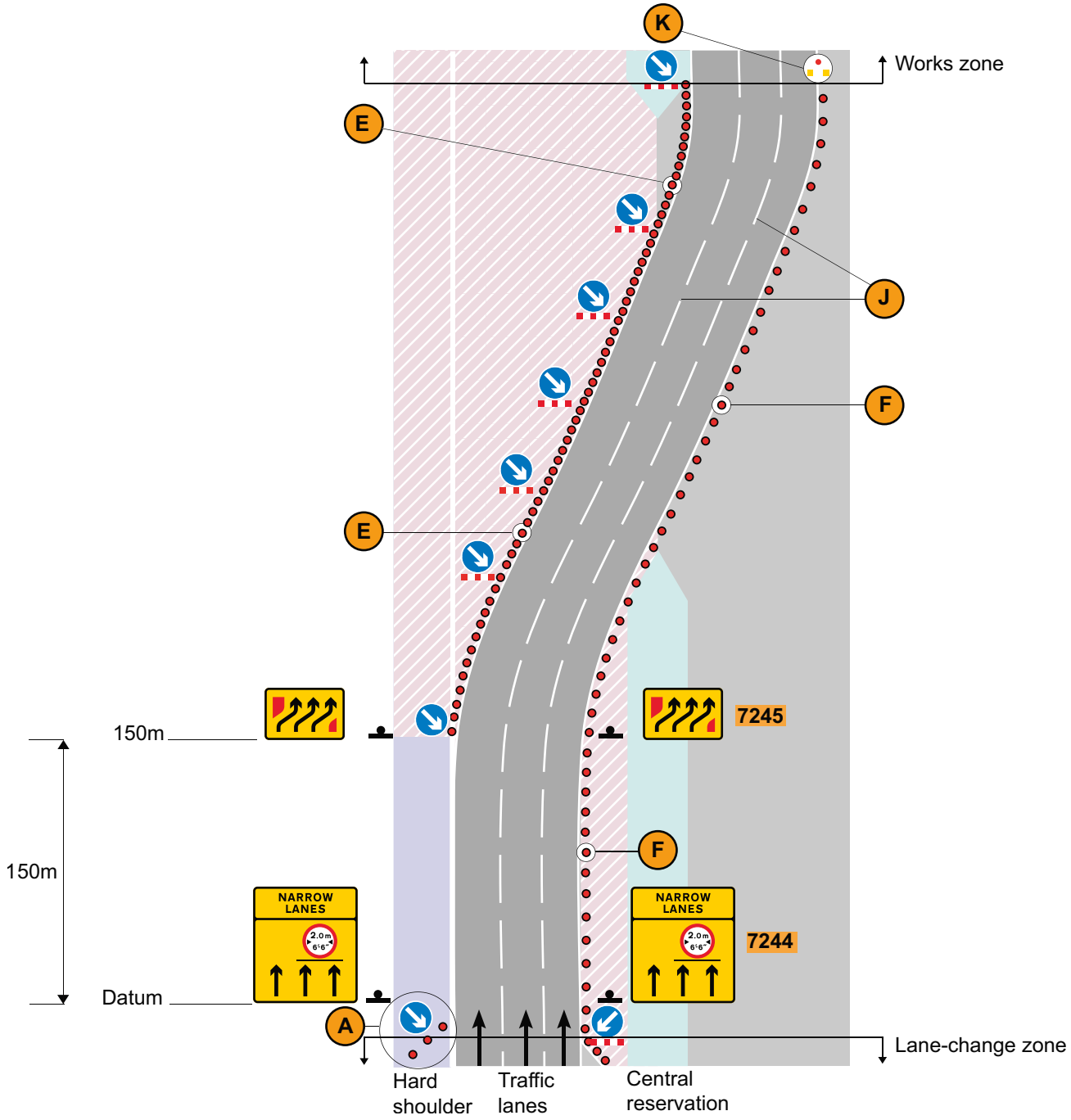
The principles for the crossover are:

- two ‘lane restriction’ signs to diagram 7244 (S13-6-15) with appropriate variation width symbols and top panel ‘NARROW LANES’, on the nearside and offside 150 m in advance of the start of the crossover.
- two ‘diversion of lanes onto other carriageway’ signs to diagram 7245 (S13-6-16) located on either side of the carriageway at the start of the crossover.
- coning to Detail E is used on the nearside.
- coning to Detail F is used on the offside.
- if a buffer zone is present, the cylinders and studs to Detail H (as shown) are placed on the offside following coning to Detail F. Detail K is used instead for narrow lanes.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the crossover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the crossover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed. The central reservations should be signed the same as one or two lanes depending on its width.
- white lining or temporary studs to Detail J used as road marking between lanes.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

An additional Detail A should be placed at the start of the coning to block the hard shoulder if it is not used for a works entry and works access signs are not in place.

Plan DZC8 Lead-in zone for a three-lane crossover with narrow lanes



Plan DZC9: Lead-in zone for splitting lanes for a changeover onto the hard shoulder and a single- lane crossover

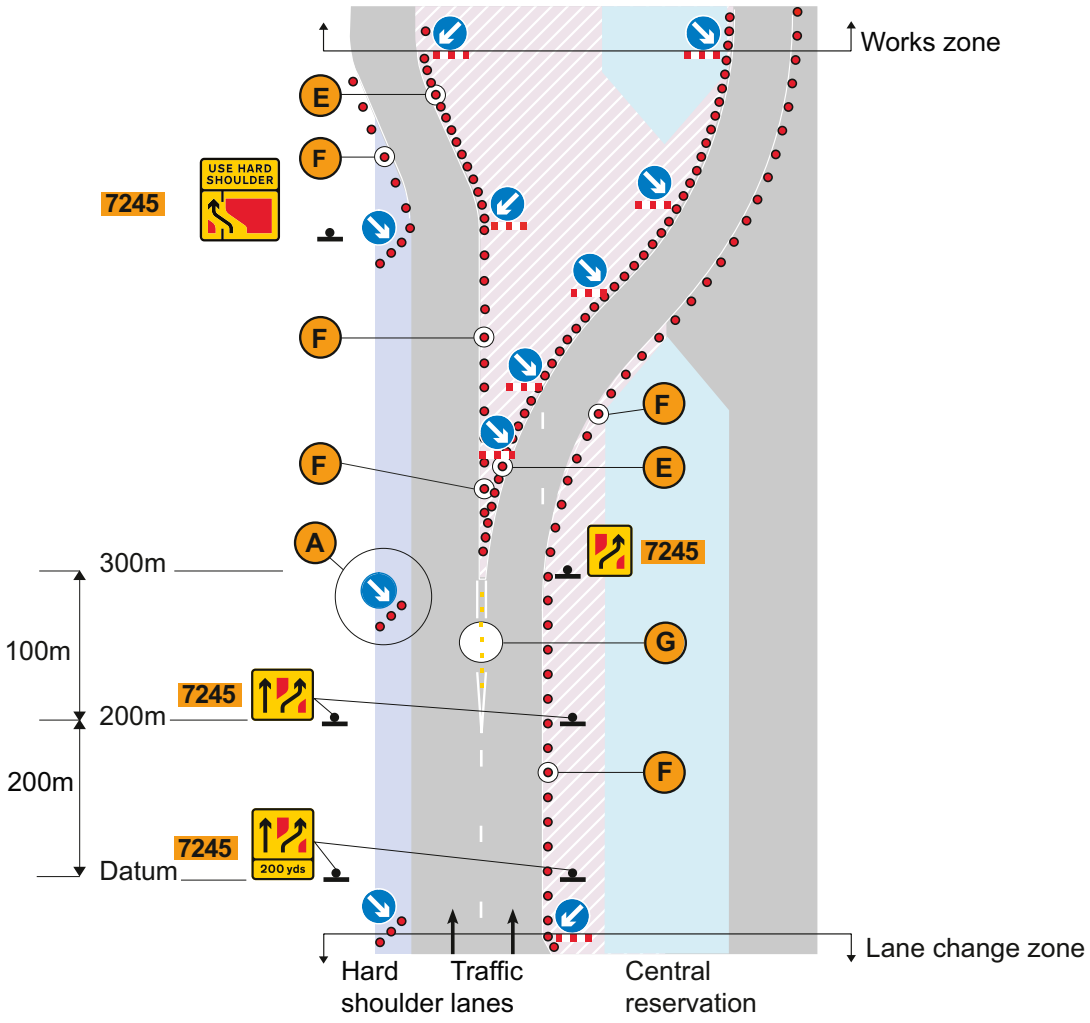
Guidance on the design of the crossover and changeover is given in **Section 7.5** and **7.6**.

The principles for splitting lanes are:

- Detail G for at least 100 m up to the ‘nose’ of the divide – there are two options:
  - using studs and traffic cylinders; a minimum of 50 m of Detail G2 followed by a minimum of 50 m of Detail G1, or.
  - using studs and road markings; a minimum of 100 m of Detail G3.
- a ‘diversion of right-hand lane onto the other carriageway’ signs to diagram 7245 (S13-6-16) with a ‘200 yds’ bottom panel, on both sides of the carriageway 200 m from the start of Detail G.
- a ‘diversion of right-hand lane onto the other carriageway’ signs (variation to 7245) on both sides of the carriageway at the start of Detail G.
- a ‘diversion onto the other carriageway’ sign variant to 7245 (S13-6-16) is located on the offside at the start of the crossover.
- a ‘use hard shoulder’ sign variant to 7245 (S13-6-16) with a ‘USE HARD SHOULDER’ top panel is located on the nearside at the start of the changeover onto the hard shoulder.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

Plan DZC9 Lead-in zone for splitting lanes for a changeover onto the hard shoulder and a single- lane crossover



7.18 Works zone

7.18.1. The works zone is the space between the start of the longitudinal safety zone and the end of the works area.

7.18.2. The works area for full contraflow layouts should include a continuous and unobstructed emergency route through the site that is available for use at all times.

Principles of design for the works zone

Plan DZD1: Works zone for a full lane closure on a dual carriageway road with a permanent speed limit of 40 mph or less

The principles are:

- coning to Detail C1 is required.
- a sign indicating the number of lanes open to traffic to diagram 7245 (S13-6-16) is required, with distance plate 'For x miles', located on the offside at ½ mile intervals.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

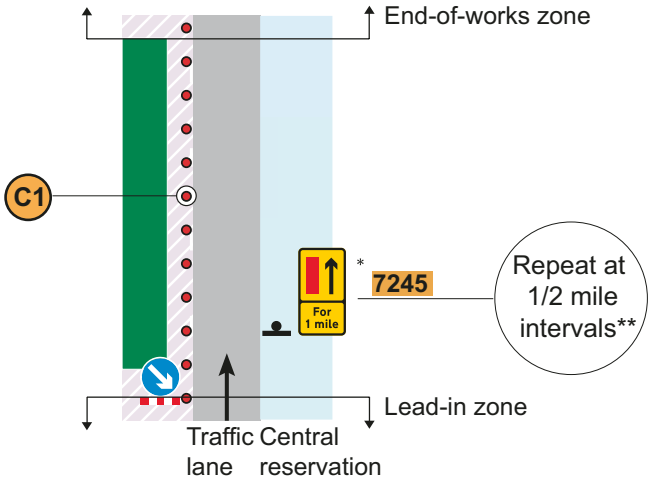
Relaxations:

- signs to diagram 7245 (S13-6-16) are not required.

A 'keep left/right' sign to diagram 610 (S3-2-3) should be placed on the approach to any works area located after the access. Additional signs to diagram 610 may be needed, following an assessment, to provide additional guidance if required to address specific risks in the works zone or changes in road geometry.

Similar signing is required for right-hand closures.

Plan DZD1 Works zone for a full lane closure on a dual carriageway road with a permanent speed limit of 40 mph or less



* Not required where there is a relaxation

** Up to a distance of 3 miles, then at 1 mile intervals

Plan DZD2: Works zone with the running lane on the same carriageway

The principles for marking running lanes through the works area are:

- coning to Detail F is used if the running lane is adjacent to the works. Detail C1 may be used instead if existing carriageway markings are suitably located and in good condition.
- a sign diagram 7245 (S13-6-16), with distance plate 'For x miles', is required. They should be located on the offside at ½ mile intervals to indicate the number of lanes open to traffic.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

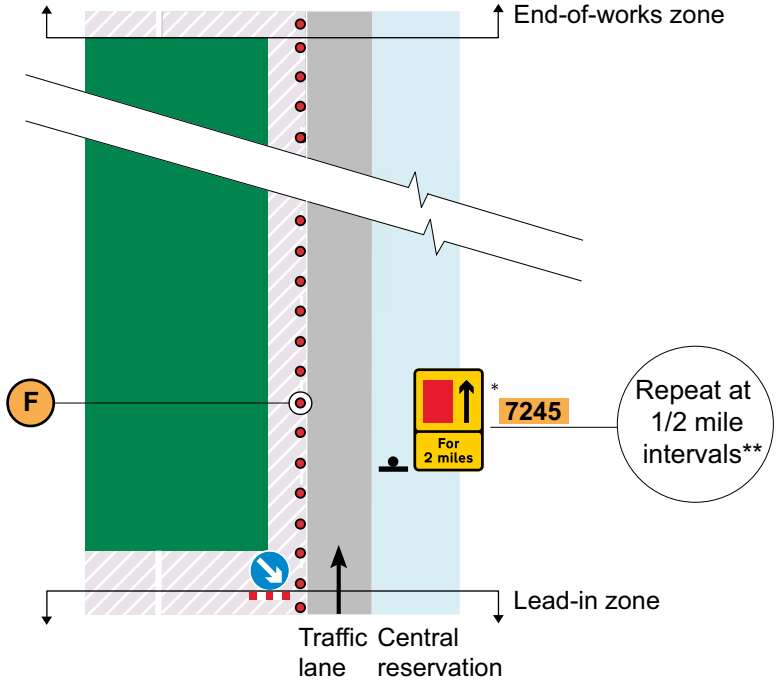
A 'keep left/right' sign to diagram 610 (S3-2-3) should be placed on the approach to any works area located after the access. Additional signs to diagram 610 may be needed, following an assessment, to provide additional guidance if required to address specific risks in the works zone or changes in road geometry.

Relaxations:

For non-contraflow situations:

- coning to Detail F or C1 may be replaced by coning to Detail C1 or D. Cone spacing depends on the permanent speed limit – see **Table A1.3** (**Appendix A1**).
- signs to diagram 7245 (S13-6-16) and associated distance plates are not required.

Plan DZD2 Works zone with the running lane on the same carriageway



* Not required where there is a relaxation.

**Up to a distance of 3 miles, then at 1 mile intervals

Plan DZD3: Works zone showing a buffer lane

The principles for marking the running lanes on the primary carriageway alongside the works area are:

- coning to Detail F is used. Detail C1 may be used instead if existing carriageway markings are suitably located and in good condition.
- a sign diagram 7245 (S13-6-16), with distance plate 'For x miles', is required. They should be located on the offside at ½ mile intervals to indicate the number of lanes open to traffic.
- a 'keep left/right' sign to diagram 610 (S3-2-3) should be placed on the approach to any works area located after the access. Additional signs to diagram 610 may be needed, following an assessment, to provide additional guidance if required to address specific risks in the works zone or changes in road geometry.

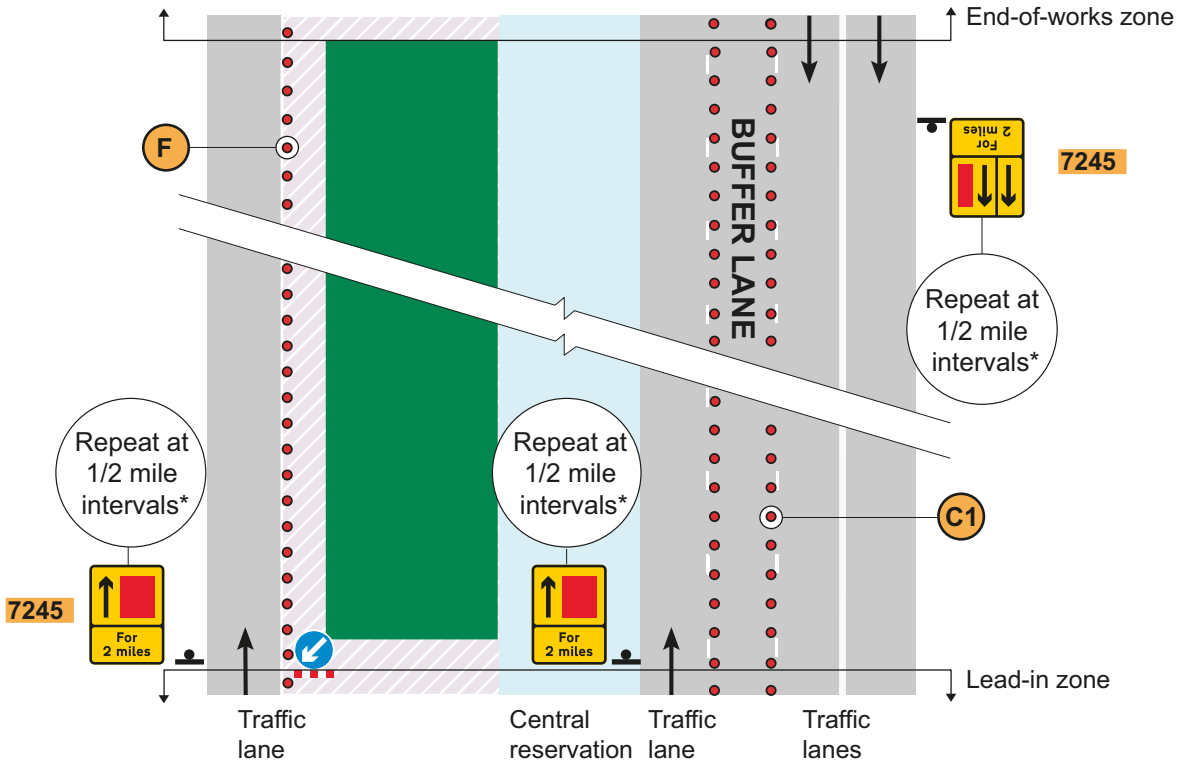
The principles for marking the running lanes on the secondary carriageway are:

- coning to Detail C1 is placed inside the existing road marking for a running lane adjacent to a buffer lane. Coning to Detail F is used where existing road markings are not suitable.
- signs to diagram 7245 (S13-6-16) with distance plate are placed on the central reservation and repeated every ½ mile across the length that vehicles are required to cross over and use the secondary carriageway. Variation signs to diagram 7245 (S13-6-16) showing black and white arrows in opposing directions, are not used.
- in the secondary direction, a sign to diagram 7245 (S13-6-16) and distance plate that permits the use of the hard shoulder is required. This combination is repeated every ½ mile on the nearside.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

Relaxations:

- coning to Detail F may be replaced by coning to Detail C1 or D. Cone spacing depends on the permanent speed limit – see **Table A1.3** (**Appendix A1**).

Plan DZD3 Works zone showing a buffer lane



*Up to a distance of 3 miles, then at 1 mile intervals

Plan DZD4: Works zone showing a buffer zone

The principles for marking the running lanes on the primary carriageway alongside the works area are:

- coning to Detail F is used. Detail C1 may be used instead if existing carriageway markings are suitably located and in good condition.
- signs to diagram 7245 (S13-6-16) with distance plate are placed on the nearside of the carriageway and repeated every ½ mile.

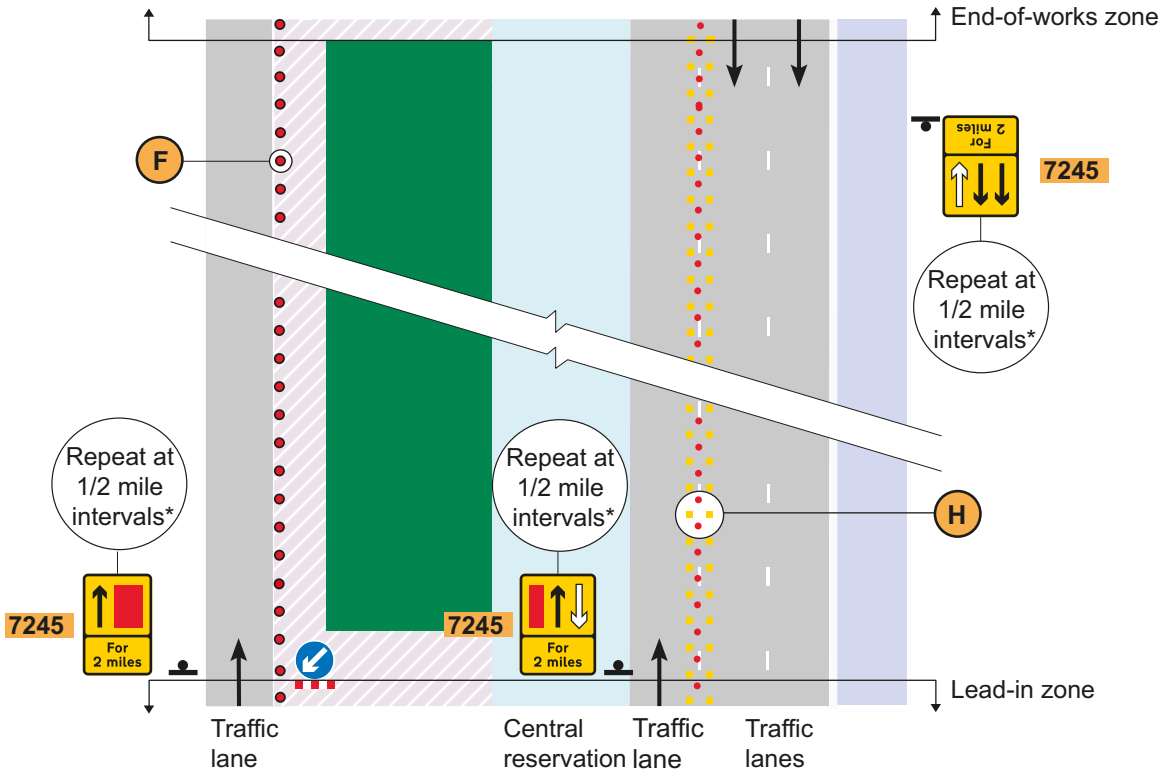
A ‘keep left/right’ sign to diagram 610 (S3-2-3) should be placed on the approach to any works area located after the access. Additional signs to diagram 610 may be needed, following an assessment, to provide additional guidance if required to address specific risks in the works zone or changes in road geometry.

The principles for marking the running lanes on the secondary carriageway are:

- cylinders and studs to Detail H are used where the running lane is adjacent to a buffer zone.
- coning to Detail E is used at the diversion of the primary carriageway, to and from the buffer zone.
- coning to Detail F is used on the secondary carriageway before and after the buffer zone.
- signs to diagram 7245 (S13-6-16) with distance plate indicate the number of lanes open to traffic and offside contraflow working if diverted carriageway is adjacent to a buffer zone. They are placed on the central reservation for primary carriageway traffic using the secondary carriageway. If restrictions apply, then this sign is replaced by the restriction sign to diagram 7244 (S13-6-15), which can incorporate variant symbols as appropriate to indicate lanes open to traffic and any imposed height, width and vehicular class restrictions.
- in the secondary direction, a sign to diagram 7245 (S13-6-16) indicating the number of lanes open to traffic and offside contraflow working, with distance plate, is required. This combination is repeated every ½ mile on the nearside.
- if a temporary vehicle safety restraint barrier is used to separate opposing flows, appropriate variation signs to diagram 7245 (S13-6-16) must be used (omitting to white secondary flow arrow).
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

Plan DZD4 Works zone showing a buffer zone



*Up to a distance of 3 miles, then at 1 mile intervals

Plan DZD5: Works zone with narrow lanes

The principles for marking the running lanes on the primary carriageway alongside the works area are:

- coning to Detail F is used. Detail C1 may be used instead if existing carriageway markings are suitably located and in good condition.
- a sign indicating the number of lanes open to traffic to diagram 7245 (S13-6-16), with distance plate ‘For x miles’, is required located on the nearside at ½ mile intervals.

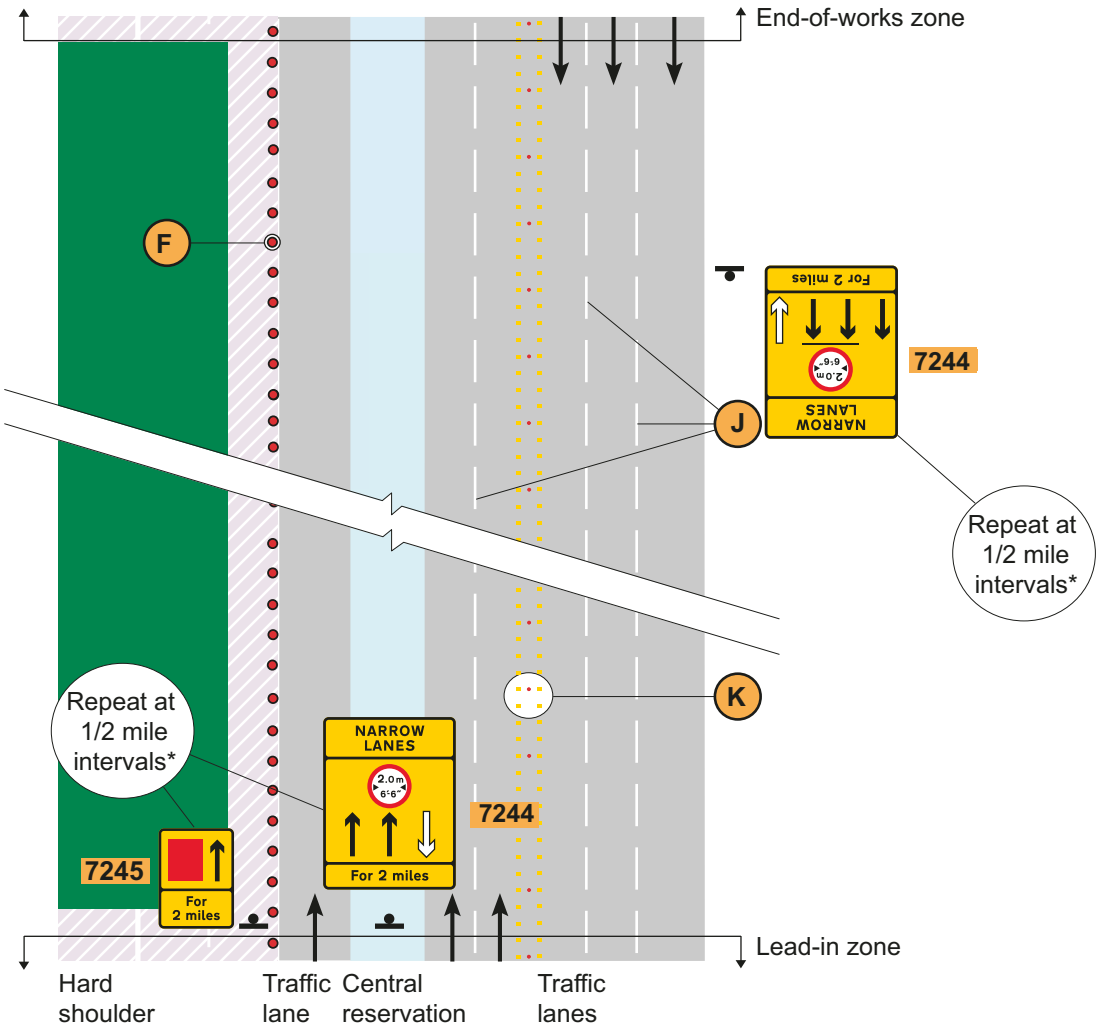
A ‘keep left/right’ sign to diagram 610 (S3-2-3) should be placed on the approach to any works area located after the access. Additional signs to diagram 610 may be needed, following an assessment, to provide additional guidance if required to address specific risks in the works zone or changes in road geometry.

The principles for marking the running lanes on the secondary carriageway are:

- the buffer zone is marked with cylinders and studs to Detail K.
- white lining or temporary studs to Detail J is used as marking between running lanes.
- signs to diagram 7244 (S13-6-15), with a top panel ‘NARROW LANES’ are used to indicate the lanes open to traffic and the distance over which any conditions apply. Variants should be used to indicate any imposed height, width and vehicular class restrictions. The first sign is located at the end of the initial crossover, then repeated at ½ mile intervals through the contraflow. Signs on the central reservation should be screened from traffic on the primary carriageway.
- signs to diagram 7244 (S13-6-15) and any appropriate variants are placed on the nearside for secondary carriageway traffic. The first sign is located opposite the start of the return crossover in the secondary direction, then repeated at ½ mile intervals through the contraflow.
- if a temporary vehicle safety restraint barrier is used to separate opposing flows, signs to diagram 7244 (S13-6-15) must not incorporate the contraflow symbol.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

No relaxations apply.

Plan DZD5 Works zone with narrow lanes



*Up to a distance of 3 miles, then at 1 mile intervals

Plan DZD6-D7: Works zone including a junction (primary and secondary carriageways)

7.18.3. These plans show segregated contraflows, where diverging and merging traffic uses the hard shoulder. **Plan DZD6** segregates traffic by destination.

Slip roads

7.18.4. Carriageways and slip roads (apart from lane gains) that join the main carriageway should be reduced to a single lane, whilst considering their potential use by wide loads . Where one dual carriageway joins another, the general principles for advance signing required and entry taper details should be taken from **Plan DZB5**. For a motorway/motorway intersection, **Plan DZB6** should be used. Where a speed limit lower than the permanent speed limit is in place speed limit signs will be required, placed on both sides of the carriageway.

Main carriageway

7.18.5. Where a lane diverges prior to a junction the following signs are used to direct traffic to the junction:

- existing final direction and advance direction signs or road markings downstream of the diverge that contain incorrect information should be covered up or removed as appropriate. This includes the 300, 200, and 100 yards countdown signs to diagrams 823, 824, and 825 (S11-2-21).
- the lane-change signs to diagram 7244 (S13-6-15), displaying route and junction number should be used to direct traffic to a junction exit where required.
- one pair of signs to diagram 7243 (S13-6-14) or diagram 7244 (S13-6-15), with a ‘USE HARD SHOULDER’ top panel and a route and junction number (if required), may be shown on the main panel above the diversion arrow and any symbol. The sign should be placed on both the nearside and offside of the carriageway directly before the hard shoulder diverge (part of the lead-in zone, see **Plan DZC9**).
- a yellow direction sign with route number and a direction arrow to diagram 7245 (S13-6-16) should be shown at the nosing of the hard shoulder diverge bifurcation (part of the lead-in zone, see **Plan DZC9**).
- a ‘lane closed’ barrier to diagram 7105 (S13-6-8) and ‘keep left/right’ arrow to diagram 610 (S3-2-3) are located behind the coning on the offside, facing approaching traffic at the start of slip road.

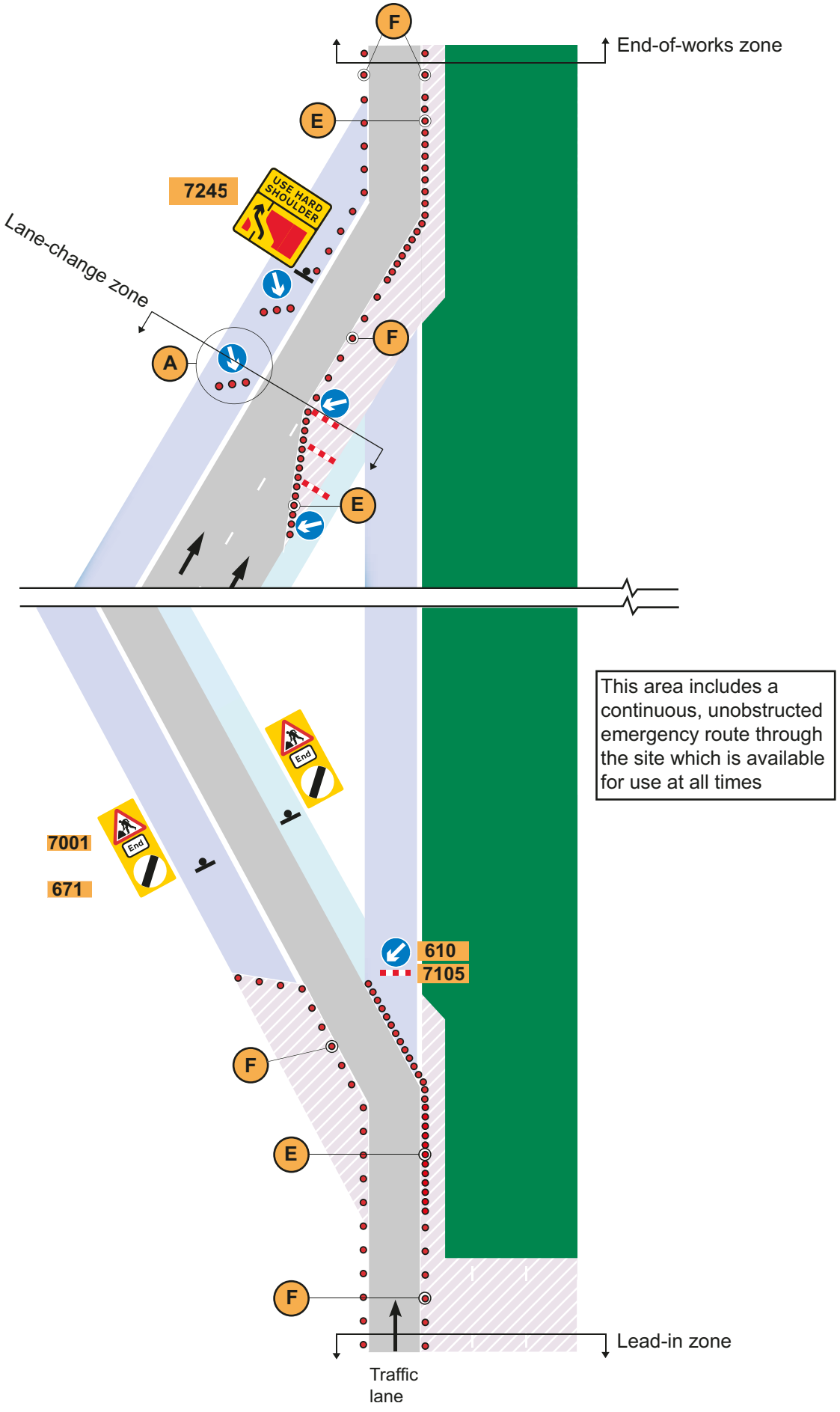
General

- coning to Detail F is required on long straight stretches. Detail C1 can be used instead if existing lane lines are suitable. Coning to Detail E should be used where coning is facing oncoming traffic.
- existing bifurcation arrows to diagram 1039 (S11-4-22) should be removed or masked.
- variant signs to diagram 7245 (S13-6-16) should be used on the slip road and main carriageway to indicate that additional traffic lanes from the slip road are joining the main carriageway.
- variant signs to diagram 7245 are used to indicate traffic lanes leaving and joining at a junction, whilst other variant signs to diagram 7245 (S13-6-16) are used to indicate traffic joining at a junction.

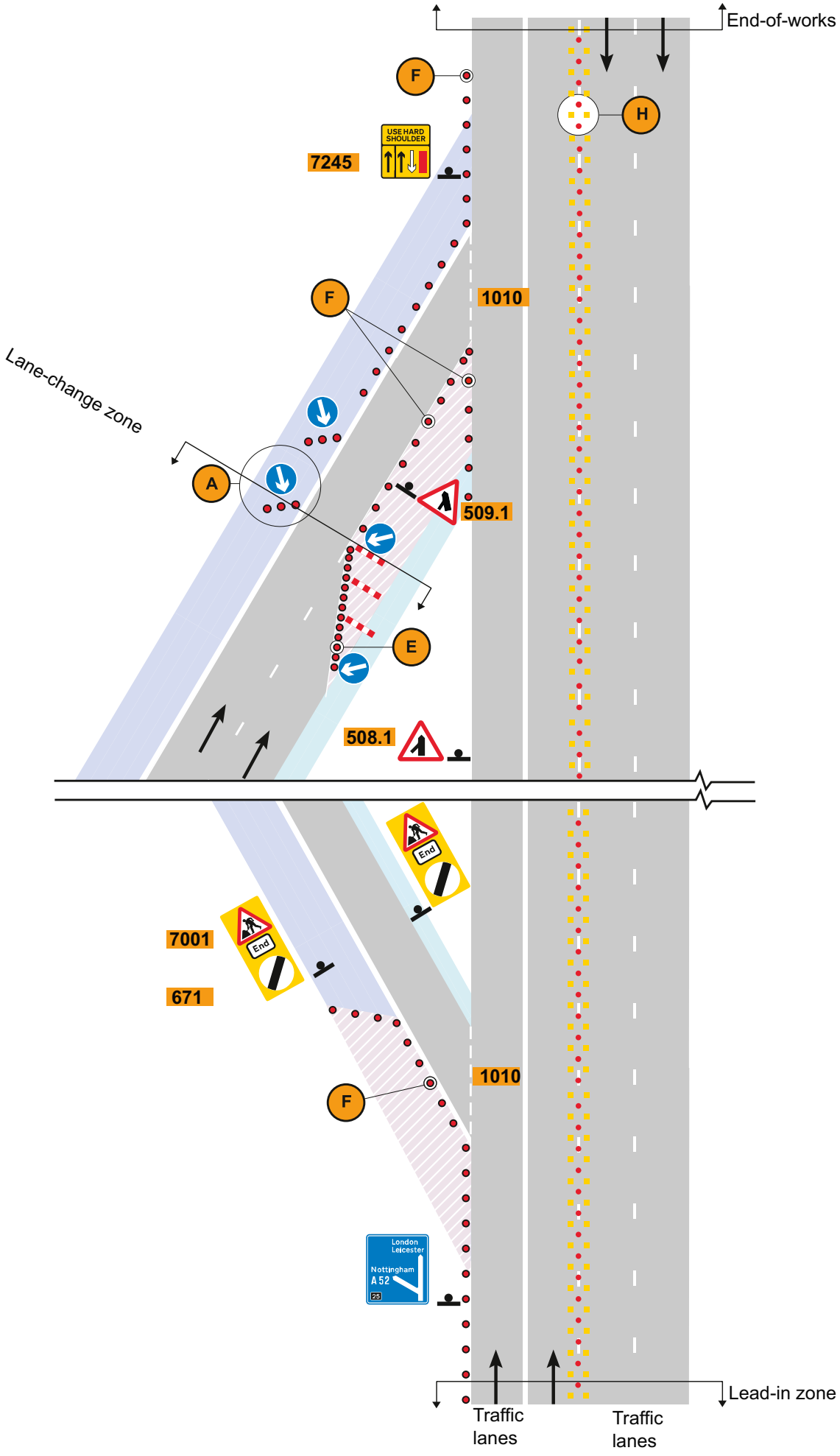
- if a temporary mandatory speed limit will be in place; initial and repeater signs to diagram 670 (S10-2-1) are required on the main carriageway and on the slip or link road prior to joining the motorway.

For advice on minimum desirable merge/diverge lengths, see CD 192 ‘The design of crossovers and changeovers’.

Plan DZD6 Works zone including a junction (primary carriageway)



Plan DZD7 Works zone including a junction (secondary carriageway)



7.19 End of works zone

7.19.1. The end-of-works zone starts at the end of the works area and continues to the last sign.

Principles of design for the end of works zone

Plan DZE1: End-of-works zone for a dual carriageway road

The principles are:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) and supplementary ‘End’ plate is placed on the nearside and offside of the carriageway. The distance placed from the end of the works is dependent on the permanent speed limit of the road, see **Table 7.7**.
- for dual carriageway roads with a permanent speed limit of 50 mph or more, this sign is placed on the nearside and offside of the carriageway, 90 m from the works.
- if no temporary speed limit is in place, the sign on the offside may be omitted.

Exit taper:

- an exit taper is required unless an exit is needed for works traffic. If required, the exit taper should be provided by coning to Detail B, at 45° to the carriageway. Otherwise, coning should be omitted; see **Plan DWA2** in **Section 7.22**.

Plan DZE1 End-of-works zone for a dual carriageway road

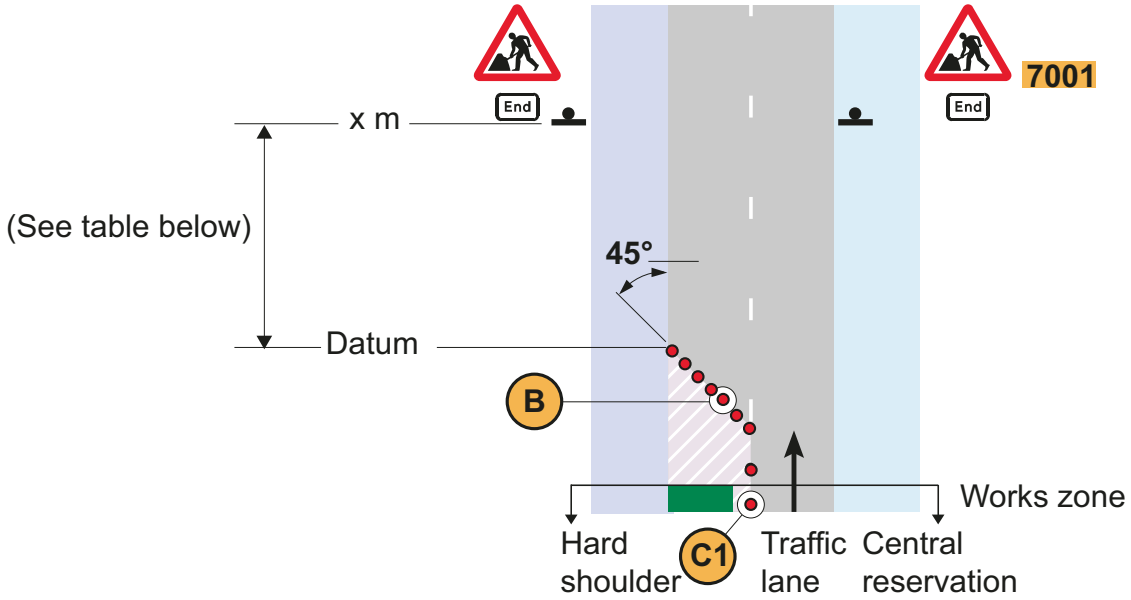


Table 7.7 Placement distance of 'road works ahead' sign to diagram 7001 (S13-2-9) and supplementary 'End' plate

Speed limit	Distance to final sign 'x'
40 mph or less	45 m
50 mph or more	90 m

Plan DZE2: End-of-works zone for a single-lane return changeover from the hard shoulder

Guidance on the design of the changeover is given in **Section 7.6**.

The principles for moving a lane from the hard shoulder are:

- a ‘rejoin main carriageway’ sign to diagram 7245 (S13-6-16), with the top panel ‘REJOIN MAIN CARRIAGEWAY’ should be placed as a minimum at the start of the changeover in advance of the coning. If two lanes are returning, then two variant signs to diagram 7245 (S13-6-16) are used on the nearside and the offside.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the changeover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the changeover.
- one ‘lane closed’ barrier sign to diagram 7105 (S13-6-8) with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed.
- coning to Detail E is used on the nearside.
- coning to Detail F is used on the offside.
- coning to Detail C1 is used on the hard shoulder at the end of the changeover.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**.

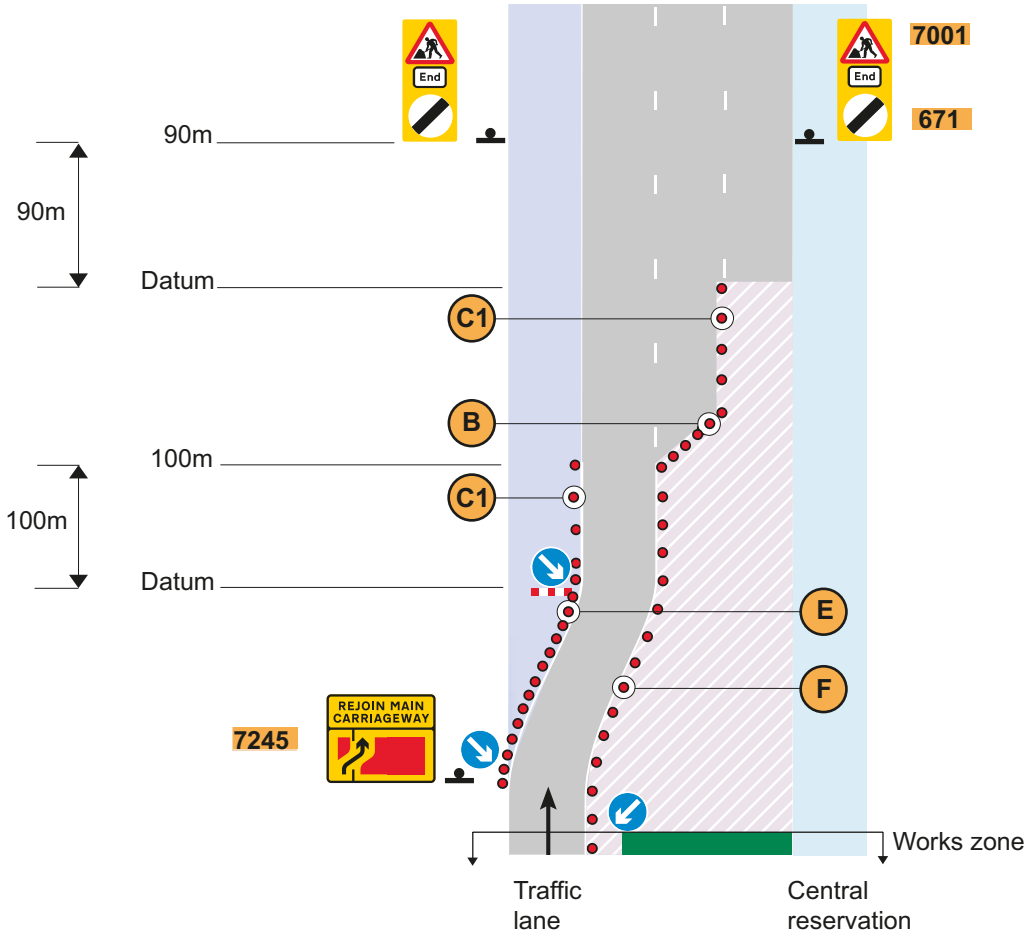
Additional coning to Detail C1 should be used where works traffic may be merging at the end of the works to prevent traffic moving into the lane. For the additional signing required, see **Plan DWA3** in **Section 7.22**. If the lane will not be used by works traffic then an exit taper with coning to Detail B at 45° to the carriageway is required.

Where the road’s permanent speed limit does not change within the works site, signs 671 (S10-2-2) or 670 (S10-2-1) on a yellow background should be used in addition to diagram 7001 (S13-2-9), with supplementary ‘End’ plate to mark the end of the road works and all associated restrictions. These signs should be used on both sides of the carriageway. Where the permanent speed limit does change terminal speed limit signs are required (see **7.19.2**).

The principles for works for which relaxations apply are as for standard works except:

- coning to Detail B is used on the nearside.
- coning to Detail C1 is used on the offside.
- subject to the outcome from a risk assessment, the hard shoulder/lane one raised rib marking may be retained at the changeover.

Plan DZE2 End-of-works zone for a single-lane return changeover from the hard shoulder



Plan DZE3: End-of-works zone for a single-lane return crossover

Guidance on the design of the crossover is given in **Section 7.5**.

Principles for the crossover are:

- a ‘return of lane to original carriageway’ sign to diagram 7245 (S13-6-16) placed 50 m in advance of the start of the crossover (this sign may be located towards the end of the works zone).
- coning to Detail F is used on the nearside.
- coning to Detail E is used on the offside following on from:
  - Detail C1 for a buffer lane (as shown),
  - Detail H for a buffer zone with standard width lanes.
  - Detail K for a buffer zone with narrow lanes.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the crossover. If this is placed in a closed lane, then a ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light, should be added.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the crossover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8), with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed. The central reservation should be signed the same as one or two lanes crossed depending on its width.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed from the lead-in zone onwards. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**, and
- a speed limit repeater sign to diagram 670 (S10-2-1) is required at the start of the crossover, located either on the near or the offside, in addition to the standard repeater sign provision.

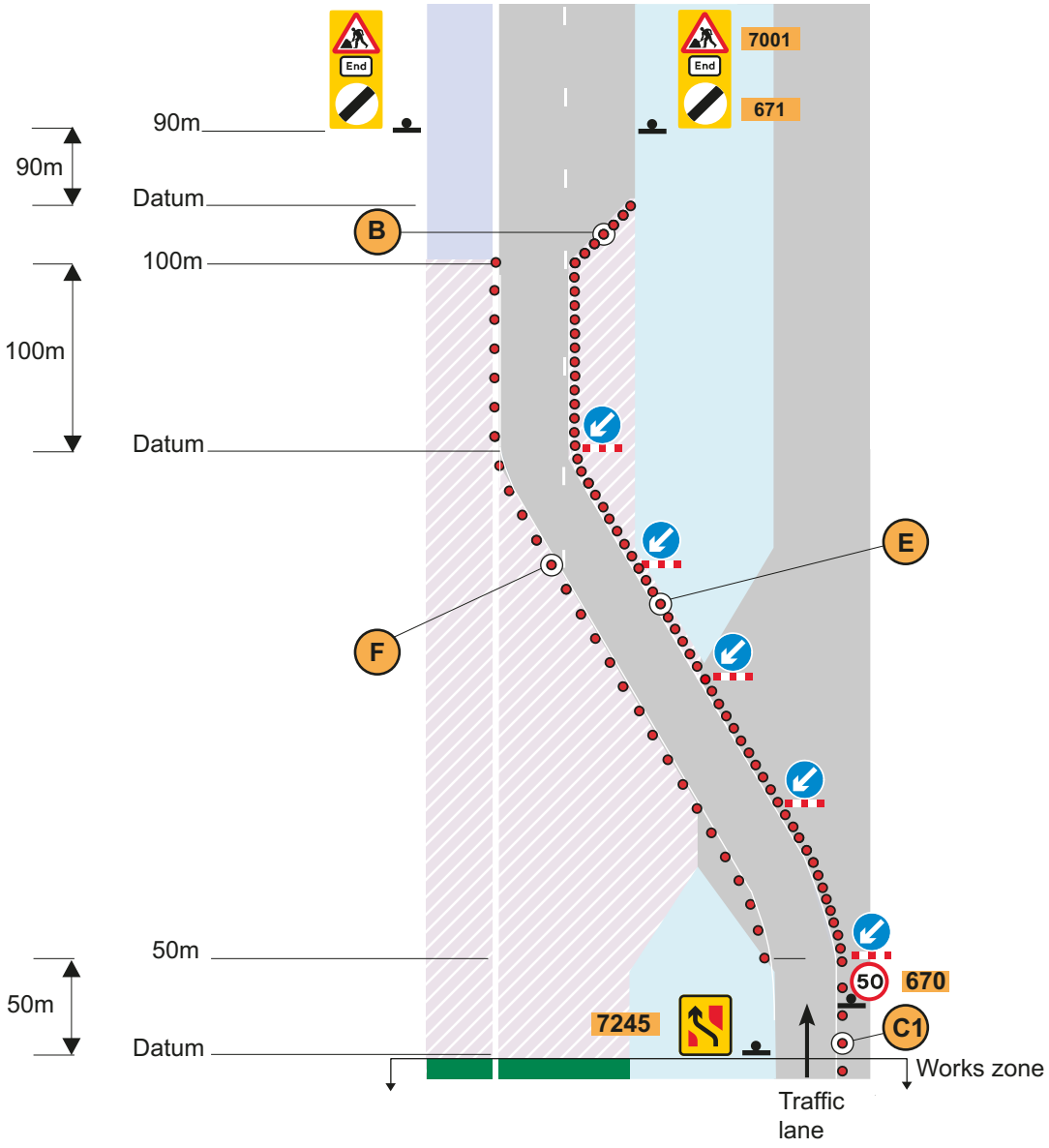
Relaxations:

- coning to Detail C1 is used on the nearside.
- coning to Detail B is used on the offside.

For crossovers with a sharp deviation, see **7.5.3**.

Where the road’s permanent speed limit does not change within the works site, signs 671 (S10-2-2) or 670 (S10-2-1) on a yellow background should be used in addition to diagram 7001 (S13-2-9), with supplementary ‘End’ plate to mark the end of the road works and all associated restrictions. These signs should be used on both sides of the carriageway. Where the permanent speed limit does change terminal speed limit signs are required (see **7.19.2**).

Plan DZE3 End-of-works zone for a single-lane return crossover



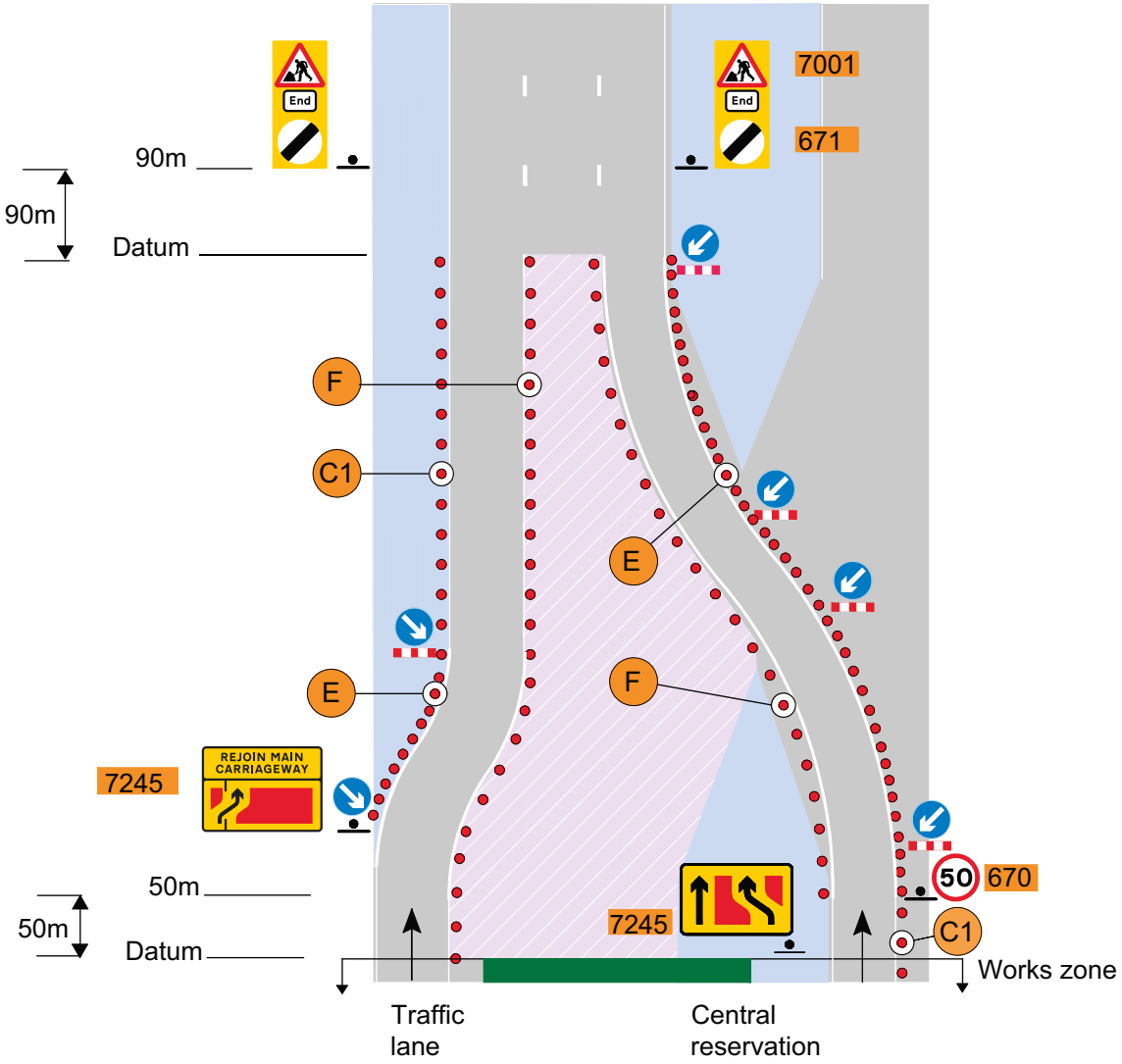
Plan DZE4: End-of-works zone for a single-lane return crossover with a single-lane changeover from the hard shoulder

Guidance on the design of the crossover and changeover is given in **Section 7.5** and **7.6**.

For crossovers with a sharp deviation, see **7.5.3**.

Where the road's permanent speed limit does not change within the works site, signs 671 (S10-2-2) or 670 (S10-2-1) on a yellow background should be used in addition to diagram 7001 (S13-2-9), with supplementary 'End' plate to mark the end of the road works and all associated restrictions. These signs should be used on both sides of the carriageway. Where the permanent speed limit does change terminal speed limit signs are required (see **7.19.2**).

Plan DZE4 End-of-works zone for a single-lane return crossover with a single-lane changeover from the hard shoulder



Plan DZE5: End-of-works zone for a two-lane return crossover

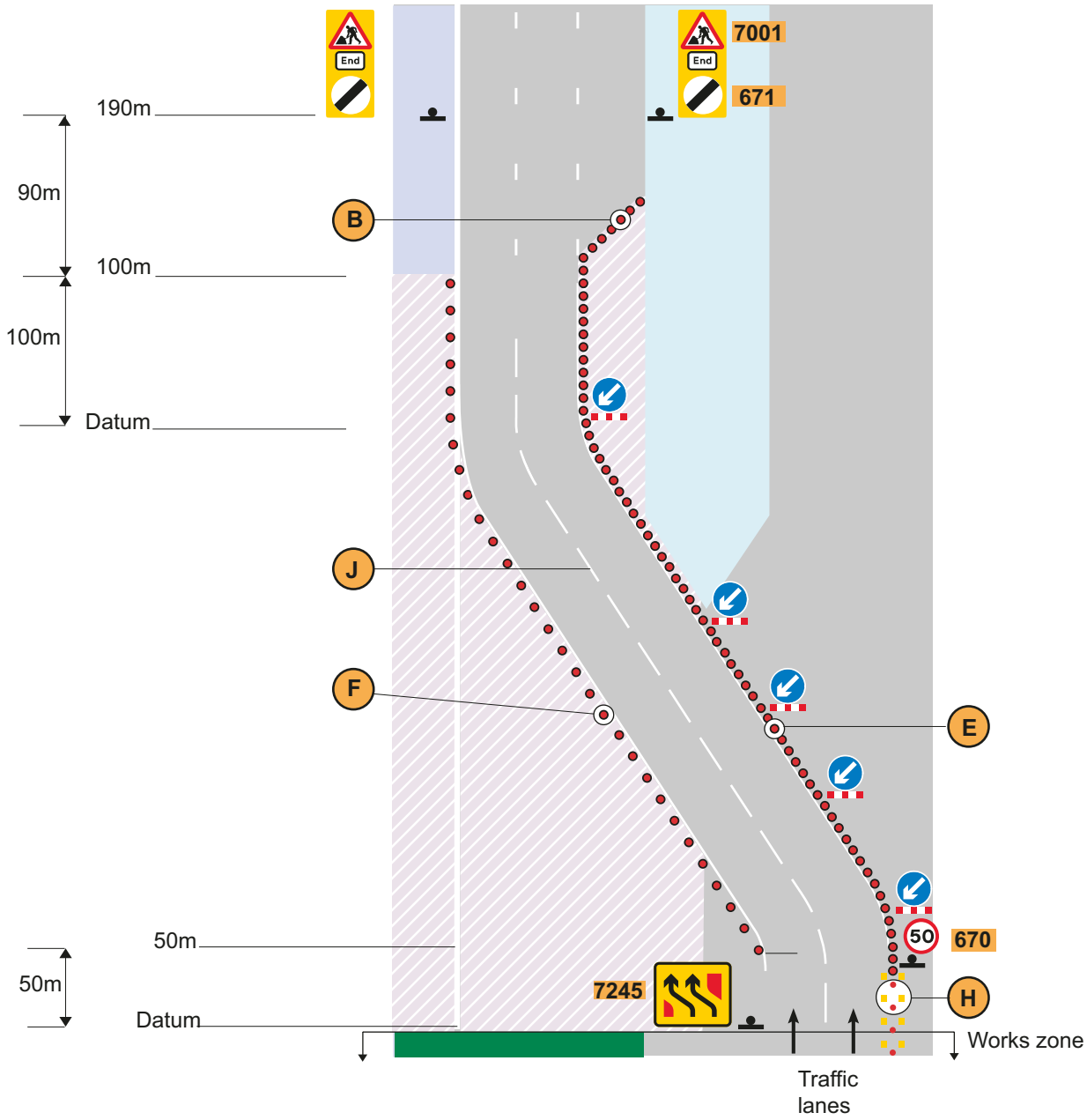
Guidance on the design of the crossover is given in **Section 7.5**.

Principles for the crossover are:

- one ‘lane returns to original carriageway’ sign to diagram 7245 (S13-6-16) located on the nearside 50 m in advance of the return crossover (this sign may be located towards the end of the works zone).
- coning to Detail F is used on the nearside.
- coning to Detail E is used on the offside following on from:
  - Detail C1 for a buffer lane.
  - Detail H for a buffer zone with standard width lanes (as shown).
  - Detail K for a buffer zone with narrow lanes.
- one ‘keep left/right’ sign to diagram 610 (S3-2-3) at the start of the crossover. A ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light should be provided if the sign is placed in a closed lane.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of the crossover.
- one ‘lane closed’ barrier to diagram 7105 (S13-6-8) with a high intensity warning light and a ‘keep left/right’ sign to diagram 610 (S3-2-3), at the end of each lane crossed. The central reservation should be signed the same as one or two lanes crossed depending on its width.
- if a temporary mandatory speed limit is applied, signs to diagram 670 (S10-2-1) should be placed past the works zone. For speed limit repeater signs spacing, see **Table 4.5** in **4.8.27**, and
- a speed limit repeater sign to diagram 670 (S10-2-1) is required at the start of the crossover, located either on the near or the offside, in addition to the standard repeater sign provision.

Where the road’s permanent speed limit does not change within the works site, signs 671 (S10-2-2) or 670 (S10-2-1) on a yellow background should be used in addition to diagram 7001 (S13-2-9), with supplementary ‘End’ plate to mark the end of the road works and all associated restrictions. These signs should be used on both sides of the carriageway. Where the permanent speed limit does change terminal speed limit signs are required (see paragraph **7.19.2**).

Plan DZE5 End-of-works zone for a two-lane return crossover

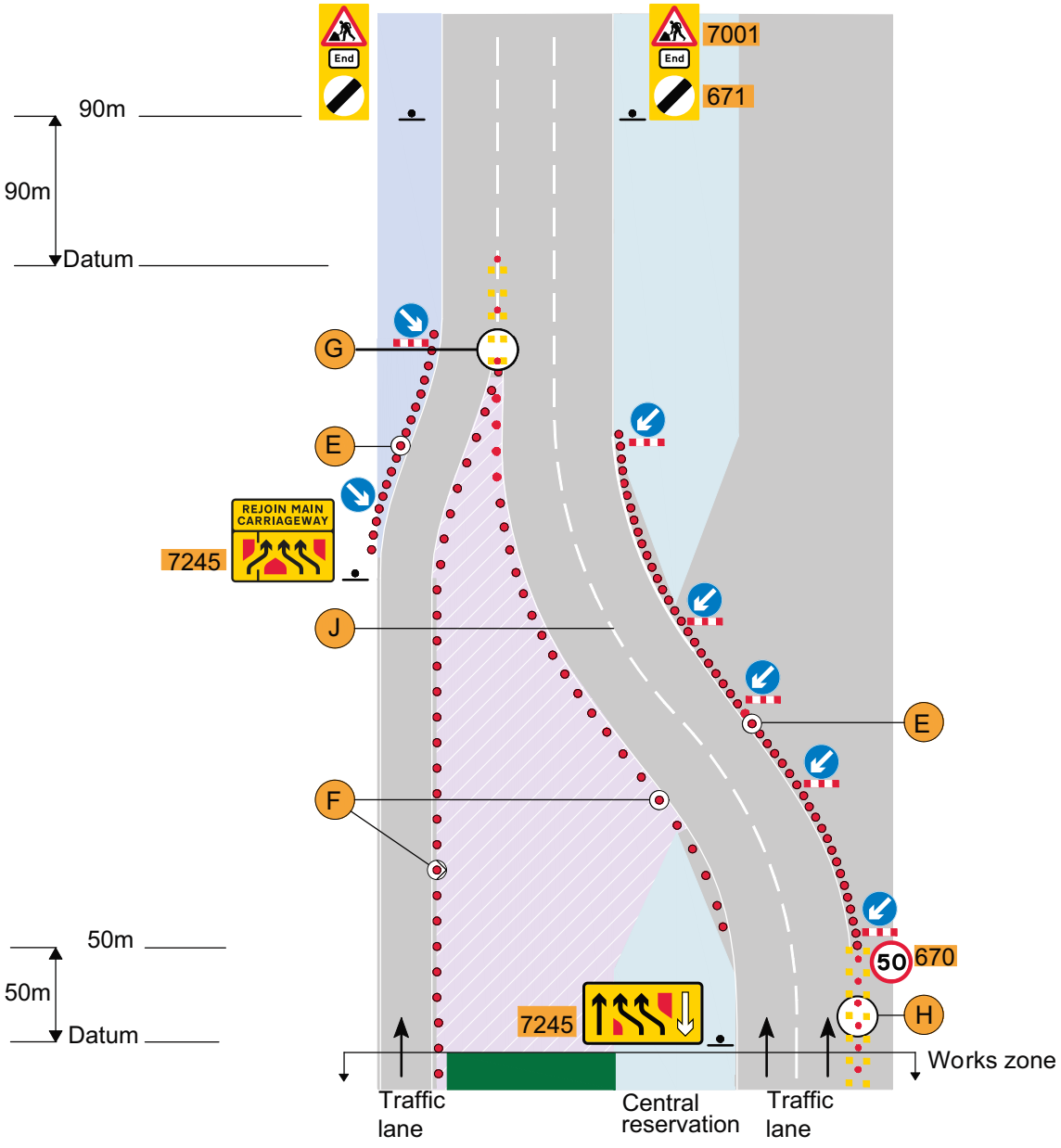


Plan DZE6 - End-of-works zone for a two-lane return crossover with a single-lane changeover from the hard shoulder

Studs and cylinders to Detail G1 are used for a minimum of 50 m at the return splitter arrangement where the return crossover lanes run alongside the lane that returns from running on the hard shoulder.

Where the road's permanent speed limit does not change within the works site, signs 671 (S10-2-2) or 670 (S10-2-1) on a yellow background should be used in addition to diagram 7001 (S13-2-9), with supplementary 'End' plate to mark the end of the road works and all associated restrictions. These signs should be used on both sides of the carriageway. Where the permanent speed limit does change terminal speed limit signs are required (see **7.19.2**).

Plan DZE6 End-of-works zone for a two-lane return crossover with a single-lane changeover from the hard shoulder



Additional information

7.19.2. If there is a works exit after the contraflow lanes have returned to the primary carriageway on a dual carriageway, in particular in the primary direction, coning may continue after the end of the works area. In these cases, the following principles apply:

In the primary direction:

- for non-contraflow works affecting one carriageway only, the coning is to Detail C1 (**Plan DZE2**). For works for which a relaxation may apply, coning to Detail D may be used.
- for contraflow works on two-lane dual carriageway roads, coning to Detail F is used on the nearside. Coning to Detail E is used on the offside of a single lane returning from the other carriageway (**Plan DZE3**).
- for contraflow works on three-lane dual carriageway roads, coning to Detail F is used on the nearside of the carriageway. Coning to Detail E is used on the offside of a single lane returning from the other carriageway. Coning to Detail C1 is used along the hard shoulder and to Detail F on the offside (**Plan DZE4**).
- for contraflow works on three-lane dual carriageway roads with two lanes returning, coning to Detail F is used on the nearside and coning to Detail E on the offside (**Plan DZE5**), However, if a single lane has remained on the primary carriageway then Detail G is used to separate the returning lanes from this lane (**Plan DZE6**).

In both directions:

- where delays are expected to be moderate or severe, the authority may request that signs to diagram 7001 (S13-2-9) be replaced by an ‘end of road works’ sign, with courtesy message to diagram 7006 (S13-6-44). If used, it should be located on the nearside 90 m from the end of the works on dual carriageway roads with a permanent speed limit of 50 mph or more (45 m on other dual carriageways).
- for high-speed roads where a temporary speed limit has been applied, the ‘end of road works’ sign should comprise of the following presented on a single backing board:
  - ‘road works’ sign to diagram 7001 (S13-2-9), with ‘End’ plate.
  - sign to diagram 671 (S10-2-2) (national speed limit sign), or 670 (S10-2-1) as appropriate.
- the assembly of signs on the single backing board will be sited on both sides of the carriageway 90 m downstream of the last cone for works on dual carriageway roads with a permanent speed limit of 50 mph or more (see **Figure 4.20**).
- for all other situations, a sign to diagram 7001, with an ‘End’ plate (S13-2-9), should be displayed. The sign should be sited on both sides of the carriageway 90 m downstream of the last cone for works on dual carriageway roads with a permanent speed limit of 50 mph or more (or 45 m for works on other dual carriageways).

7.20 Carriageway closure

7.20.1. For short-term works, overnight or weekend carriageway closures may be appropriate since this allows the works to be carried out quickly with little risk to the workforce. General guidance on the design of road closures and diversions is given in **Section 4.24**. Before deciding on a carriageway closure, the suitability of the diversion route will need to be assessed along with the increased level of accident risk imposed on the alternative route.

7.20.2. Advance warning should be given of the closure indicating the time and date when the carriageway will be closed. Publicity is dealt with in **Section 4.41**.

7.20.3. Before closing the carriageway, temporary traffic management should be deployed to reduce the number of lanes. Appropriate traffic management should be designed in accordance with the principles given in **Sections 7.15** to **7.19** for the approach, lane change and lead-in zones. As there is unlikely to be the opportunity to remove or enhance the TTM the design of the approach, lane change and lead-in zones will need to be safe, and the signing sufficiently clear, on the assumption that traffic queues may occur. Design options shown in Figures 7-26 to 7-29 are not appropriate for carriageway closures.

7.20.4. Traffic volumes (see **Section 4.4**) should be assessed to determine whether to keep one or two lanes open for traffic leaving the carriageway by the exit slip road. Usually, one lane will be sufficient for an overnight closure.

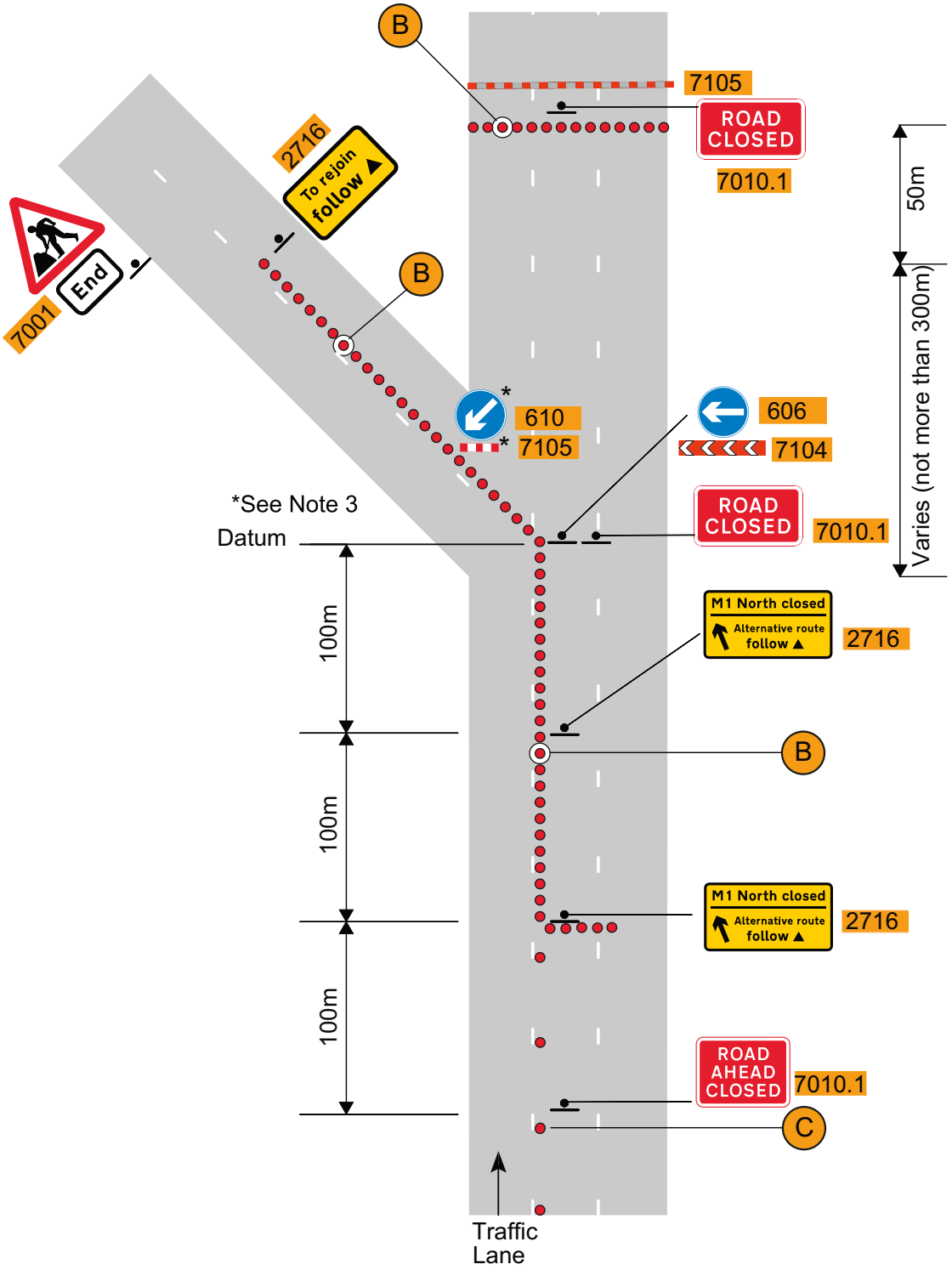
7.20.5. A typical layout and signing for a carriageway closure is given in **Plan DCC1**. All coning is to Detail B. A transverse line of cones and a ‘ROAD CLOSED’ sign to working drawing 7010.1 (S13-9) should be positioned on the main carriageway 50 m downstream from the final cone on the slip road.

7.20.6. To provide an adequate warning of any vehicles that may breach the closure, the closure point should be staffed, particularly if there is a works access point.

7.20.7. If the works site is a significant distance from the closure point, further transverse lines of cones to Detail B and ‘ROAD CLOSED’ sign to working drawing 7010.1 (S13-9) should be positioned on the main carriageway at 1 km intervals.

7.20.8. For a short-term carriageway closure, permanent road markings at the exit slip road will not usually need to be masked, or replaced with temporary ones. They may need to be masked (or replaced) for longer-term closures, for example over a full weekend.

Plan DCC1 Example of a signing layout for the complete closure of a dual carriageway road



NOTES:

1. Certain signs have been omitted on the plan for clarity.
2. All coning is to Detail B.
3. If the curvature of the exit slip road is severe, the use of signs to diagram 606 (S3-2-1) and 7104 (S13-6-7) should be considered.

7.21 Slip road closure

7.21.1. The impacts of diversion routes on drivers (such as travel length, road quality and signing) should be considered before deciding to implement a slip road closure.

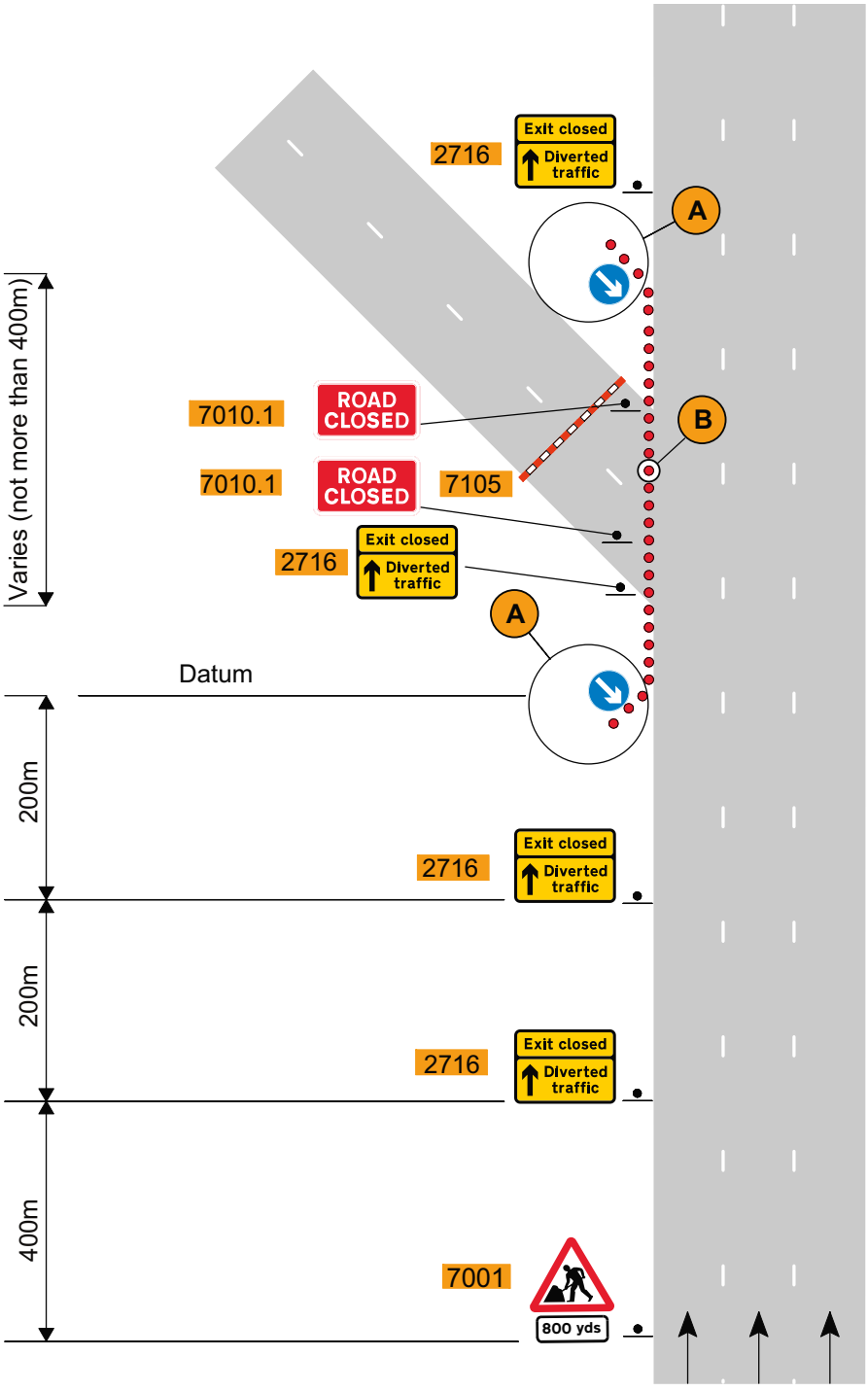
7.21.2. Slip road closures may be required to facilitate works safely. Preferably, works requiring these closures should be carried out overnight or during off-peak periods.

7.21.3. Advance warning of the closure should be given including the time and date when the slip road will be closed. This may be indicated using the sign to diagram 7005 (S13-6-43) (see **5.14.1**). Publicity is dealt with in **Section 4.41**.

7.21.4. When a slip road at a grade separated junction is closed, traffic may be directed to the next grade separated junction up or down stream to prevent traffic being diverted to more unsuitable roads. Local knowledge of the surrounding network and traffic conditions should be used to determine the most appropriate diversion route.

7.21.5. A suitable diversion route will need to be signed on the main carriageway if an exit slip road is closed. Requirements on the nature of any diversion route e.g. vehicle restrictions or charge zones are identified in **Section 4.24**. The route indicated will depend on whether just a slip road or the full junction is closed and how well destinations can be accessed using other junctions upstream or downstream. Signs may be placed in advance of junctions upstream to advise of the closure and allow drivers to divert. Variants of signs to working drawing 2716 (S13-9) should be used in advance of the slip road and on the carriageway after the slip road to indicate the alternative route to be followed. An example of the signing required is shown in **Plan SRC1**.

Plan SRC1 Exit slip road closure

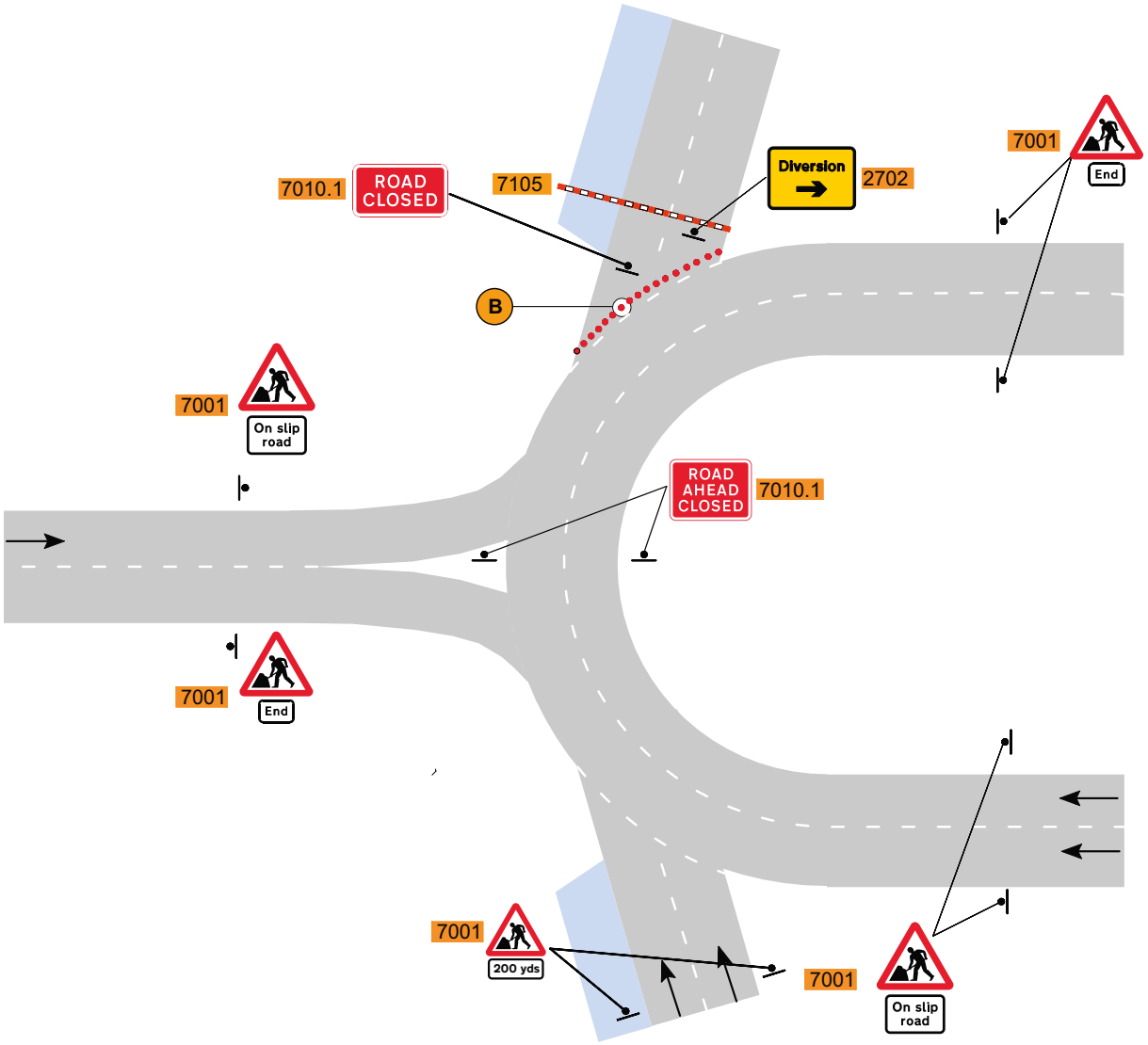


NOTES:

1. Certain signs have been omitted for clarity.
2. All coning is to Detail B.

7.21.6. A suitable diversion route will need to be signed when a motorway or dual carriageway entry slip road is closed. **Plan SRC2** shows an example of the required signs. Traffic may be diverted onto the opposing carriageway and re-join the affected carriageway at the previous junction, if appropriate.

Plan SRC2 Entry slip road closure



NOTES:

1. Signs to working drawing 7010.1 (S13-9) should be placed to make it clear that only the slip road is closed, not the roundabout.

2. If it is not already lit, temporary floodlighting should be provided at the top of the slip road to highlight the coning and signing used at the closure.

7.21.7. A two-panel sign to working drawing 2716 (S13-9) may be used at the start of the closure to warn drivers and indicate a diversion, see **4.24.34**. These signs may be particularly useful if symbolic diversion signs are being used. If a reference is made to an alternative route then this will need to be identified; the use of terms such as ‘Find alternative route’ or ‘Use alternative route’ are not permitted under S13-9. Alternatively, a ‘ROAD CLOSED’ sign to working drawing 7010.1 (S13-9) may be used. See **Figure 7.31** and **Figure 7.32** for typical direction signs for closed entry and exit slip roads. Additional signs and TTM shown in **7.21.5** should be provided delineating the start of the closure.

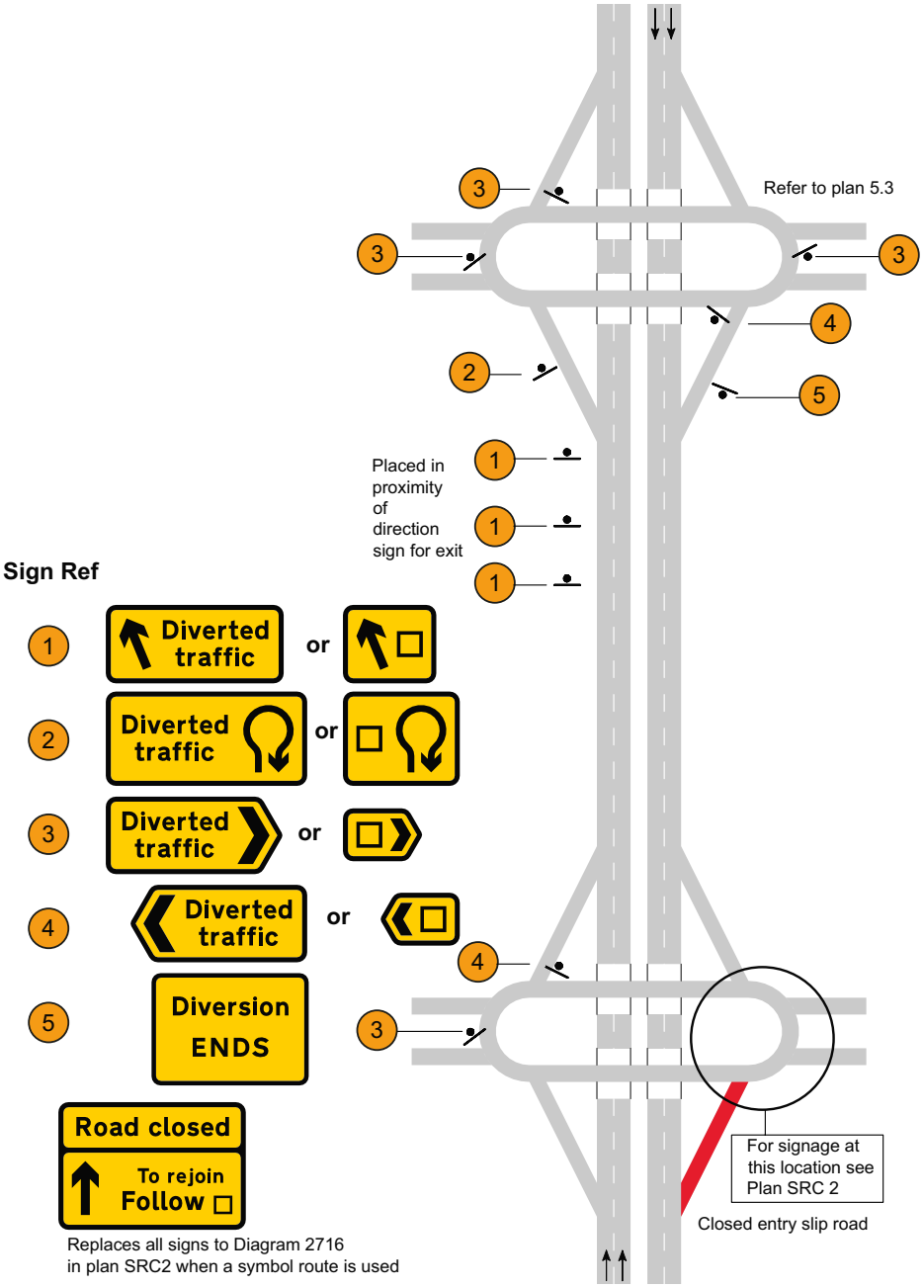


Figure 7.31 Diversion route signing for a closed entry slip

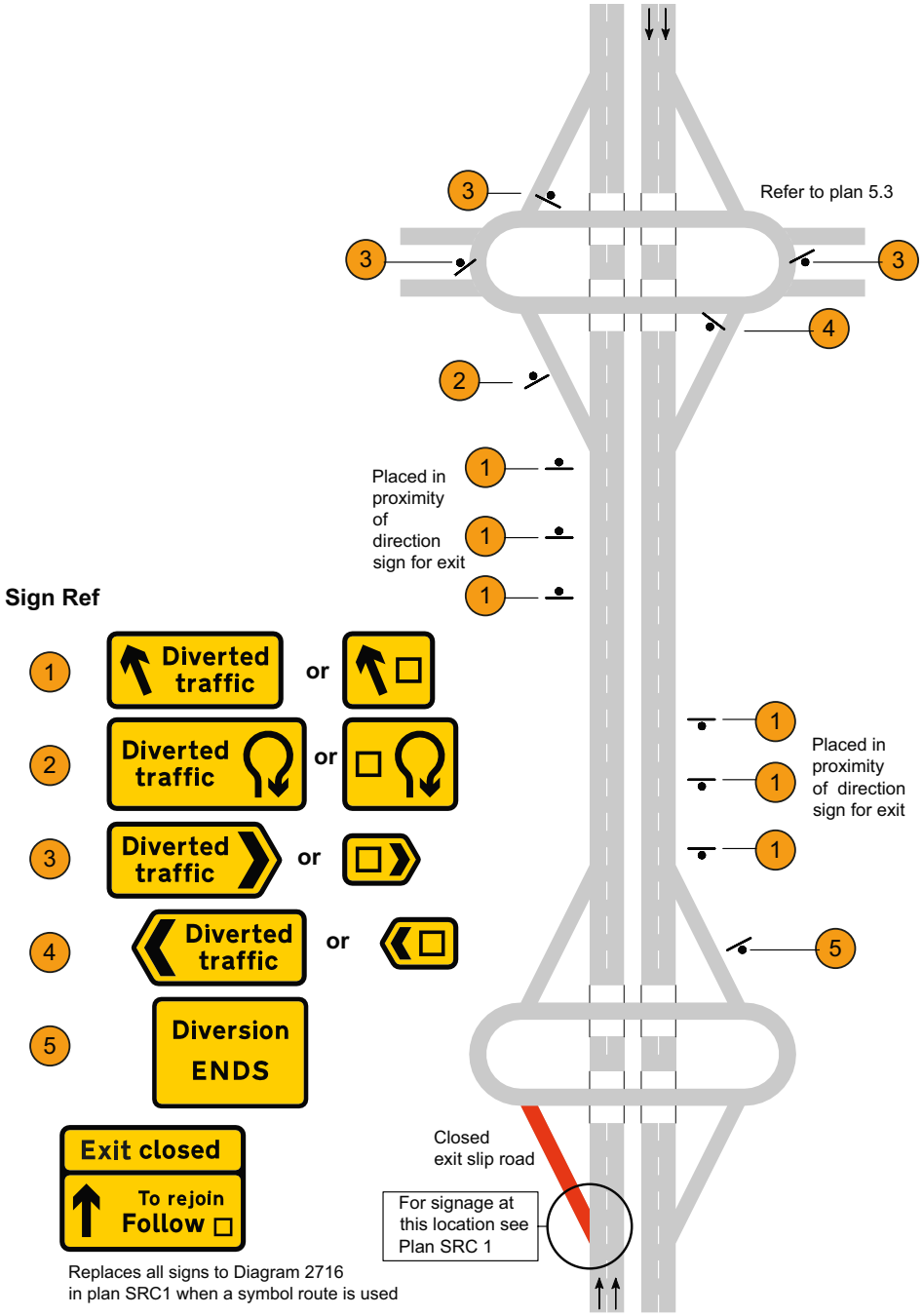


Figure 7.32 Diversion route signing for a closed exit slip

7.21.8. Any temporary diversion signing (either worded or symbolic) used should not conflict with the wording or symbols on existing signs along the diversion route.

7.21.9. Additional signing will be needed if intermediate junctions are present between the closed slip road and the junction at which traffic U-turns. These signs should typically be an appropriate variation of working drawing 2703 (S13-9), with a diversion warning (symbol or worded legend) and an arrow pointing in the appropriate direction.

7.21.10. If there is an intermediate at-grade junction, the 2703 (S13-9) sign alone is sufficient, however additional signing may be need if the route through the junction is not obvious. Additional directional signs (S13-9) may be required if the diversion route at an intermediate junction requires traffic to turn off a through-route.

7.21.11. A map type variant sign is not required on the approach to a roundabout if signs to working drawing 2703 (S13-9) are installed to guide traffic to the relevant exit.

7.21.12. Signs to working drawing 2702 (S13-9) bearing the legend 'Diversion ENDS' may be installed on a slip road to indicate to traffic that they are about to re-join the route or have returned to the junction they were diverted from. It should be noted that other variant signs to working drawing 2702 (S13-9) are generally too small to be suitable for use on high-speed dual carriageway roads.

7.21.13. Some drivers with local knowledge may prefer to divert at an earlier junction ahead of the closed exit slip road, especially where the signed diversion route is significantly longer than potential alternatives. Therefore, a sign advising of the closed exit slip road should be installed in advance of the first junction before the closed exit slip road. It should be located at a sufficient distance from the junction for drivers to make a decision as to whether or not to make a voluntary diversion, see **Figure 7.33**. This voluntary alternative route should not be signed for as it may be undesirable for those not familiar with the area. The relevant authority for the alternative route should be consulted prior to using this type of sign.

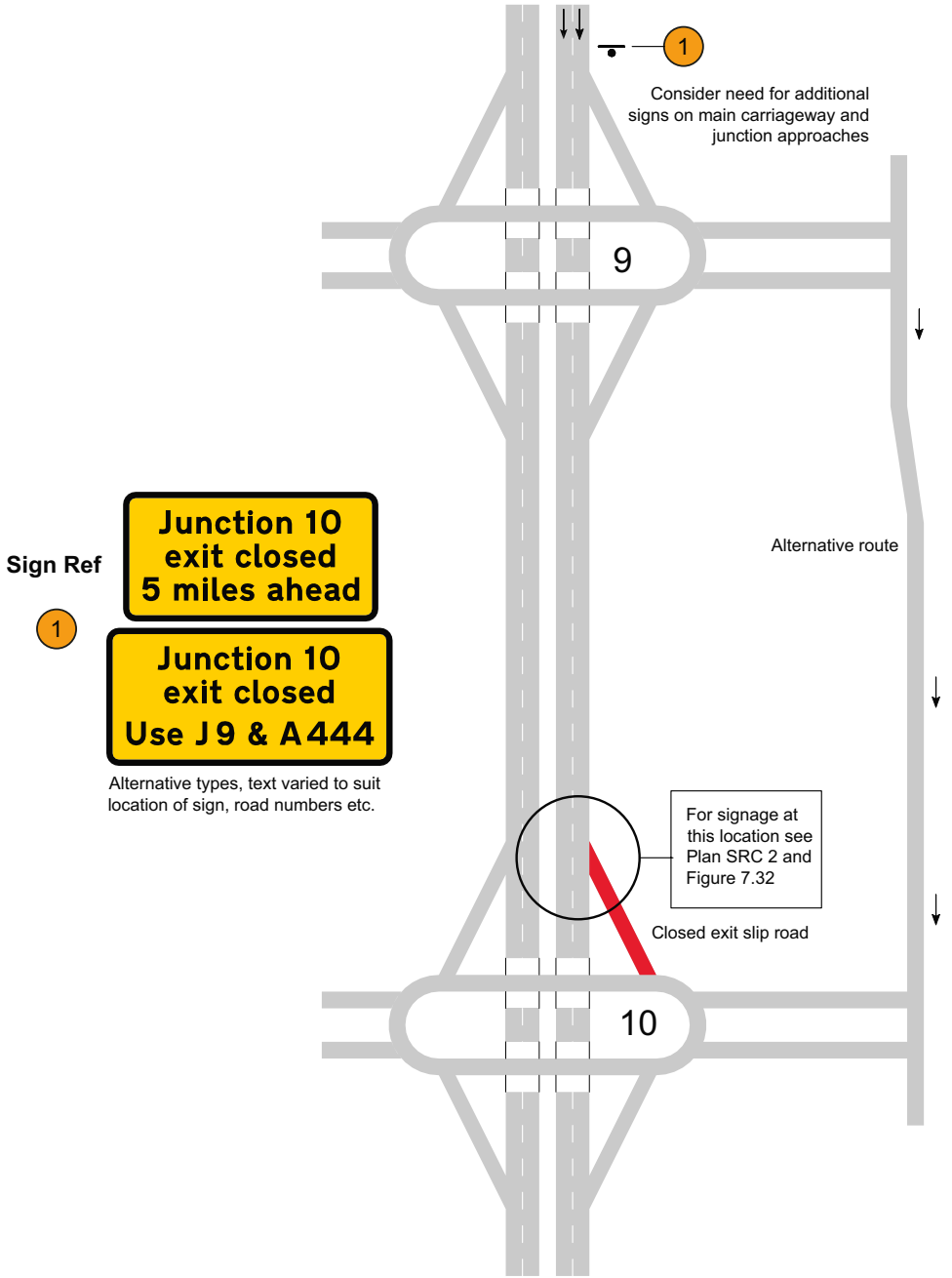


Figure 7.33 Advanced signing for a closed exit slip road

7.22 Works accesses and exits

7.22.1. Works accesses and exits are covered in **Section 4.26**. Signs should be positioned to ensure that they can be seen by road users but do not prevent or hinder the safe works access or egress by works vehicles. They will need to be designed to the underling highest safe speed, see **Section 4.9**. For long and slow vehicles using the works access then MLC or MCC (including eMMC) options may be suitable for protecting both road works and road users, see **Section 10**, **11** and GG117. The guidance covers the signing for simple access arrangements where desirable minimum SSD and clear visibility to signs is maintained.

7.22.2. Entry to a works area located on the nearside of a carriageway may be from the hard shoulder if one is present, see **Plan DWA1**.

The principles are:

- a ‘WORKS ACCESS ONLY 100 yds’* sign is placed on the nearside 100 m in advance of the works access.
- a ‘WORKS TRAFFIC ONLY’ sign is placed on the nearside at the start of the works access, opposite the start of the entry taper.
- a ‘WORKS TRAFFIC MERGING 100 yds’* sign is placed within the safety zone coning adjacent to the nearside running lane 100 m in advance of the works exit.
- a ‘WORKS EXIT’ sign is placed on the nearside at the works exit at the end of the works.

If a risk assessment indicates locating the site access just prior to the taper is likely to cause confusion then the coning in advance of the taper should be lengthened to 50 m.

If the hard shoulder is not wide enough for the required access, then access will be required from the single running lane past the works, see **Plans DWA2** and **DWA3**. Works exit may also be required into the running lane, see **7.22.5** below.

* Signs in S13-9 may have the distances varied if required.

7.22.3. For works located on the nearside of the carriageway of a dual carriageway without a hard shoulder, entry to the works area is through the safety zone in advance of the works area / working space (**Plan DWA2**).

The principles are:

- a ‘WORKS ACCESS ONLY 100 yds’* sign to working drawing 7306 (S13-9) is placed on the nearside, after the end of the entry taper, 100 m in advance of the works access.
- a ‘WORKS TRAFFIC ONLY’ sign to working drawing 7301 (S13-9) is placed on the nearside immediately before the start of the works access.
- a ‘WORKS TRAFFIC MERGING 100 yds’* sign to working drawing 7307 (S13-9) is placed within the safety zone coning adjacent to the nearside running lane 100 m in advance of the works exit.
- a ‘WORKS EXIT’ sign to working drawing 7302 (S13-9) is placed on the nearside at the works exit at the end of the works.
- coning to Detail B is used either side of the entry for works traffic.

* Signs in S13-9 may have the distances varied if required.

For works on the offside of the carriageway, entry to the works area is through the safety zone in advance of the works area, see **Plan DWA3**.

The principles are:

- a ‘WORKS ACCESS ONLY 100 yds’* sign to working drawing 7306 (S13-9) is placed on the offside, after the end of the entry taper, 100 m in advance of the works access.
- a ‘WORKS TRAFFIC ONLY’ sign to working drawing 7301 (S13-9) is placed within the safety zone coning adjacent to the offside running lane immediately before the start of the works access.
- a ‘WORKS TRAFFIC MERGING 100 yds’* sign to working drawing 7307 (S13-9) is placed within the safety zone coning adjacent to the offside running lane 100 m in advance of the works exit
- a ‘WORKS EXIT’ sign to working drawing 7302 (S13-9) is placed on the offside in the central reservation at the works exit at the end of the works.
- coning to Detail B is used either side of the entry for works traffic.

* Signs in S13-9 may have the distances varied if required.

The works area entry should be located to ensure that it can remain clear at all times while still leaving adequate storage space for plant, material and equipment. Storage space is particularly important for surfacing operations.

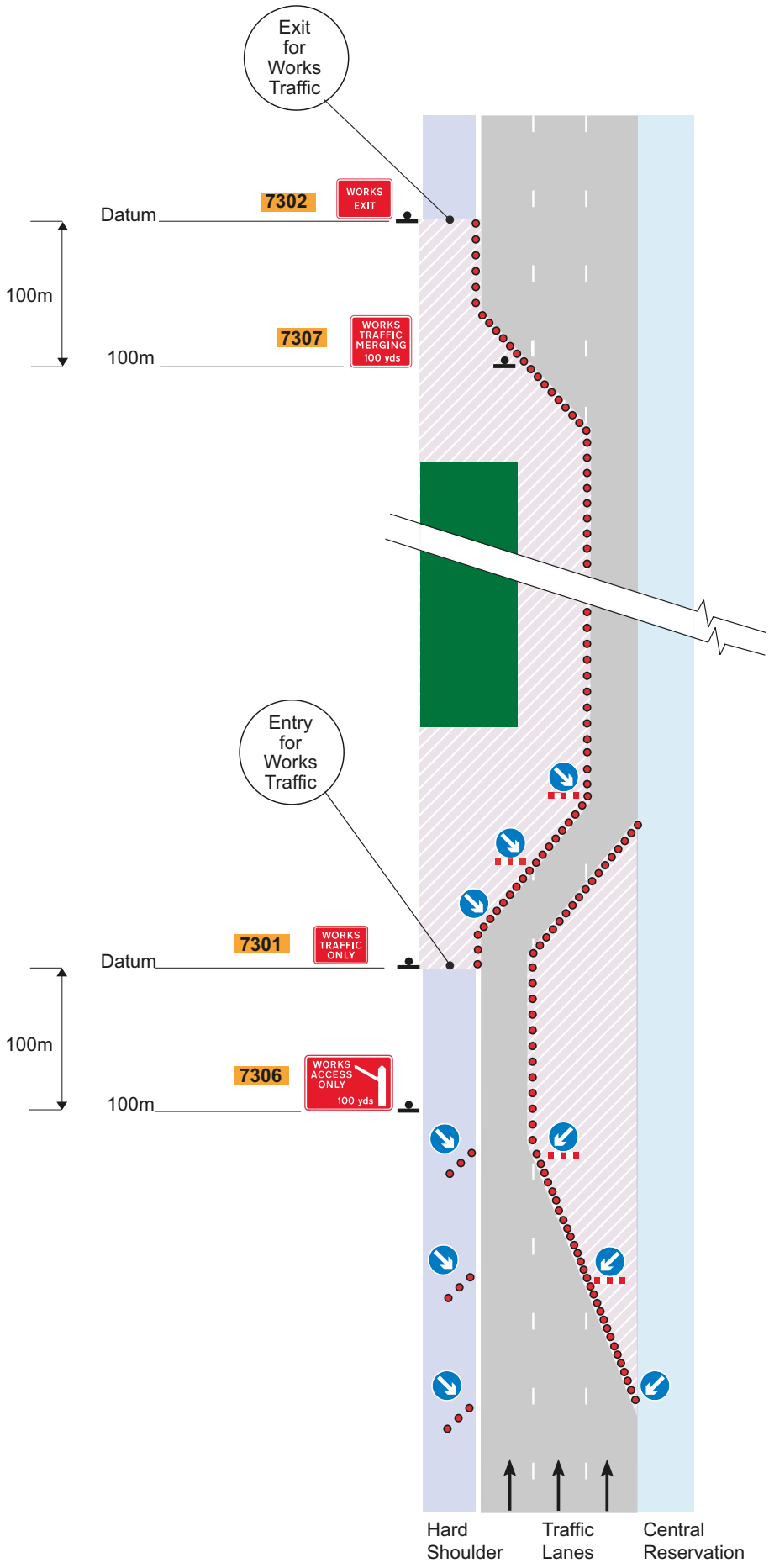
7.22.4. When partial contraflow works are in progress, works traffic may not be able to exit from the works into a dedicated running lane (see **Plan DZE6**). Instead, a works exit should be located through the safety zone following the works area. Exit into the nearside lane is preferable to the contraflow lane.

7.22.5. The principles for such an exit are:

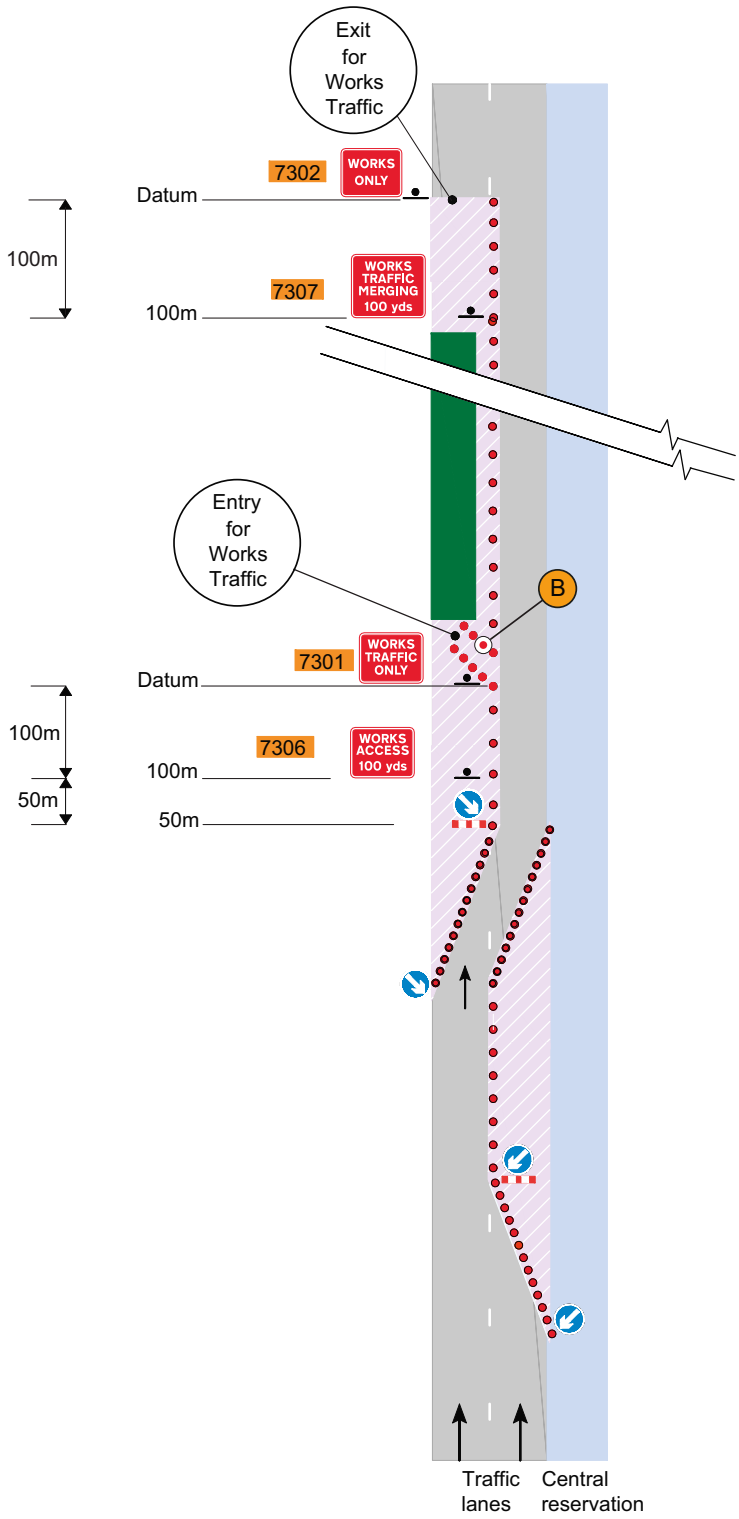
- a ‘WORKS TRAFFIC MERGING 100 yds’ sign to working drawing 7307 (S13-9) placed within the safety zone 100 yds in advance of the works exit.
- a ‘WORKS EXIT’ sign to working drawing 7302 (S13-9) placed within the safety zone immediately before the works exit.
- coning to Detail B used either side of the works traffic exit.

7.22.6. The following plans show the required signing for works accesses and exits only (for clarity, only coning and certain selected signs have been shown). These plans supplement the normal traffic management signing shown in **Sections 7.15** to **7.19**.

Plan DWA1 Works access and exit for works located on the nearside of a dual carriageway road with a hard shoulder

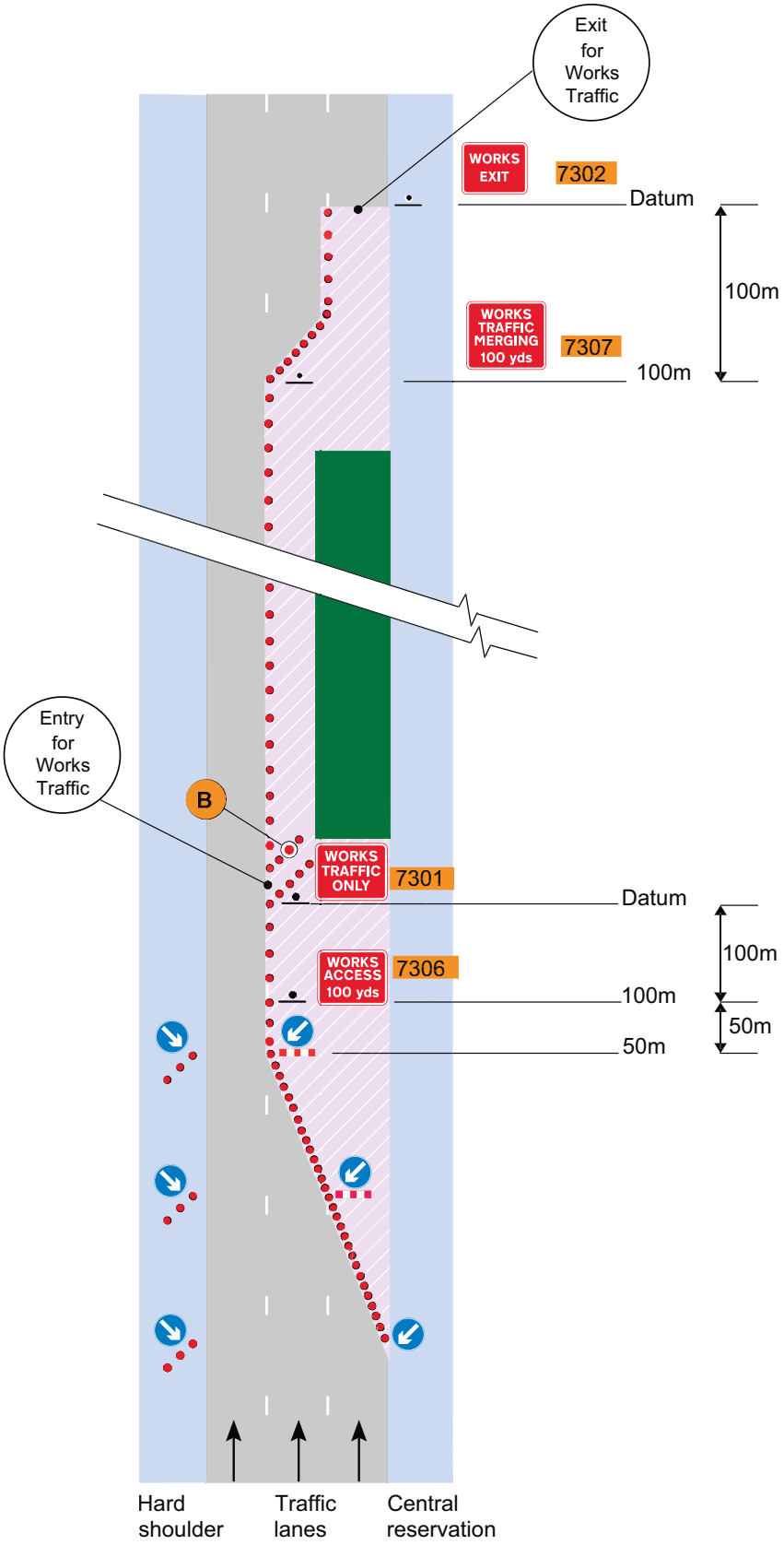


Plan DWA2 Works access and exit for works located on the nearside of a dual carriageway road without a hard shoulder



NOTE. Alternative close-spaced coning may be used (for example to Detail C2) either side of the works access point to aid works vehicles in locating the works access from a distance.

Plan DWA3 Works access and exit for works located on the offside of a dual carriageway road



NOTE. Alternative close-spaced coning may be used (for example to Detail C2) either side of the works access point to aid works vehicles in locating the works access from a distance.

7.23 Merge in turn signing

7.23.1. Merge in turn is the process of two lanes of traffic combining into one by shared alternate priority.

7.23.2. Merge in turn signing may be used to supplement lane closure signing on a dual carriageway road where two-lanes are being reduced to one and substantial queuing is likely to occur. It is likely to be particularly useful at sites where single-lane queues block back and affect secondary junctions. It has no effect on transit times through the scheme.

7.23.3. Merge in turn signing arrangements for carriageways with three or more lanes are not provided as merge in turn signing is not suitable for situations with more than one lane is closed on such carriageways.

7.23.4. Merge in turn uses both lanes for queuing and so shortens the physical length of a queue, reduces interference with upstream junctions and so reduces delays.

7.23.5. As queuing will be expected where Merge in turn signing is justified, it is assumed a temporary reduced mandatory speed limit is imposed at the works site, see **Section 4.8**.

7.23.6. Merge in turn uses the signs 'WHEN QUEUING USE BOTH LANES' and 'MERGE IN TURN' to supplement the standard temporary lane closure signing. These signs should carry legends with an x-height of 125 mm (175 mm capital letter height). The sign should have a white legend on a red background for all-purpose roads. For motorways it should have a black legend on a yellow background (lower case text S18).

The legend on each sign should be arranged to read as follows:

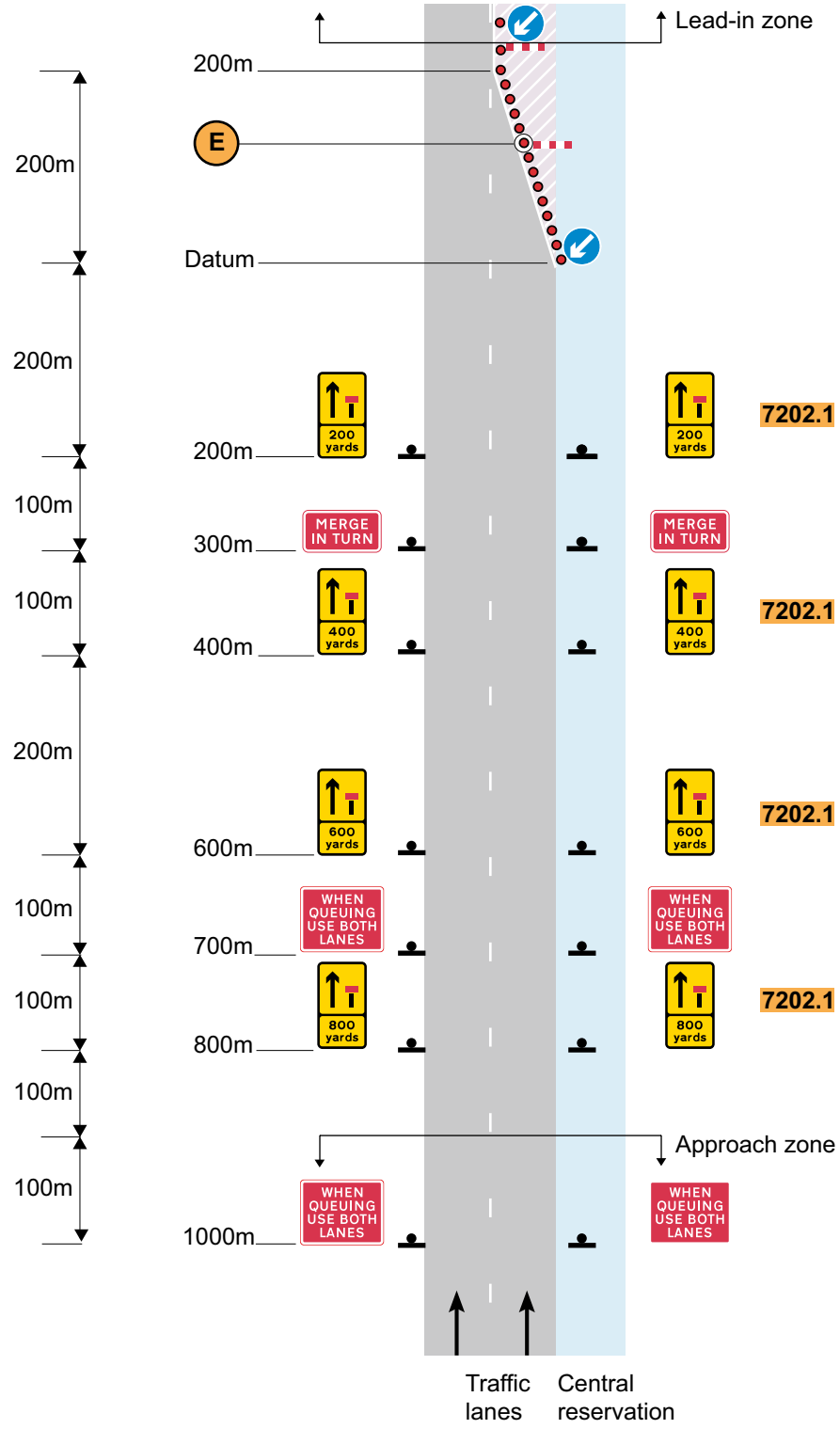


7.23.7. The 'WHEN QUEUING USE BOTH LANES' sign should be located on both sides of the carriageway. At a minimum they should be placed 1000 m and 700 m in advance of the taper. For longer queues, additional signs should be placed upstream at 500 m intervals to where the queue is expected to start. The 'MERGE IN TURN' sign should be located on both sides of the carriageway and be placed 300 m in advance of the taper. **Plan DMT1** shows a simple merge in turn layout. When used for off-peak lane closures all merge in turn advance signs will need to be covered or removed when the lane closure is removed.

7.23.8. Merge in turn signing is prescribed in S13-9 and so does not require special sign authorisation to use. The use of the two 'MERGE IN TURN' signs as described above, and shown in **Plan DMT1**, is the recommended approach for merge in turn signing at works in England and Scotland.

7.23.9. The design of the merge in turn signs differs in Northern Ireland and Wales. The appropriate Overseeing Organisation should be consulted when use of such signing is being considered in Northern Ireland.

Plan DMT1 Example of a simple merge in turn signing layout on an all-purpose dual carriageway road



NOTE: Certain signs have been omitted for clarity.

7.24 Mobile traffic management

7.24.1. On dual carriageway roads, mobile work may be carried out using single, or multiple vehicles standing or operating in the carriageway, see **Section 12**.

7.24.2. Mobile traffic management predominantly uses vehicle mounted signs for mobile road works which involve short-duration lane closures. Works utilising mobile TM include:

- continuous mobile operations.
- those involving movement and periodic stops.

- short-duration static work.
- minor works, often to public utilities, carried out from a single or a small number of vehicles.

They may be carried out whether a hard shoulder is present or not, however mobile works must be carried out in good visibility only.

7.24.3. Mobile works should only be carried out when the risk is assessed to be low and where congestion is unlikely to occur. The authority may need to agree on the use of mobile works.

7.24.4. The Mobile Lane Closure (MLC) technique should be used for all works on roads with full-width hard shoulders, except for inspection stops (see GG 117 Appendix B) and salting and gritting operations. These may be carried out as single vehicle works as described in **Section 12.1**.

7.24.5. The MLC technique should be carried out for works on roads without a hard shoulder and where the national speed limit applies, except for works carried out at normal road speeds such as salting and gritting. Works on dual carriageway roads with speed limits less than the national speed limit may be carried out using either single vehicle works or MLC techniques.

7.24.6. Mobile traffic management techniques are suitable for the following works:

- road marking.
- weed spraying (particularly on central reservations).
- grass cutting.
- overband joint sealing.
- replacement of inserts in depressible road studs.
- longitudinal work on the hard shoulder or central reservation.

7.24.7. The techniques may be suitable for other operations which involve repeated movement along the road and periodic stops. Short-duration static works may also be carried out using these techniques. Examples are:

- road lighting maintenance.
- fire hydrant checking.
- gully emptying.
- condition surveys such as Computerised Highways Assessment of Ratings and Treatments (CHART), concrete carriageway inspections, and work associated with Routine Maintenance Management Systems (RMMS) from the ‘Well-managed Highway Infrastructure’ Code of Practice.
- some public utilities works.

7.24.8. Signs to diagram 7001 (S13-2-9) should be used with the appropriate supplementary plate.

7.24.9. Any signs on the live carriageway and hard shoulder must always be vehicle-or trailer-mounted. Signs on the verge may be vehicle or trailer-mounted or static.

7.25 Tidal flow

7.25.1. At sites where the direction of the dominating traffic flow changes with the time of day, contraflow schemes can be modified to permit tidal flow operation. This allows additional lanes to be run in the direction of the higher flow at the expense of the other (less trafficked) direction. The configuration can be reversed when the direction of dominating flow changes.

7.25.2. The tidality of the traffic flow should be determined at the design stage to predict the effectiveness of the proposed traffic management system and plan the time when the lanes should be changed and the installation procedure.

7.25.3. Tidal flow layouts take longer to set out (and to change phases) than conventional contraflow systems, due in part to the additional buffer zone. They also require a significant amount of TTM equipment to be installed and that equipment must not be left in an unsafe temporary configuration.

7.25.4. A signing system that can change legends and be operated electronically may be used at tidal flow layout to permit simple changing of signs when the direction of dominant flow changes.

7.25.5. Full tidal flow systems on two-lane carriageways are shown in **Figure 7.33.** Approaching traffic is marshalled into lanes and guided through the contraflow. Access to, and exit from, the tidal lane is controlled by 'gates' placed at key locations using a line of traffic cones to Detail B. There needs to be a minimum of three combinations of 'lane closed' barriers to diagram 7105 (S13-6-8) and 'keep left/right' signs to diagram 610 (S3-2-3).

7.25.6. It is not possible to operate partial contraflow system on a two-lane carriageway.

7.25.7. A full tidal flow system for three-lane carriageways is shown in **Figure 7.35** and for a partial contraflow arrangement in **Figure 7.37**. The use of tidal flow layouts on full contraflow systems is limited by the match between lane allocation (1+3 and 2+2) and the peak traffic demand pattern.

7.25.8. Providing a second buffer zone to a full contraflow narrow lane layout (3+2) for a standard carriageway would result in the lane widths being reduced below the allowed minimum (see **7.3.2**). As such, this option should not be considered.

7.25.9. A temporary mandatory speed limit will normally be in place. Signs to diagram 670 (S10-2-1) should be located as indicated in **Tables 4.4** and **4.5** in **Section 4.8**.

Tidal flow conditions

7.25.10. There are two operating conditions for each tidal flow operation, one for each direction of flow along the tidal lane. Approaching traffic is marshalled into physically divided lanes which then guide the vehicles through the contraflow. Access to the tidal lane is controlled by four 'gates' at key locations. **Table 7.8** specifies the tidal flow operating conditions.

Table 7.8 Tidal flow operating conditions

Tidal flow operation	Condition 1	Condition 2
Full contraflow on two-lane carriageway (**Figure 7.34** and **Figure 7.35**)	1 + 2	2 + 1
Full contraflow on three-lane carriageway (**Figure 7.36** and **Figure 7.37**)	1 + 3	2 + 2
Partial contraflow on three-lane carriageway (**Figure 7.38** and **Figure 7.39**)	2 + 3	3 + 2

NOTES:

1. Partial contraflow is not operated on two-lane carriageways.
2. The first number is the number of lanes running in the primary direction, the second is the number of lanes running in the secondary direction.

7.25.11. In the following figures, a gate is shown as 'open' if it lies parallel to the carriageway lane lines, and 'closed' when it is drawn at an angle across the lane.

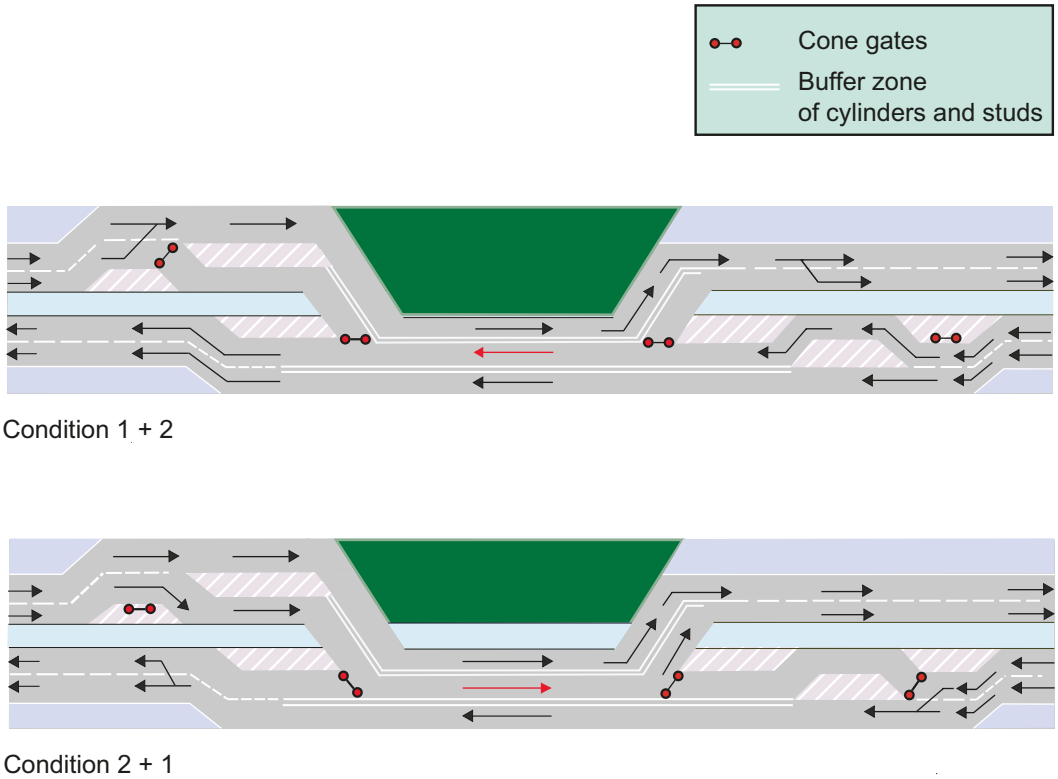


Figure 7.34 Schematic of tidal flow layout for full contraflow on two-lane carriageways with hard shoulder

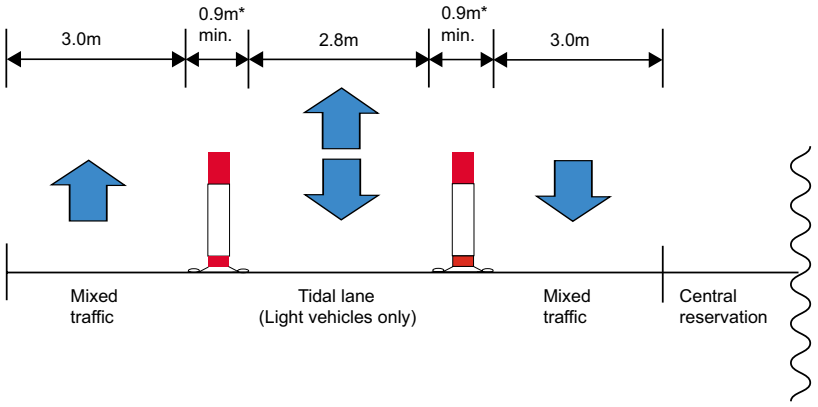


Figure 7.35 Cross section of tidal flow layout for full contraflow on two-lane carriageways

* Existing stud insert housings may be used for the cylinders. At minimum, a 0.9 m wide buffer zone to Detail K should be provided using rows of saturn yellow studs either side of the cylinders. Dimensions for the cylinder buffer zone width are to the outside edge of the studs.

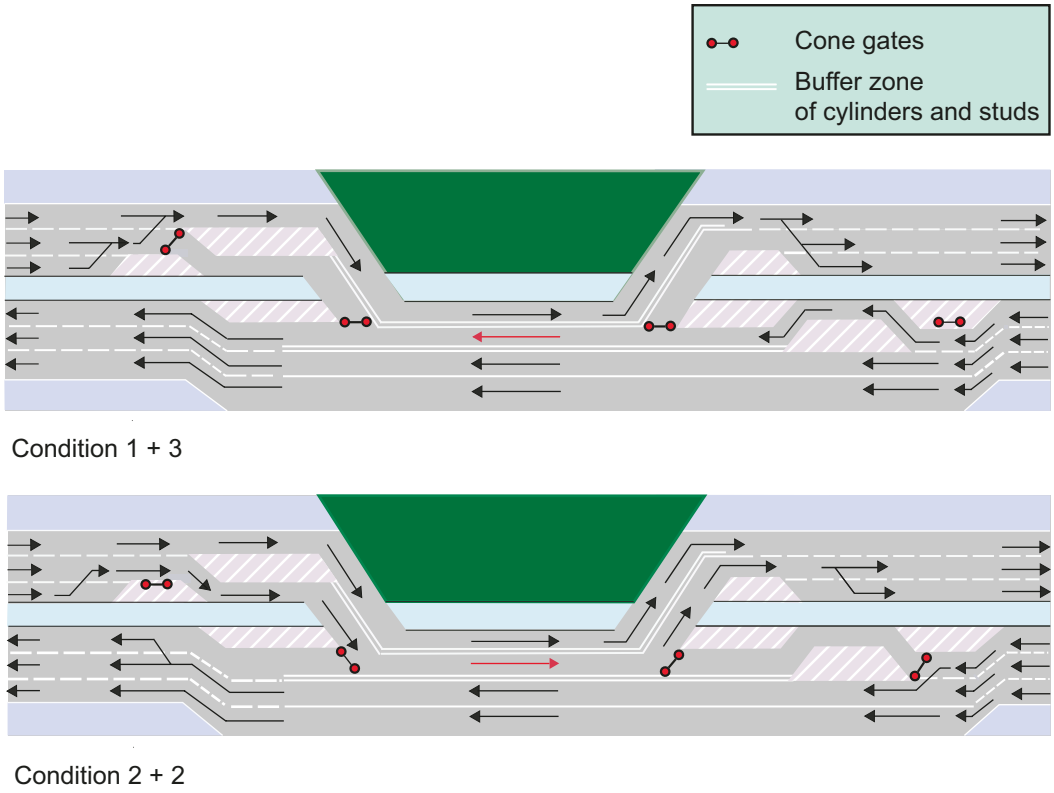


Figure 7.36 Schematic of tidal flow layout for full contraflow on three-lane carriageways with hard shoulder

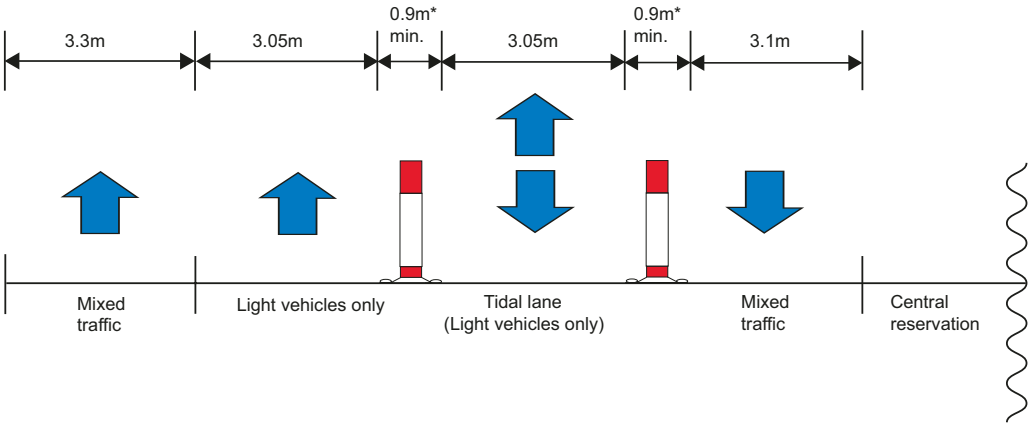


Figure 7.37 Cross section of tidal flow layout for full contraflow on three-lane carriageways

* Existing stud insert housings may be used for the cylinders. At minimum, a 0.9 m wide buffer zone to Detail K should be provided using rows of saturn yellow studs either side of the cylinders. Dimensions for the cylinder buffer zone width are to the outside edge of the studs.

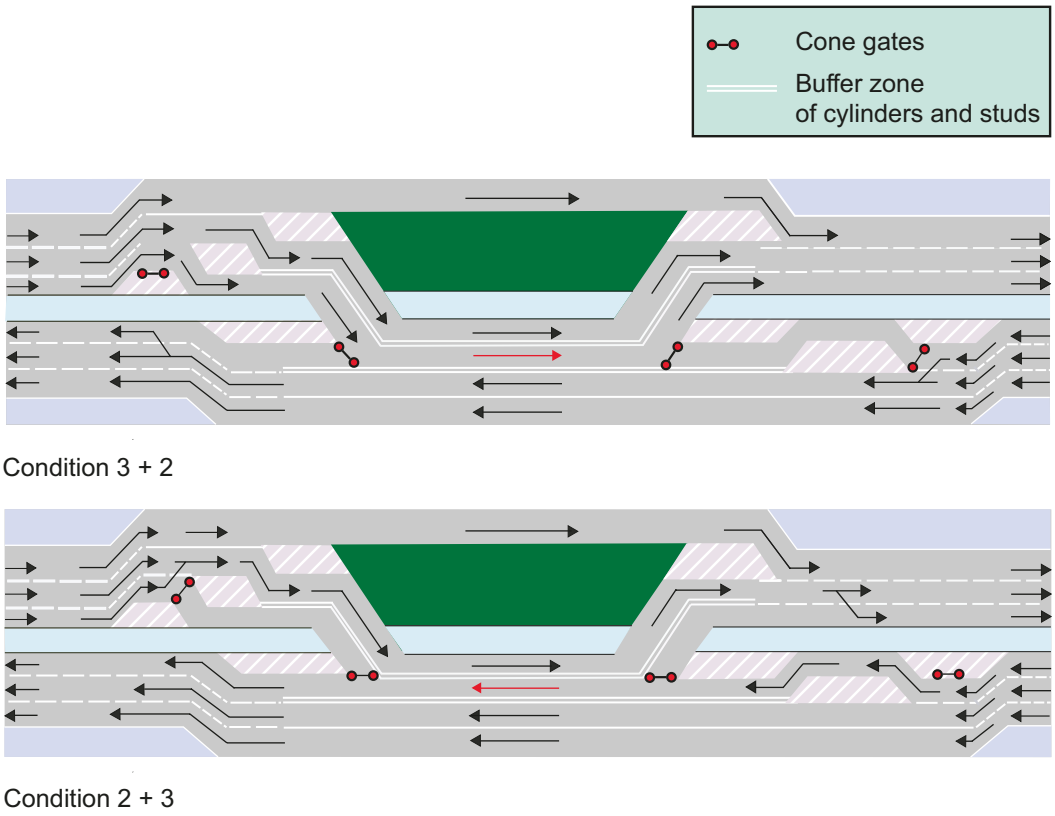


Figure 7.38 Schematic of tidal flow layout for partial contraflow on three-lane carriageways with hard shoulder

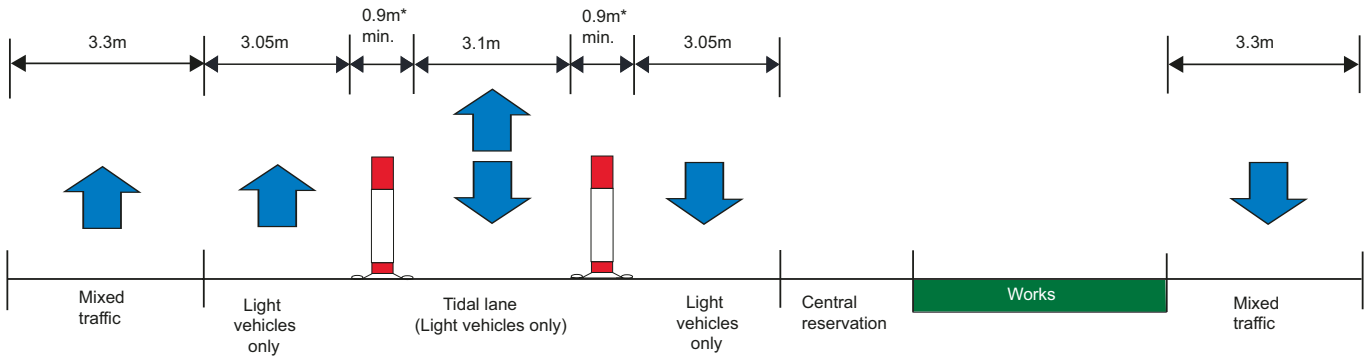


Figure 7.39 Cross section of tidal flow layout for partial contraflow on three-lane carriageways

* Existing stud insert housings may be used for the cylinders. At minimum, a 0.9 m wide buffer zone to Detail K should be provided using rows of saturn yellow studs either side of the cylinders. Dimensions for the cylinder buffer zone width are to the outside edge of the studs.

Principles and plans for tidal flow operations

The approach zone

7.25.12. The principles for approach signing for tidal flow operations are as shown in **Plan DZA3**.

The lane change zone

7.25.13. If a lane closure is involved in the lane-change zone, then the detailed principles and signing requirements are as shown in **Plan DZB9**.

7.25.14. If no lane closure is involved, then the detailed principles and signing requirements are as shown in **Plan DZB10**.

The lead in zone

7.25.15. This zone includes changeovers (i.e. moving lanes) and the initial crossover.

7.25.16. The detailed principles and signing requirements for moving lanes to the hard shoulder are as shown in **Plan DZC4**.

7.25.17. The detailed principles and signing requirements for moving lanes across the carriageway are as shown in **Plan DZC2** and **DZC3**.

Advance warning signs

7.25.18. The type and exact location of the advance warning signs vary with the direction of flow and the condition in operation.

7.25.19. Signs for lane closures are placed on both nearside and offside at 600 m, 400 m and 200 m, measured from the start of the closed gate.

7.25.20. In the primary direction, the following signs are required:

The principles for full contraflow on two-lane carriageways (**Plan DTF1**) are:

- for Condition 1 + 2:
  - ‘lane closed ahead’ variant signs to diagram 7244 (S13-6-15) with bottom distance panel ‘x yards’ to inform restrictions ahead owing to road works (see **7.25.22**).
- for Condition 2 + 1:
  - An appropriate variation of signs to diagram 7244 (S13-6-15) and 7245 (S13-6-16), bottom panel ‘x yards’ to indicate lane use restrictions. The signs are placed on both the nearside and the offside at 800 m, 600 m, and 400 m, measured from the end of the open gate.

For full contraflow on three-lane carriageways:

- for Condition 1 + 3:
  - ‘lane closed ahead’ variant signs to diagram 7202.1 (S13-6-13) with bottom distance panel ‘x yards’ to inform restrictions ahead owing to road works (see **7.25.22**).
- for Condition 2 + 2:
  - An appropriate variation of signs to diagram 7244 (S13-6-15) and 7245 (S13-6-16), bottom panel ‘x yards’ to indicate lane use restrictions. The signs are placed on both the nearside and the offside at 800 m, 600 m, and 400 m, measured from the end of the open gate.

For partial contraflow on three-lane carriageways (Plan DTF3):

- for Condition 2 + 3:
  - ‘lane closed ahead’ variant signs to diagram 7244 (S13-6-15) with bottom distance panel ‘x yards’ to inform restrictions ahead owing to road works (see **7.25.22**).
- for Condition 3 + 2:
  - An appropriate variation signs to diagram 7244 (S13-6-15) and 7245 (S13-6-16), bottom panel ‘x yards’ to indicate lane use restrictions. The signs are placed on both the nearside and the offside at 800 m, 600 m, 400 m and 200 m, measured from the end of the open gate.

7.25.21. In the secondary direction, the following signs are required:

For full contraflow on two-lane carriageways (**Plan DTF2**):

- for Condition 1 + 2:
  - An appropriate variation of signs to diagram 7244 (S13-6-15) and 7245 (S13-6-16), bottom panel ‘x yards’ to inform restrictions ahead owing to road works. The signs are placed on both nearside and offside at 800 m, 600 m, 400 m and 200 m, measured from the end of the open gate.
- for Condition 2 + 1:
  - ‘lane closed ahead’ variant signs to diagram 7202.1 (S13-6-13) with bottom distance panel ‘x yards’ (see **7.25.22**).

For full contraflow on three-lane carriageways:

- for Condition 1 + 3:
  - An appropriate variation of signs to diagram 7244 (S13-6-15) and 7245 (S13-6-16), bottom panel ‘x yards’ to indicate lane use restrictions. The signs are placed on both the nearside and the offside at 800 m, 600 m, 400 m and 200 m measured from the end of the open gate.
- for Condition 2 + 2:
  - ‘lane closed ahead’ variant signs to diagram 7202.1 (S13-6-13) with bottom distance panel ‘x yards’ to inform restrictions ahead owing to road works (see **7.25.22**).

For partial contraflow on three-lane carriageways (**Plan DTF4**):

- for Condition 2 + 3:
  - An appropriate variation of signs to diagram 7244 (S13-6-15) and 7245 (S13-6-16) with bottom panel ‘x yards’ to indicate lane use restrictions. The signs are placed on both the nearside and the offside at 800 m, 600 m, 400 m, and 200 m, measured from the end of the open gate.
- for Condition 3 + 2:
  - ‘lane closed ahead’ variant signs to diagram 7244 (S13-6-15) with bottom distance panel ‘x yards’ to inform restrictions ahead owing to road works (see **7.25.22**).

7.25.22. Where traffic has been moved onto a hard shoulder, for signs to diagram 7202.1 (S13-6-13) and 7244 (S13-6-15) the hard shoulder line is not used.

Gates

7.25.23. The general principles for signing gates are:

- each gate consists of a line of cones to Detail B.
- three ‘lane closed’ barriers to diagram 7105 (S13-6-8), each with a keep left sign to diagram 610 (S3-2-3), are required if there is a reduction in lanes at the gate. The cone taper length should be as given in **Table A1.3** (**Appendix A1**).
- advance warning signs are placed on both nearside and offside at 200 m intervals from 600 m in advance of the gate to 200 m in advance of the gate.

7.25.24. When lanes are divided at the end of a closed gate:

- cylinders and studs to Detail G (see **Plan DZC9** for details of splitter) are to be used for a length of 150 m, up to the nose of the divide.
- cylinders and studs to Detail K are used instead if one lane proceeds on the hard shoulder, as in a partial contraflow.
- a sign to diagram 611 (S11-2-73) in advance of the split. This sign is used where traffic using either route reaches the same destination. Where one route has an alternative end destination, two keep ‘left/right’ arrows to diagram 610 (S3-2-3) need to be displayed side by side.

Crossovers

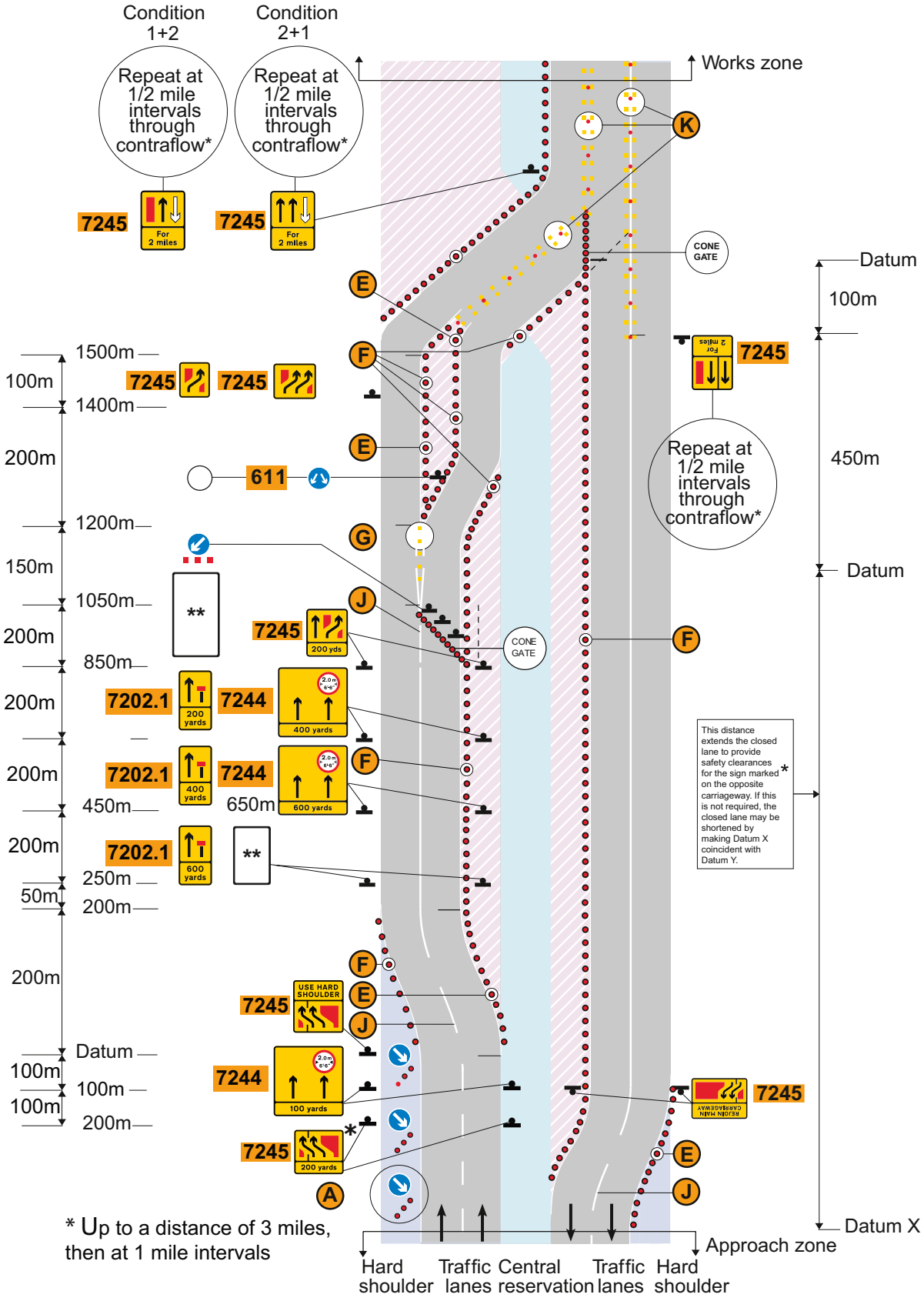
7.25.25. For guidance on the design of crossovers, see **Section 7.5**.

7.25.26. In the layouts shown, the crossover can work as either a single-lane or a two-lane crossover. The number of lanes in a crossover depends on what the condition of the tidal flow system is in.

7.25.27. The detailed principles and signing requirements for the initial crossover are as shown in **Plans DZC6** and **DZC7**.

The principles for tidal flow operations are shown in **Plans DTF1** to **DTF8**.

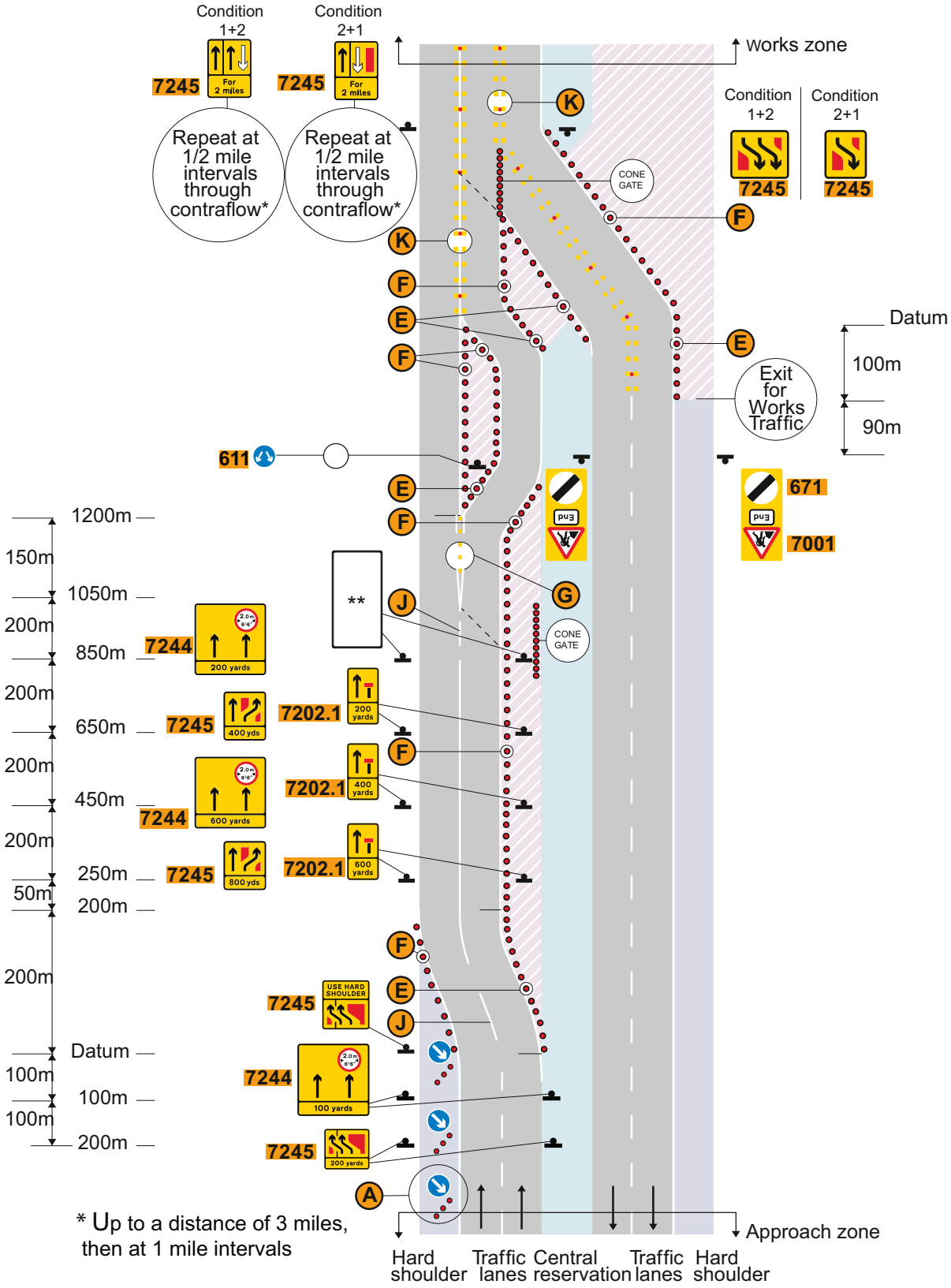
Plan DTF1 Tidal flow layout, lead-in zone for full contraflow on a two-lane carriageway road (primary direction)



NOTE: All cone gates are shown in position for ‘Condition 1+2’. Positions for ‘Condition 2+1’ are shown dotted.

** indicates where a sign required for one condition but not for the other should be covered or removed when not required.

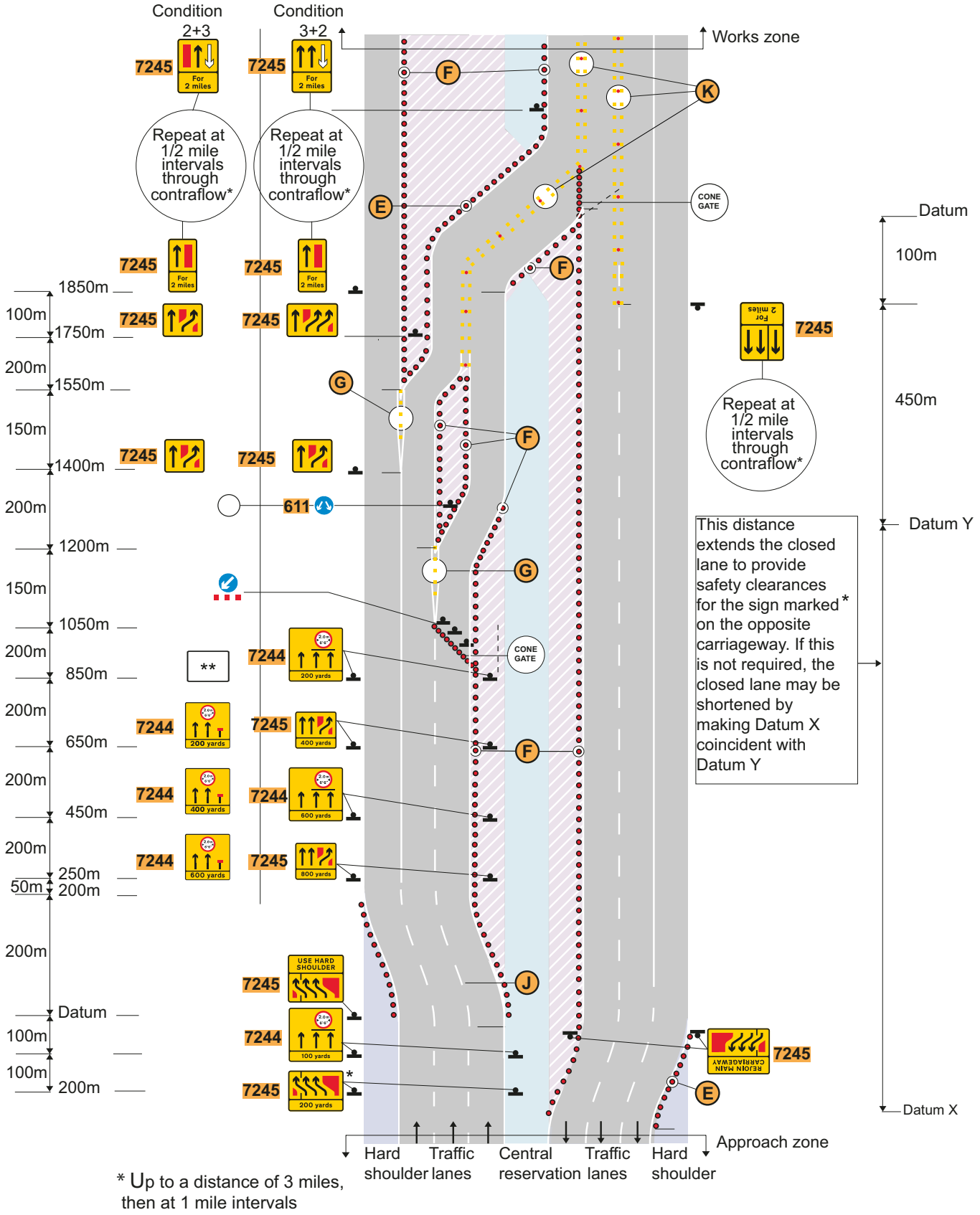
Plan DTF2 Tidal flow layout, lead-in zone for full contraflow on a two-lane carriageway road (secondary direction)



NOTE: All cone gates are shown in position for ‘Condition 1+2’. Positions for ‘Condition 2+1’ are shown dotted.

** indicates where a sign required for one condition but not for the other should be covered or removed when not required.

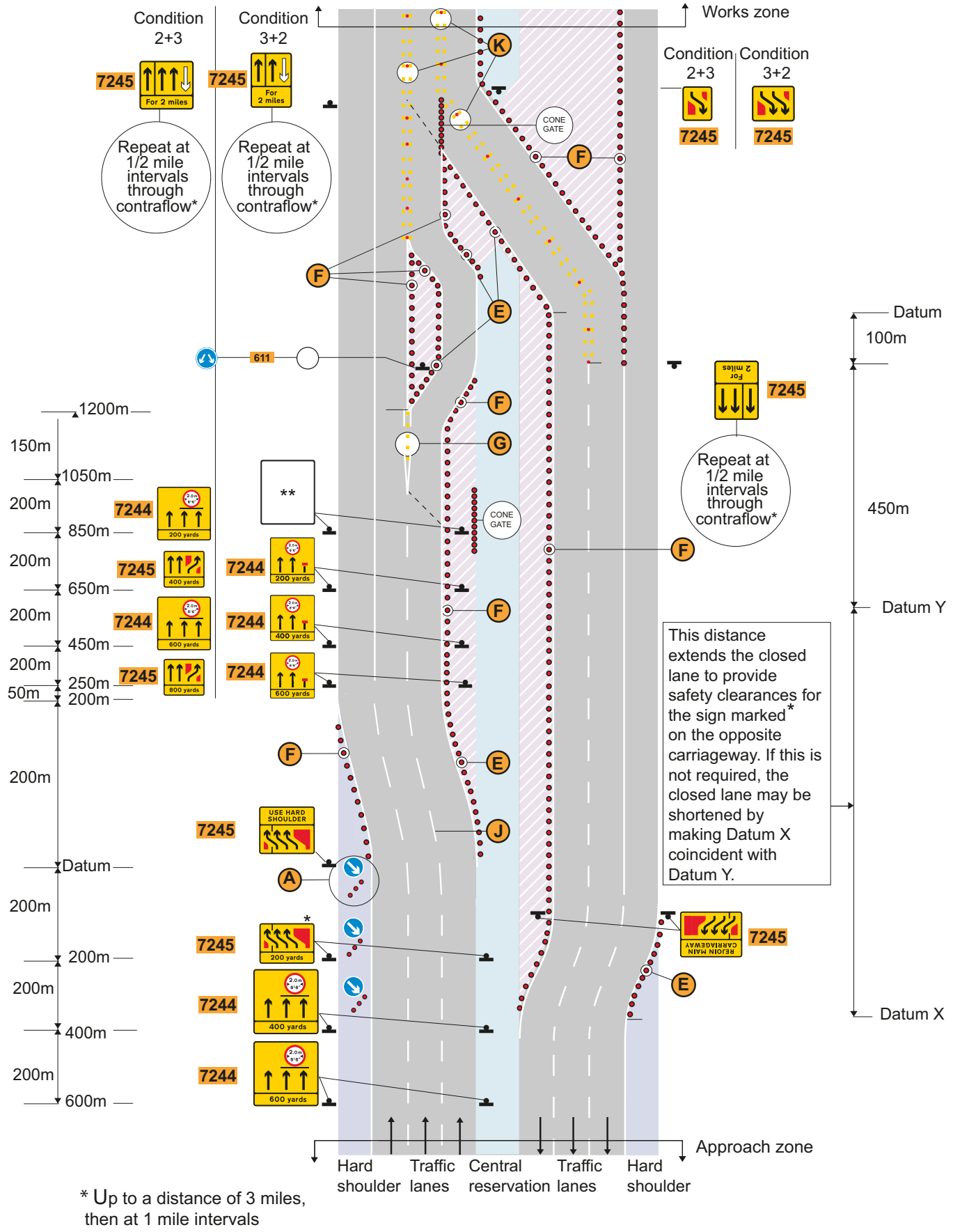
Plan DTF3 Tidal flow layout, lead-in zone for partial contraflow on a three-lane carriageway road (primary direction)



NOTE: All cone gates are shown in position for ‘Condition 2+3’. Positions for ‘Condition 3+2’ are shown dotted.

** indicates where a sign required for one condition but not for the other should be covered or removed when not required.

Plan DTF4 Tidal flow layout, lead-in zone for partial contraflow on a three-lane carriageway road (secondary direction)



NOTE: All cone gates are shown in position for ‘Condition 2+3’. Positions for ‘Condition 3+2’ are shown dotted.

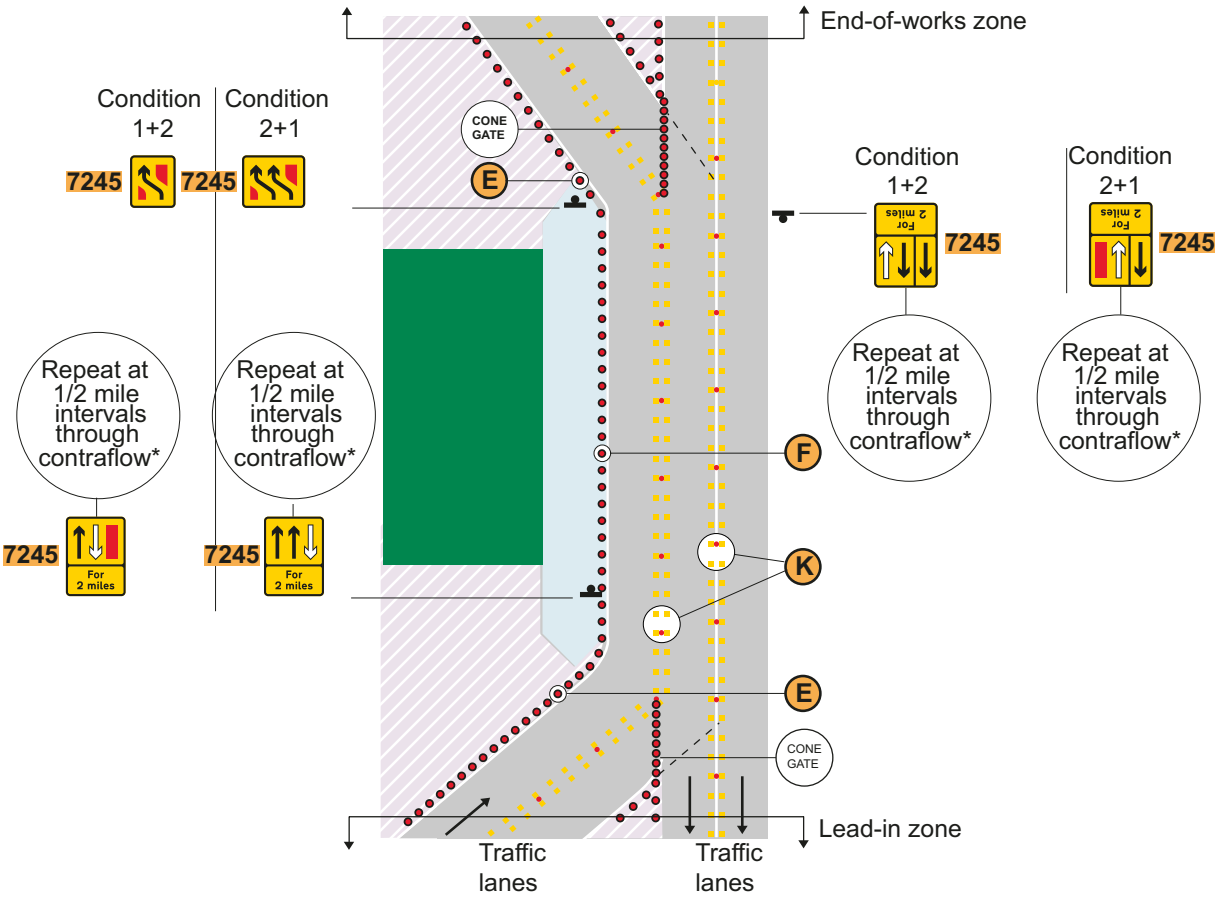
** indicates where a sign required for one condition but not for the other should be covered or removed when not required.

Works zone

The principles for the works area are:

- cylinders and studs to Detail K are used to mark the contraflow running lanes.
- in the primary direction, a variation of diagram 7245 (S13-6-16), with distance plate ‘For x miles’ is used to indicate the open and contraflow lanes. The signs are placed on the nearside and repeated at ½ mile intervals through the contraflow.
- in the secondary direction, a variation of diagram 7245 (S13-6-16), with supplementary plate ‘For x miles’ to indicate the hard shoulder, open and contraflow lanes. The signs are placed on the nearside and repeated at ½ mile intervals through the contraflow.

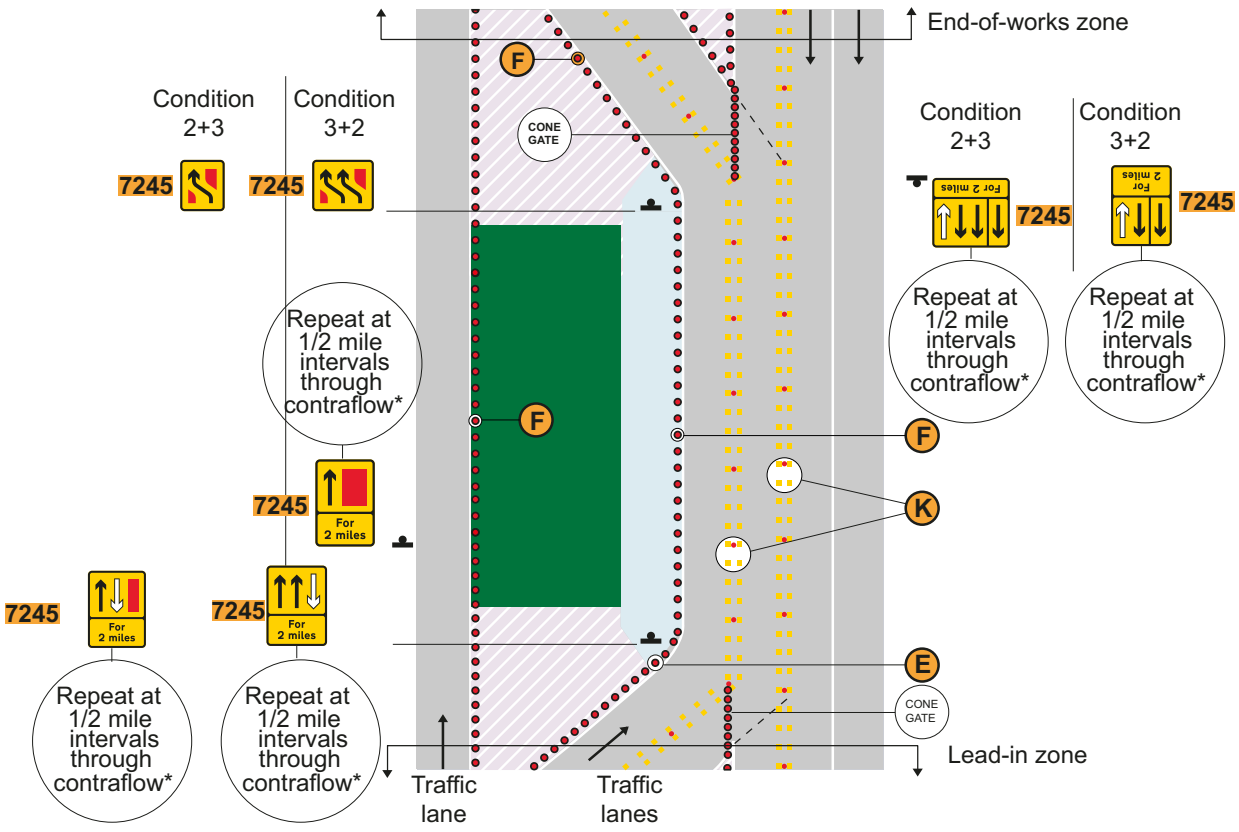
Plan DTF5 Tidal flow layout, works zone for full contraflow on a two-lane carriageway road



* Up to a distance of 3 miles, then at 1 mile intervals

NOTE: All cone gates are shown in position for ‘Condition 1+2’. Positions for ‘Condition 2+1’ are shown dotted.

Plan DTF6 Tidal flow layout, works zone for partial contraflow on a three-lane carriageway road



* Up to a distance of 3 miles, then at 1 mile intervals

NOTE: All cone gates are shown in position for ‘Condition 2+3’. Positions for ‘Condition 3+2’ are shown dotted.

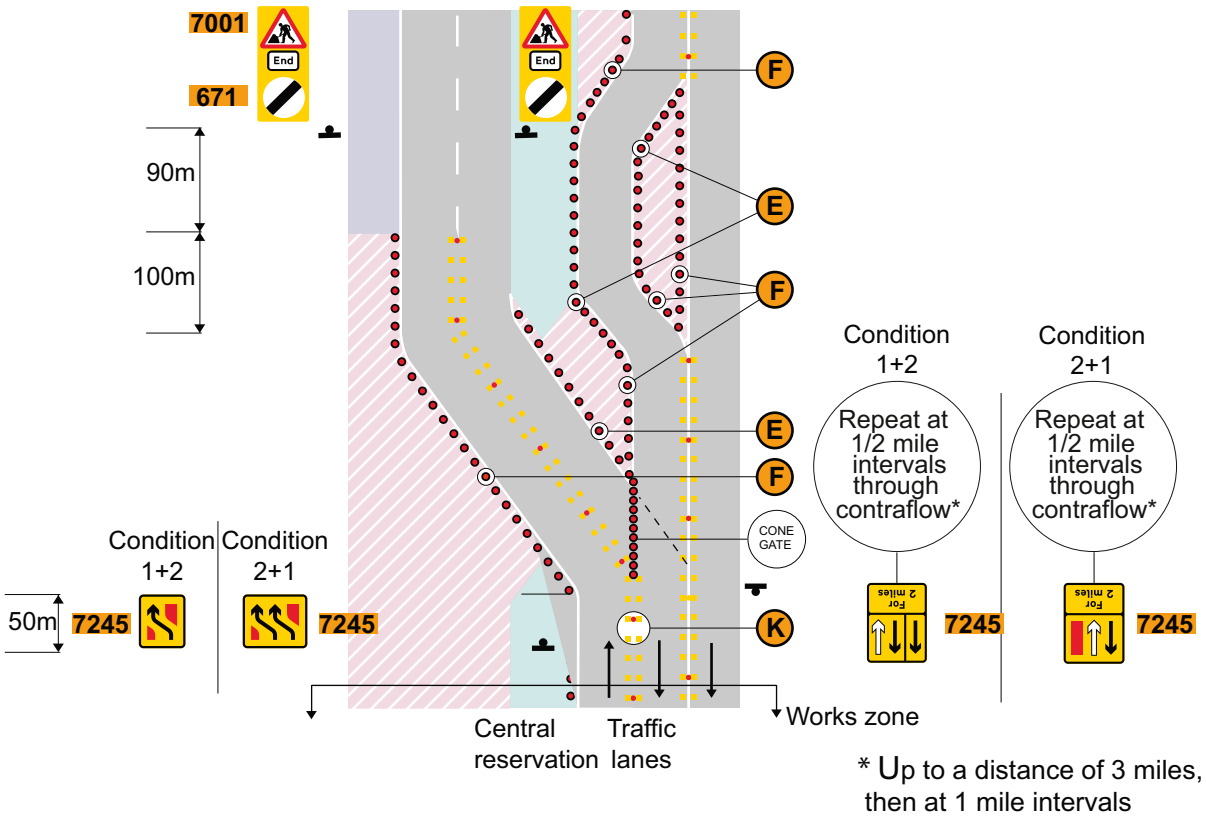
End of works zone

7.25.28. The detailed principles and the signing required for changeovers from the hard shoulder are as shown in **Plan DZE2**.

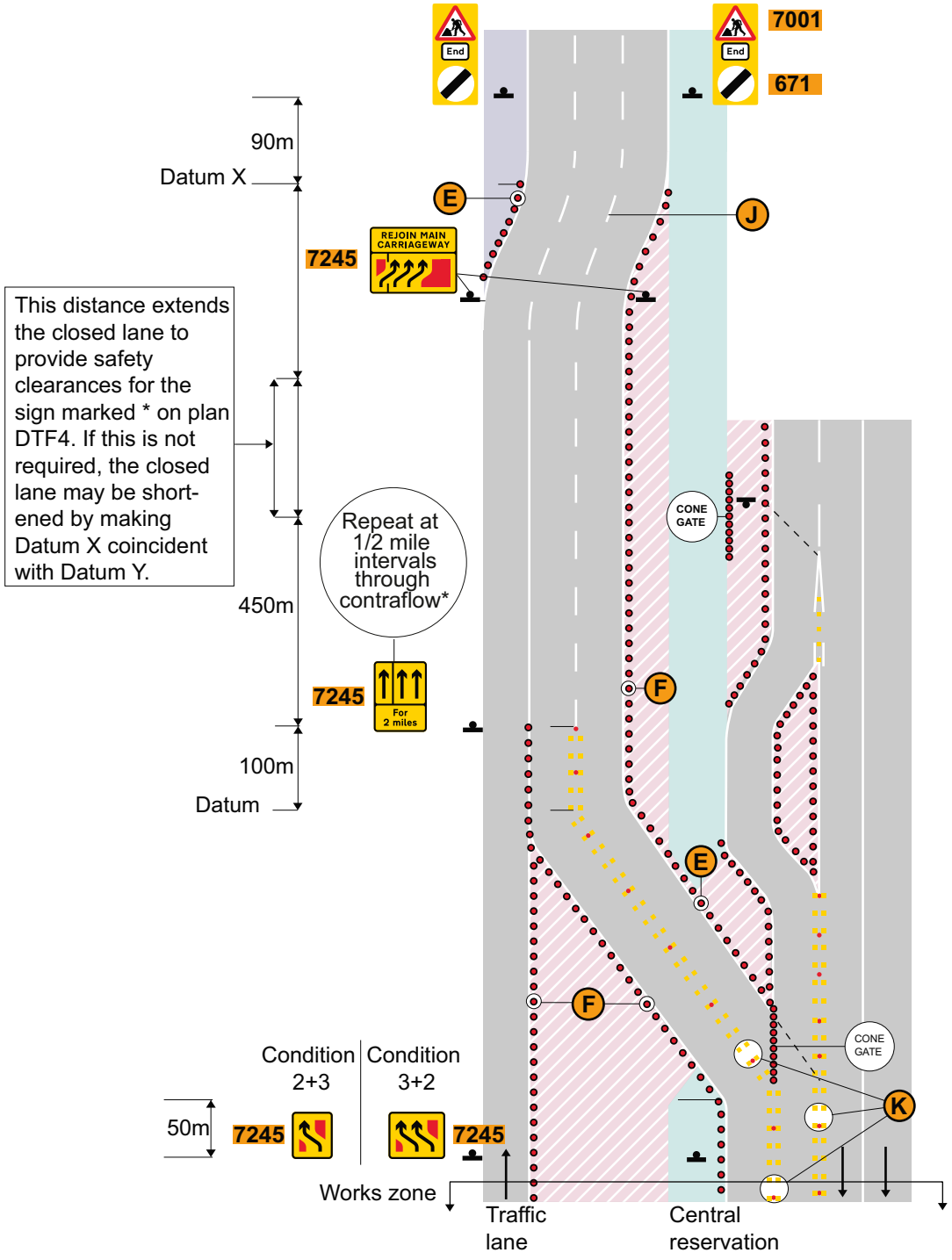
7.25.29. The detailed principles and the signing required for the return crossover are as shown in **Plans DZE3** and **DZE5**.

7.25.30. On three-lane carriageways, the secondary carriageway central reservation approach sign to diagram 7245 (S13-6-16) may need to encroach into lane 3 of the primary carriageway for safety clearance purposes. In which case lane 3 should be coned off using Detail F to provide the necessary sign protection (see **Plan DTF4**) and the two-lane crossover returned traffic should be to lanes 1 and 2.

Plan DTF7 Tidal flow layout, end-of-works zone for full contraflow on a two-lane carriageway road



Plan DTF8 Tidal flow layout, end-of-works zone for partial contraflow on a three-lane carriageway road



* Up to a distance of 3 miles, then at 1 mile intervals

8 EMERGENCY TRAFFIC MANAGEMENT

8.1 Emergencies

8.1.1. This section gives guidance and considerations for the use of Emergency Traffic Management (ETM) applicable to all roads on the highway network. If an emergency occurs within an area subject to works, the contractor is legally responsible for the management of any incidents while maintaining the safety of the works and any associated signing. However, the police (and Traffic Officers where relevant) may request the site personnel to erect or alter signing to assist with an incident. The police and Traffic Officers will need to consult the persons responsible for the TTM before making requests to change existing signing. The police and Traffic Officers must not place ETM at works which would impact on the risk to road workers, such as increasing the potential for incursions.

8.1.2. For standard schemes there should be an incident management plan developed to identify what actions, and what signs, IPVs and vehicle recovery services etc, should be deployed for common types of incident; this should be provided to, and agreed with, the police and any relevant control centre. For relaxation schemes where there are signalling systems present in the works or immediately upstream of the works, plans should be developed and consulted on with the control centre to identify whether signals in the works, or in advance of the works should be set as part of ETM. Incident management plans and procedures relating to works should consider how the incident and its management affects all types of road users including pedestrians and cyclists. It is accepted that it may not always be possible to address the additional needs of vulnerable road users during emergencies. If the ETM is in place for a considerable duration the additional needs of vulnerable road users should be addressed, with the approach required to be detailed in the incident management plan.

8.1.3. Emergencies that occur on the highway network outside of road works will usually be attended initially by the police or traffic officers and then by other emergency services. The police or traffic officers will often erect the required signs to deal with short term emergencies such as breakdowns or minor accidents on the carriageway.

8.1.4. Authorities may have dedicated Incident Support Units (ISU). These should have specific plans and methods of working for the initial deployment of ETM. Contractors do not have any general authorisation or powers to stop or direct traffic. However, under section 65 of the Road Traffic Regulation Act 1984 (as amended by the New Roads and Street Works Act 1991) an authority can permit contractors employed by them to place ETM on any part of their network without a specific instruction. Contractors should confirm with the authority employing them, whether or not they are permitted to deploy ETM complying with this section.

8.1.5. Where the effects of the emergency last longer than 20 minutes the police or traffic officers may require enhancements to the ETM to be installed by the authority or maintaining organisation. Where incidents are likely to last more than 90 minutes, or where emergency remedial repairs are needed (e.g. replacing a road surface damaged by a vehicle fire), the police or traffic officers may require the TTM signs and equipment consistent with that recommended for planned works to be erected by the authority or maintaining organisation. This section gives guidance and considerations for the use of enhanced ETM applicable to all roads on the highway network.

8.1.6. By their nature, the locations and times of emergencies are difficult to predict compared to other types of incident occurring on the network.

8.1.7. The authority must make, or arrange for, the necessary resources available and ensure the relevant staff are competent to provide ETM as required or requested by the emergency services.

8.1.8. Emergency diversion routes should be signed in accordance with **Section 4.24** using 'temporary diversion' signs to working drawings 2702 to 2706 inclusive (S13-9; **Figure 8.1**).



Figure 8.1 Sign to working drawing Diagram 2702 (S13-9)

8.1.9. Where a suitable diversion route is already marked by permanent signing to working drawing 2703 and 2704 (S13-9) it may be used to sign the emergency diversion. The cost of permanent signing for the sole use of signing emergency routes may not be justified if the emergency diversions are uncommon.

8.1.10. If an incident takes place within an existing tidal flow system, the system may be configured to help manage traffic flow around the incident. When traffic flows are low (e.g. at night, or during off-peak periods), the tidal lane may also be closed for maintenance, emergency access or to act as a buffer lane.

8.2 General principles of emergency traffic management

8.2.1. It may not always be possible to provide ETM fully compliant with the principles recommended for planned works in an emergency. When identifying equipment (size, number) and ETM plans, the capacity of vehicles used, and the training of the operatives etc, will need to be taken into account.

8.2.2. When considering requirements for enhanced ETM, this will be limited to providing extra equipment and will likely exclude any requirement to change permanent features e.g. masking marking or obscuring/bagging signs. This section describes the practice of providing ETM, or enhanced TTM which allows for fast deployment in an emergency using only limited traffic management resources. As guide enhanced ETM installed in the period 20-90 min should reflect the requirements for relaxation schemes. Where incidents extend past 90 minutes, particularly where emergency repairs are likely, the TTM should reflect the requirements for standard schemes. Flexibilities, such as a 150m standard taper, are likely to be acceptable where this would minimise the time taken to upgrade to enhanced ETM or post 90 min TTM.

8.2.3. ETM should be deployed at unplanned incidents for the purposes of:

- preventing the incident from escalating.
- providing short-term protection to those involved.
- protecting and directing approaching traffic.
- protecting the scene of a crime.
- managing related congestion and / or.
- giving sufficient advance warning of an incident or obstruction.

8.2.4. Examples of situations that would require ETM are given below:

- road traffic accidents.
- broken down/abandoned vehicles: ETM is required to warn other road users of the obstruction and to protect them and the vehicle recovery operation personnel.
- debris on the road: ETM may be required to safely remove small pieces of debris. Larger, unmanageable debris may need to be protected by TTM.

8.2.5. ETM must not be used for planned activities such as short duration temporary works.

8.2.6. ETM must take account of all the road users likely to be affected by management of the incident, including pedestrians, equestrians, and cyclists.

8.2.7. Highway authorities may operate Incident Support Units (ISUs) or similar teams/ operations to support emergency services when responding to incidents on roads. The main function of ISUs (and equivalent support teams) are to:

- attend and help clear minor incidents when requested by the police or traffic officers.
- provide traffic management equipment to supplement the limited amount carried by police and traffic officers.
- enhance the ETM initially deployed by the police or traffic officers.
- replace ETM with fully compliant TTM when required.
- undertake highway maintenance safety patrols and safety inspections.
- assess asset damage and clear minor debris.
- identify when a road is safe to reopen following a minor incident. For major incidents, the police or traffic officers should make the decision. Alternatively, the managing agent or Direct Labour Organisation (DLO), along with the relevant control centre may make the decision if the incident requires the road to be repaired.

8.2.8. ETM should be deployed immediately, if safe to do so, by the first to arrive at the incident out of the police, traffic officers or ISU. All available equipment and resource should be used. If the ISU arrives first, they should deploy ETM according to their own procedures and with the equipment available. However, ETM deployed by an ISU has to, as a minimum, comply with the basic ETM layout described in this section. ISUs should immediately request the appropriate police or traffic officer assistance as soon as the need for assistance is identified.

8.2.9. Only the police or traffic officers have powers to close a carriageway or stop traffic. As such ISUs should only deploy ETM that would stop traffic or close a carriageway when instructed to do so by the police, a traffic officer or when the authority has issued an emergency notice under Section 14 of the Road Traffic Regulation Act 1984. Where a carriageway closure is required, the ISU should deploy fully compliant TTM as soon as practicable.

8.2.10. Deployed ETM should be continually assessed to ensure it remains appropriate or whether it should be replaced by TTM (see **Section 8.4**).

8.2.11. The deployment of ETM layouts should consider how the nature of the incident will impact the requirements of ETM. Resources and equipment available for deployment over the course of the incident should also be considered. Topographical and environmental conditions should also be included in planning (e.g. obstructed sight lines or fog may impact visibility which may require the deployment of warning lights as part of the ETM).

8.3 Training

8.3.1. Contractors and ISUs (and equivalent support teams) staff deploying ETM must have the relevant training to implement TTM on a live carriageway in accordance with **Section 15.1** as well as specific incident management procedures.

8.3.2. Records should be kept of all qualifications and training provided to all staff. Staff competency should be periodically reviewed to identify new training requirements.

8.4 Duration of the incident

8.4.1. This section gives recommendations for ETM depending on the duration of the incident. The durations and recommendations given can be used to suit the needs of the situation and the availability of equipment and resources.

8.4.2. Those dealing with an incident should assess whether an incident is likely to be short, medium, or long term when they arrive on the scene and immediately request the relevant support if required:

- Short-term incidents: categorised as incidents that are expected to last less than 20 minutes after ETM is deployed. Additional TTM is unlikely to be required.
- Medium-term incidents: categorised as incidents that are expected to last between 20 and 90 minutes after the initial ETM is deployed. The ETM should be enhanced using larger coning and signing to comply with the basic ETM layout described in this section. The enhanced ETM should be deployed either adjacent to or upstream of the initial ETM with the initial ETM equipment being removed once the enhanced ETM is in place. Removed ETM equipment should be left on the hard shoulder, or verge (if no hard shoulder is present).
- Long term incidents are categorised as an incident that is expected to last longer than 90 minutes. The ETM or enhanced ETM should be replaced with TTM as soon as practicable following a dynamic risk assessment.

8.5 Initial response

8.5.1. Factors such as incident type, location, road geometry, time of day and available equipment will determine which ETM layout is most appropriate to use for an initial response.

8.5.2. The first to arrive at the scene should immediately take action, if safe to do so, to prevent the incident from escalating further and ensure the scene is safe.

8.5.3. An assessment of the incident should then be made considering:

- Is ETM necessary immediately to prevent escalation or protect people at the incident? If it is, how quickly does the ETM need to be deployed?
- Can the incident be dealt with on foot? For example, removal of a small piece of debris from the carriageway (see **Section 13.2**).
- Can the incident be moved to a place of relative safety (e.g. hard shoulder) without deploying ETM?
- Can the incident be cleared quickly? If so, can a high-conspicuity vehicle be stopped in the carriageway to protect the incident? (see **Section 8.10**)
- Should a lane closure be set out or an approved rolling road block technique be used?
- What equipment is required? Can it be deployed without delay or are additional traffic management resources available nearby?

8.5.4. **Figure 8.2** summarises guidance for deploying ETM.

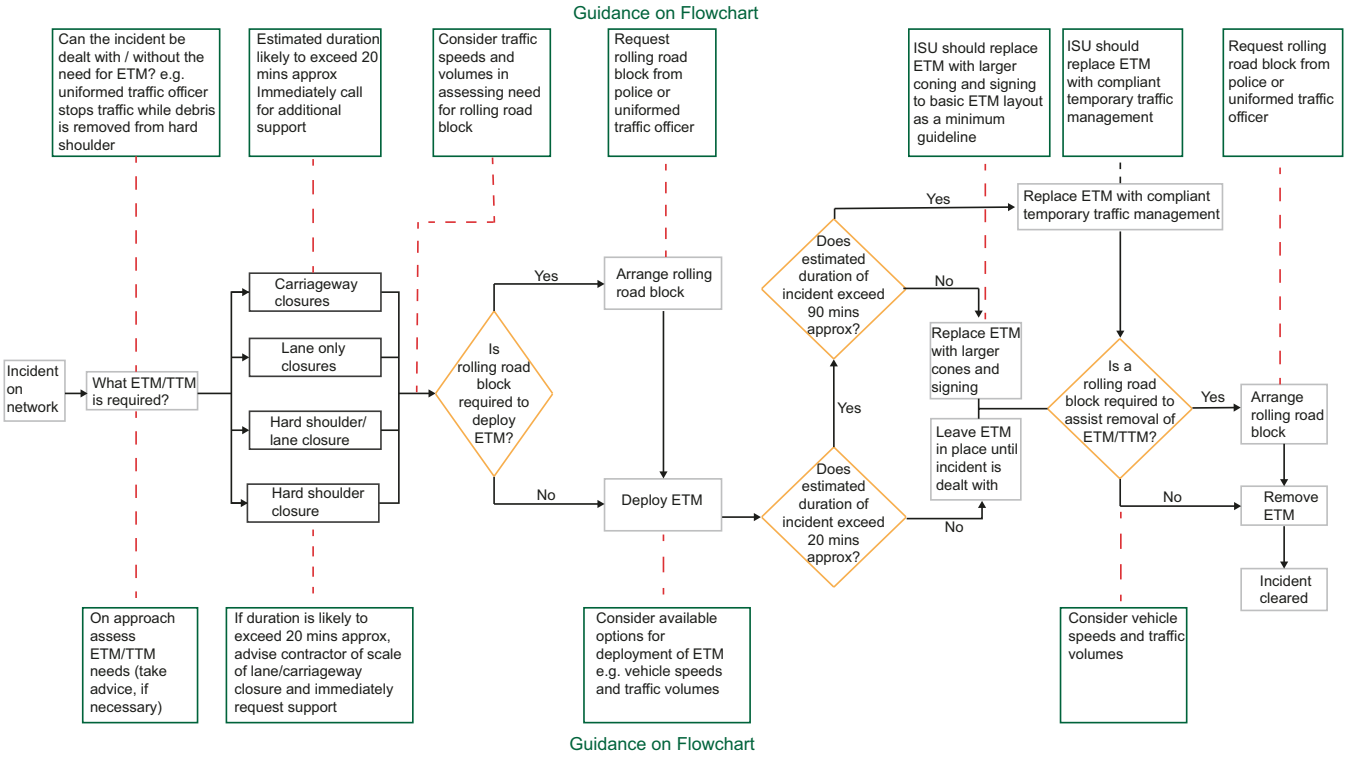


Figure 8.2 Deployment of emergency traffic management

8.6 Deployment of emergency traffic management

8.6.1. Before deploying ETM, a dynamic risk assessment must be carried out to determine the requirements and extent of ETM to be deployed. The dynamic risk assessment should consider:

- traffic flow – the volume of traffic and its speed.
- lighting levels and time of day.
- weather - rain, fog, snow, etc.
- road geometry – curvature, proximity to junction, crests of hills, etc.

8.6.2. Where used ETM should be deployed to close the lane(s) completely. Where only a single lane remains open and is less than 3.25m wide then the adjacent lane may be only partially closed to enable HGVs to pass.

8.6.3. The first vehicle to arrive on the scene should normally stop a minimum of 50 m upstream of the incident to provide additional warning to drivers approaching an incident and encourage them to proceed at an appropriate speed. On single carriageway roads, stopping 50 m upstream may not be practicable. In this case an appropriate distance should be selected by undertaking a dynamic risk assessment or as directed by the emergency services officer in charge.

8.6.4. A vehicle arriving at the scene may be used to create a longitudinal safety zone by stopping on the carriageway. If used in this way, the vehicle must be fitted with high-conspicuity makings (**Section 14.7**) and enhanced warning lights. If available, an IPV should be used. Alternate-flashing, rear-facing red lights are not authorised for use on vehicles other than emergency services.

8.6.5. Vehicles stopping in a live lane may be equipped with an appropriate electronic light arrow (see **8.10.2**). If they are not fitted with such a device, a ‘keep left/right’ sign to diagram 610 (S3-2-3; **Figure 8.3**) must be deployed at the rear of the vehicle to indicate that it has stopped. This sign should be removed when the incident is resolved or replaced with ETM, if required.



Figure 8.3 Diagram 610 (S3-2-3)

8.6.6. Under no circumstances should a vehicle be reversed in a live carriageway unless protected by the police, traffic officer, or TTM.

Coning and signing

8.6.7. Traffic cones used for ETM must comply with either diagram 7101.1 (S13-6-4) or 7102 (S13-6-5), see **Figure 8.4**. It is unlikely that the number of cones used for ETM would comply with the requirements for TTM given in this document, see **Section 5**. As such, those deploying ETM should always use the largest size cone available to maximise visibility and conform to class R2/R2B in BS EN 13422. Cones less than 450 mm in height are not suitable for ETM.

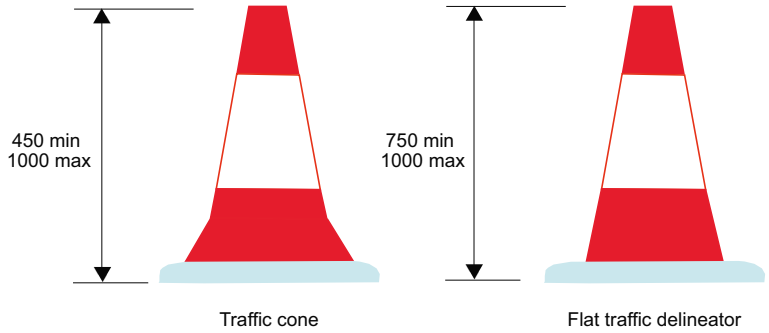


Figure 8.4 Diagram 7101.1 (S13-6-4) Traffic cone and diagram 7102 (S13-6-5) Flat traffic delineator

NOTE:

1. Details of the design of flat traffic delineators is now in CD 132

8.6.8. On dual carriageways, ETM coning should always begin at either the nearside or the offside of the carriageway and should never allow an incident to be surrounded by live lanes of traffic, forming an island.

8.6.9. Longitudinal and lateral clearances provided between the working area and live traffic constitutes the safety zone which should not be entered except to maintain or remove ETM.

8.6.10. **Figure 8.5** gives the basic ETM layout and minimum required signing for roads with a speed limit of 40 mph and above.

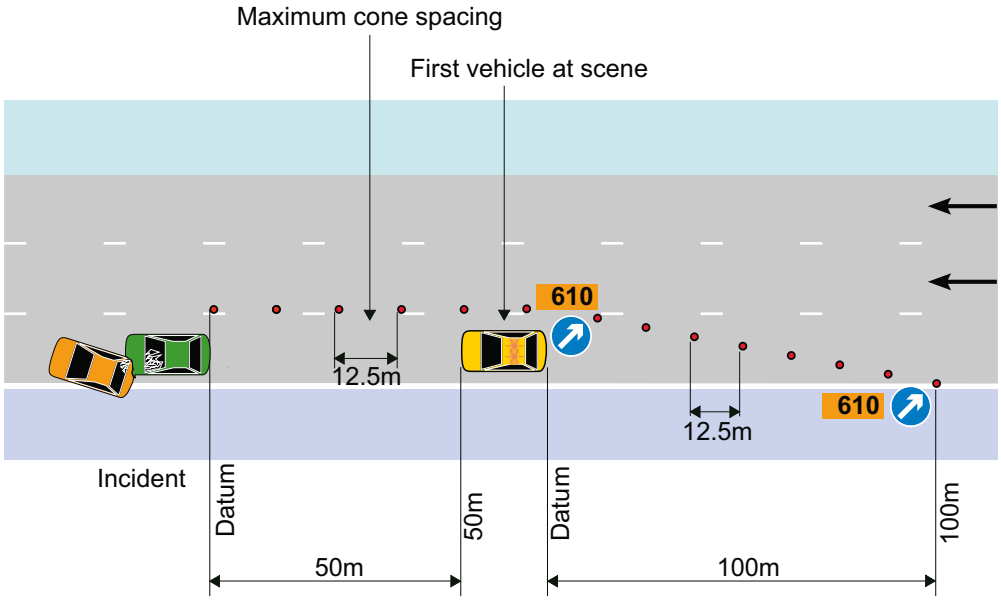


Figure 8.5 Minimum required ETM coning and signing (40 mph roads and above)

NOTES:

1. The first vehicle at the scene should be parked in the appropriate 'fend' position (see **8.10.5** to **8.10.10**).

2. Sign to diagram 610 (S3-2-3) may be placed either in the centre of the lane being closed or in line with the last cone of the taper.

8.6.11. For single carriageway roads an appropriate taper length of between 13 m and 125 m should be used (see **Table 6.3**).

8.6.12. For dual carriageway roads (40 mph or above), the minimum taper length is 100 m per lane closed. Below 40 mph, the minimum taper length is 50 m. Longer taper lengths should be installed if horizontal or vertical sight lines are restricted.

8.6.13. ETM has to be enhanced with more permanent TTM if the incident lasts for a long duration. This may require a longer taper to be installed.

8.6.14. If the emergency services or traffic officers need to use the area upstream of the incident, the required working space needs to be provided in addition to the 50 m longitudinal safety clearance. Those attending the incident should always work protected by ETM within a designated working area.

8.6.15. Longitudinal clearance should be provided regardless of whether a high-conspicuity vehicle is providing protection.

8.6.16. A minimum lateral clearance of 1.2 m should be provided between the working space and live traffic. An additional lane may need to be closed to achieve this.

8.6.17. A longitudinal line of cones should be placed past the incident at 12.5 m centres. If sufficient cones are available they should be continued past the incident.

8.6.18. A wider working area may be required where the fire service is in attendance as they are likely to need access to the equipment on both sides of their vehicle. As such closing an additional lane should be considered to maintain adequate lateral clearance.

8.6.19. A longer working area extending past the incident may be required where an ambulance is required as they will usually park downstream of the incident to quickly transport the injured.

8.6.20. An exit taper is not required for ETM and in some cases may impede the access and egress of emergency vehicles. One may be installed if it is appropriate and sufficient resources are available.

8.6.21. 'Keep left/ right' signs to diagram 610 (S3-2-3) need to be installed as shown in **Figure 8.3**. A minimum of two of these signs should be used per lane closed, three signs may be used per lane closed if available. If this cannot be met using the resources available, the positions of the signs may be varied to make best use of the number of available signs.

8.6.22. **Table A1.2** (**Appendix A1**) defines appropriate sizes to be used for 'Keep left/right' signs to diagram 610 (S3-2-3). If the most appropriate size is not available, the largest diameter sign should be used. Signs smaller than 600 mm in diameter are not suitable for ETM.

8.6.23. Signs adjacent to traffic cones must be of suitable dimension and mounting height to be visible.

8.6.24. For incidents restricted to the hard shoulder only, ETM should be deployed in accordance with Detail A, see **Table A1.5** (**Appendix A1**).

8.6.25. Some incidents may require traffic to be diverted on to the hard shoulder and then directed to re-join the main carriageway, once past the incident. This is achieved through the appropriate use of signing to diagrams 7243 (S13-6-14), 7244 (S13-6-15), and 7245 (S13-6-16) or the non-police sign 'INCIDENT USE HARD SHOULDER' (S13-9). Where these signs are not available then traffic must be directed to leave and re-join the main carriageway using cones and signs to Detail A. The use of a hard shoulder in this was requires a police officer or traffic officer to be on site, or a route order be on place to permit hard shoulder use.

8.6.26. No entry' signs to diagram 616 (S3-2-10; **Figure 8.6**) may be used to restrict access to traffic on a two way road where traffic may still be using the road in opposite direction. They must not be used as an alternative to prescribed signs to fully close a road or carriageway. However, this sign should be used by the police or traffic officers or when instructed to do so by them; their presence on site is required if the sign is placed by anyone other than a police or traffic officer.



Figure 8.6 Diagram 616 (S3-2-10) No entry

8.6.27. Where visibility is reduced (e.g. during the hours of darkness, rain, or fog) amber warning lights complying with BS EN 12352 'Warning and safety light devices' should be used on the lead-in taper of the ETM. Synchronised, sequentially-flashing warning lights (or similar light emitting devices) may be used if specifically authorised. Unsynchronised flashing warning lights must not be used.

8.6.28. High-intensity flashing warning lights may be used in combination with prescribed traffic signs. However, high-intensity flashing warning lights should not be used to delineate the incident.

8.7 Advance signing

8.7.1. In an emergency, it may not always be possible to immediately provide advance warning signs equivalent to standard TTM.

8.7.2. A dynamic risk assessment of the nature and duration of the incident must be taken to determine the need for advance warning signs. VMS and EMS should be considered for providing advance signing as part of this process.

8.7.3. Advance warning signs deployed on the hard shoulder should not impede the emergency services from accessing the incident or other incidents/ emergencies.

8.7.4. The amount of advance signing required for an incident depends on local traffic speed and road layout. If required, advance signing should be provided on the hard shoulder, verge or central reservation upstream of the incident at:

- 300, 600, and 900 m on high-speed dual carriageway roads.
- at 150 and 300 m on high-speed single carriageway roads.
- at 50 and 100 m on roads with a 40mph permanent speed limit, or.
- at 50 m on roads with a speed limit of 30 mph or less

8.7.5. As a minimum, the 'INCIDENT SLOW' sign (S13-9; **Figure 8.7**), or police equivalent, 'POLICE SLOW' sign to diagram 829.1 (S13-6-23; **Figure 8.8**), should be used to provide advance warning.



Figure 8.7 (S13-9) Incident slow

NOTE:

1. The available evidence shows that 'ACCIDENT SLOW' results in the greatest reduction in speed of approaching traffic. While 'accident' indicates a lack of deliberate action (with no implication on whether it was avoidable or there was no culpability), there may need to install signs where there is a deliberate act. Where space is limited, to avoid there need for two signs, 'INCIDENT SLOW' should be used.



Figure 8.8 Diagram 829.1 (S13-6-23) Police slow

8.7.6. Signs to diagram 829.1 (S13-6-23), 829.2 (S13-6-24; **Figure 8.9**), 829.3 (S13-6-25; **Figure 8.10**), and 829.4 (S13-6-26; **Figure 8.11**) may also be attached to the front or rear of a police vehicle.



Figure 8.9 Diagram 829.2 (S13-6-24) Police accident



Figure 8.10 Diagram 829.3 (S13-6-25) Police use hard shoulder



Figure 8.11 Diagram 829.4 (S13-6-26) Police rejoin main carriageway

8.7.7. INCIDENT USE HARD SHOULDER' sign (S13-9; **Figure 8.12**) and 'REJOIN MAIN CARRIAGEWAY' sign (S13-9; **Figure 8.13**), may also be used as appropriate by police officers in uniform and traffic officers, or those acting under their instruction.



Figure 8.12 Non-police incident management sign (S13-9) Incident use hard shoulder



Figure 8.13 Non-police incident management sign (S13-9) Rejoin main carriageway

8.7.8. Advance warning of an accident on motorways and dual carriageways subject to the national speed limit should be given using an 'Other danger ahead' sign to diagram 562 (S13-2-7) and 'Accident' supplementary plate as shown in **Figure 8.14**. Chapter 4 gives further guidance on the use of diagram 562 (S13-2-7), this sign will replace the diagram 7001 (S13-2-9) sign in TTM deployment.



Figure 8.14 Diagram 562 (S13-2-7) Other danger ahead with supplementary plate accident

8.7.9. Signs to diagram 554A (S13-2-2) 'Flood' and to diagram 554D (S13-2-9) 'No smoking', see **Figure 8.15**, may also be appropriate for incident management purposes.

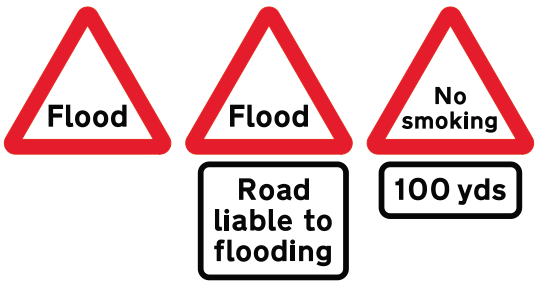


Figure 8.15 Diagram 554A (S13-2-2) Flood and diagram 544D (S13-2-9) No smoking with supplementary plate examples

8.7.10. For winter incidents, signs to diagram 554.2 (S13-2-4; **Figure 8.16**) may be used with or without a supplementary plate.

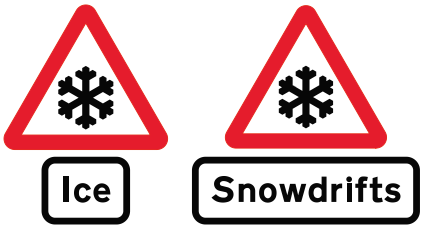


Figure 8.16 Diagram 554.2 (S13-2-4) with supplementary plate ice or snowdrifts

8.8 Use of variable message signs

8.8.1. Where available, temporary or permanent VMS, including central reservation matrix signals, should be used to provide advance warning to motorists (especially where lanes are closed) in response to an incident.

8.8.2. Messages displayed on VMS must comply with S13-9 and Schedule 16. Text must be either white or yellow. Requests to apply warning messages on fixed VMS should be addressed to the relevant control centre. Instructions given on VMS regarding lane closures or speed limits do not guarantee compliance from motorists.

8.8.3. Other than where there is a dynamic hard shoulder VMS should not be used to display hard shoulder closures related to incidents. For situations outside works consideration should be given to implement a temporary advisory or mandatory speed limit (as appropriate) on the approach to an incident in order to minimise the risk and potential severity of secondary incidents. Variable mandatory speed limits must not be used in incidents where there is a temporary limit signed with fixed plate signs.

8.8.4. If VMS are not present near the incident, the closest signs upstream should be used where practicable.

8.8.5. Where used, VMS should be kept active until the incident is fully resolved and the carriageway is reinstated, or full TTM implemented.

8.9 Removal of emergency traffic management

8.9.1. ETM should be completely removed as soon as the incident has been fully resolved and the carriageway has been cleared, or replaced by TTM (see **8.4.2**).

8.9.2. ETM should be replaced according to incident traffic management procedures of the participating organisations. As a minimum, the TTM taper should be deployed no closer to the incident than the ETM.

8.9.3. Full TTM should be deployed so that it completely envelops the existing ETM equipment. This allows the ETM to be removed when the TTM is in place.

8.9.4. ETM should be removed as quickly as possible after TTM has been installed to prevent motorists being confused from multiple sets of signs.

8.10 Use of vehicles at incidents

8.10.1. Vehicles that regularly deal with incidents must be fitted with appropriate high-conspicuity retroreflective livery and lighting. Further guidance can be obtained from the authority.

8.10.2. Light arrow devices and impact protection devices may be beneficial in incident management and fitting them on vehicles that regularly deal with incidents should be considered. For further information on impact protection devices and vehicles see **Section 14.9**.

8.10.3. If fitted, light arrow devices should be activated when a vehicle is stopped in a live lane to provide protection to the scene of the incident. The device should not be active on a two-way single carriageway, unless at the scene of an incident.

8.10.4. Enhanced light arrow devices which are subject to authorisation, must not display the arrow aspect when placed on the hard shoulder of a dual carriageway if there is a specific aspect designed for hard shoulder use, except if the nearside lane is blocked by an incident. In this case, the device may be used to provide additional warning that an incident is blocking the lane until the ETM is put in place. As soon as the ETM is fully installed, the vehicle and device should then move to the closed lane.

8.10.5. Vehicles parked on the carriageway for incident management can adopt three stationary positions; see **Figure 8.17**.

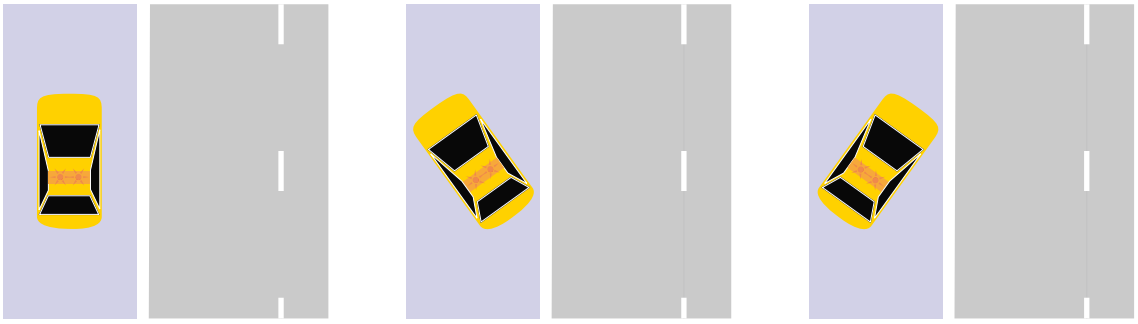


Figure 8.17 Positioning of vehicles

8.10.6. Vehicle parked ‘in line’:

Advantages	Disadvantages
Rear markings and lights are completely facing towards the carriageway.	It is less obvious to approaching drivers that the vehicle is stationary.
The driver is not exposed to direct impacts when exiting the vehicle.	The vehicle does not completely fill the width of the lane giving limited protection.
	The vehicle may travel forward when struck and potentially breach the safety zone.

8.10.7. Vehicle parked in the ‘fend in’ position:

Advantages	Disadvantages
Vehicle completely fills the width of the lane giving better protection.	Rear markings and lights are partially facing away from approaching traffic.
It is clearer to drivers that the vehicle is stationary.	The vehicle visually grows smaller the closer motorists get.
The driver is not exposed to direct impacts when exiting the vehicle.	It is more difficult for occupants to see when it is safe to get back in the vehicle.
The vehicle is facing away from the carriageway. As such it is less likely to stray into live lanes if struck when parked on the hard shoulder.	If struck while parked on the hard shoulder, the vehicle may collide with any barriers and then travel along the barrier, possibly breaching the safety zone.
	If struck when parked on the hard shoulder, the vehicle may turn over if a ditch or embankment is present.

8.10.8. Vehicles parked in the ‘fend off’ position:

Advantages	Disadvantages
Vehicle completely fills the width of the lane giving better protection.	Rear markings and lights are partially facing away from approaching traffic.
It is clearer to drivers that the vehicle is stationary.	The driver is more exposed to direct impacts when exiting the vehicle.
The vehicle visually grows larger the closer motorists get.	The vehicle is facing towards the carriageway. As such it is more likely to stray into live lanes if struck when parked on the hard shoulder. Errant vehicles may then breach the safety zone.
Imitates the position of a vehicle emerging from the hard shoulder which is likely to make approaching drivers more cautious.	Approaching driver may confuse vehicle as one emerging from a hard should and react by slowing down or changing lanes.
Occupants have a better view of approaching traffic and potential dangers.	
Occupants can more easily see when it is safe to get out of the vehicle.	

8.10.9. The ‘fend off’ position is generally considered the best position to take and should be used subject to a dynamic risk assessment. The dynamic risk assessment may identify factors that make the ‘fend off’ position less suitable. The following factors should be noted:

- whether a narrow hard shoulder is present. Using the ‘fend off’ position may result in part of the vehicle protruding into the live carriageway. ‘in line’ position may be more appropriate.
- whether the road significantly curves left. Using the ‘fend off’ position may reduce the vehicle’s visibility to approaching drivers. ‘fend in’ position may be more appropriate.

8.10.10. Whatever the position used, the vehicle should:

- have the front wheels positioned straight ahead (i.e. parallel to the vehicle).
- have the parking brake engaged.
- have four-wheel drive mode engaged (if available).
- have the gear selector set to ‘park’ (if the vehicle has an automatic gearbox).
- have ‘run lock’ activated (if available and if the engine has to be left running).

8.11 Rolling road blocks

8.11.1. Only the police or traffic officers can implement an emergency rolling road block. ISUs should not be involved at holding back traffic at any time unless they are implementing a rolling road block according to the Mobile Carriageway Closure / enhanced Mobile Carriageway Closure technique including eMCC (see **Section 11** and GG117 Appendix A).

8.11.2. A rolling road block should be considered for the following tasks:

- accessing the central reservation to place/remove TTM equipment.
- removing debris on the carriageway.
- setting out/removing a lane or carriageway closure.
- recovering a vehicle broken down to the hard shoulder.
- recovering stray animals on the motorway.

8.12 Summary checklist for emergency traffic management

8.12.1. The first to arrive at the scene should:

- stop before the incident and activate roof mounted flashing amber warning beacons (rear facing flashing red beacons if permitted) at the recommended safe distance (see **8.6.3**).
- notify the traffic officers or emergency services if required.
- provide improved visibility with a high-conspicuity vehicle (see **Section 14.7**) or provide protection with an IPV (if available).
- place a ‘keep left/right’ sign to diagram 610 (S3-2-3) behind the vehicle. A light arrow device may be activated instead if available and use is appropriate.
- request VMS to be activated if the incident cannot be cleared quickly.
- deploy a cone taper. For minimum taper length see **8.6.11** and **8.6.12**.
- place additional ‘keep left/right’ signs along the taper.
- deploy advance warning signs if appropriate and safe to do so, then
- deploy warning lights along the taper if visibility is reduced.

8.12.2. The ISU or similar support team should:

- replace ETM with TTM if the incident is likely to last longer than 90 minutes;
- respond to the incident in accordance with their incident management procedures;
- clear the carriageway;
- remove ETM when appropriate.
- reopen the carriageway.

9 CONVOY WORKING

9.1 Convoying method

9.1.1. Convoy TTM may be used where normal TTM arrangements are not feasible (i.e. where carriageway width is restricted, and a diversion is not possible). This method has traffic stopped in advance of the works, before being led slowly past the works in single file by an appropriate works vehicle.

9.1.2. Convoy working methods are not suitable for use on motorways and other special roads.

9.1.3. Traffic speeds past the works must be reliably reduced to 10 mph or less. An agreed safe method of working must be imposed on the site.

9.1.4. Convoy working may be used at all hours. It can be used on:

- single carriageway roads where traffic travels in a single direction, or in alternating opposite directions;
- individual carriageways of all-purpose dual carriageways, where works have reduced the traffic to moving in single file in one direction.
- carriageways during surface dressing operations, when it is necessary to ensure compliance with speed limits implemented to protect newly laid surface dressing.

9.1.5. The basic principles of convoy working are the same for all works situations. On single carriageway roads, the single-vehicle method will be more appropriate when flows are low and where there are convenient turning locations at each end of the works. Three-vehicle working is more appropriate where flows are greater and/or suitable turning locations are not present.

9.1.6. The way these principles are applied is dependent on:

- the number of convoy escort vehicles used;
- how easily convoy escort vehicles can be turned around after leading traffic through the site.
- whether convoy working is operated on a uni-directional or shuttle basis.

9.1.7. The main methods of working are outlined in the following paragraphs. The drawings are diagrammatic and not to scale. R indicates ‘red’/ ‘stop’, and G means ‘green’/ ‘go’. In the drawings, the convoy escort vehicle is shown in yellow, while grey vehicles are those in the convoy.

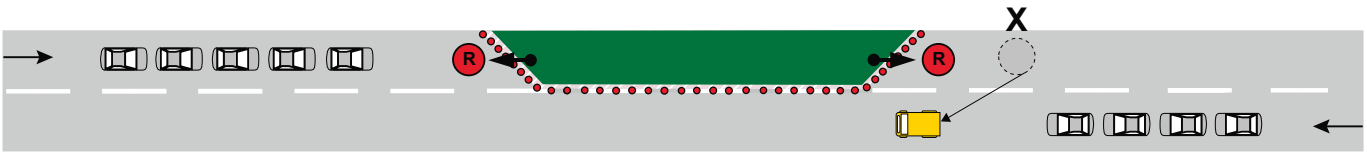
SINGLE CARRIAGEWAY - SINGLE VEHICLE WORKING



1. With both signs on ‘STOP’, the convoy escort vehicle moves to the head of the queue in front of the ‘WAIT HERE FOR CONVOY VEHICLE’ sign to diagram 7011 (S14-2-58; **Figure 9.1**).



2. The sign is changed to ‘GO’ then the convoy escort vehicle sets off leading the traffic past the works at 10 mph or less. The sign is changed to ‘STOP’ when the last vehicle in the queue enters the part of the road adjacent to the works area. During busy periods, the number of vehicles in the convoy may have to be restricted.



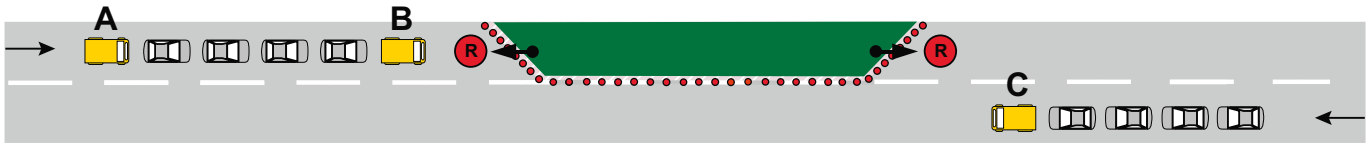
3. The convoy escort vehicle pulls over when it reaches the end of the work. It then waves traffic on and waits until the last vehicle has cleared the works before turning around to proceed in the return direction as Step 1.

9.1.8. The pull-off X should be positioned so that the last vehicle in the convoy has passed the works area before the convoy escort vehicle pulls off, this will avoid the tail of the convoy speeding up whilst still passing the work area. Extending the coning past the end of the works may therefore be required.

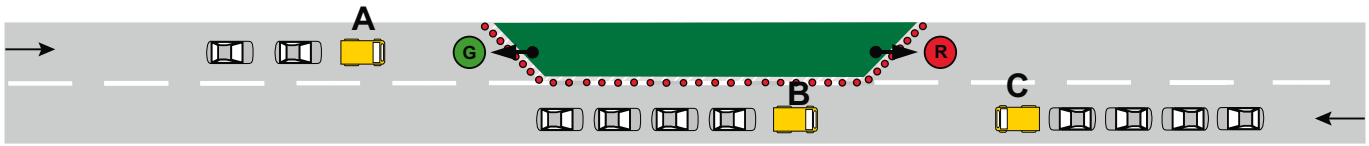
9.1.9. The convoy escort vehicle should not obscure the ‘STOP’ sign for opposing vehicles while stopped at position X.

SINGLE CARRIAGEWAY - THREE VEHICLE WORKING

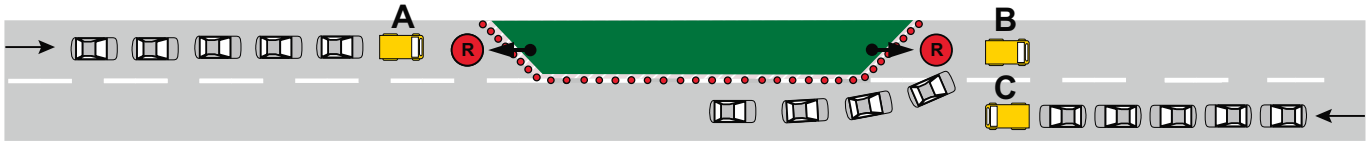
1. Signs initially show ‘STOP’. Convoy escort vehicles A, B and C are positioned as shown.



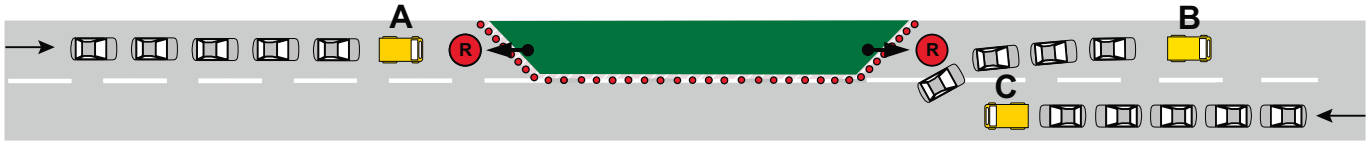
2. The sign in front of vehicle B is switched to ‘GO’. Vehicle B then sets off leading traffic past the works at 10 mph or less.



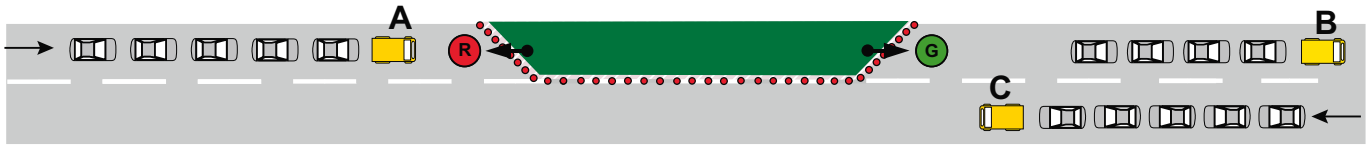
3. Driver A radios the sign operator to switch to ‘all-stop’ as they approach the sign. They stop in front of the sign to prevent following vehicles passing through the works.



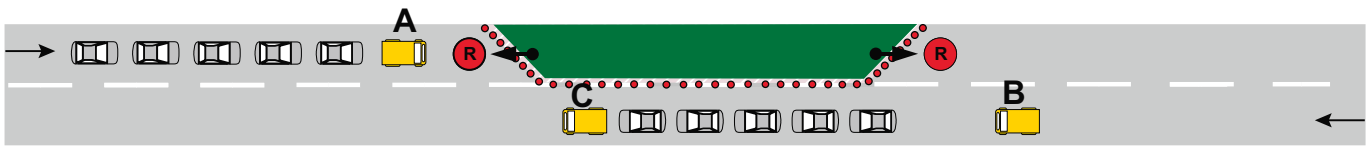
4. Vehicle B leads the following traffic at no more than 10 mph until sufficiently clear of the works. This ensures that vehicles at the back of the convoy are still travelling at 10 mph or less.



5. Driver C radios the sign operator once the last vehicle of the convoy has cleared the works to change their sign to ‘GO’. Driver B turns around and joins the queue.

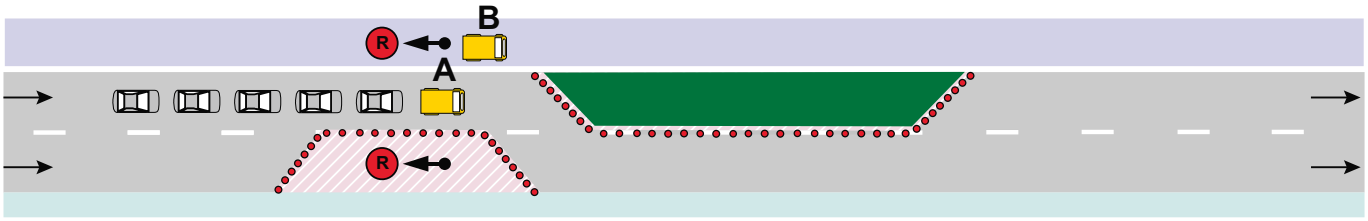


6. Driver C leads traffic past the works at 10 mph or less. Driver B radios the sign operator to switch to ‘all-stop’ as they approach the sign. Vehicle B may need to enter the queue part way along its length to limit the number of vehicles passing through the works.

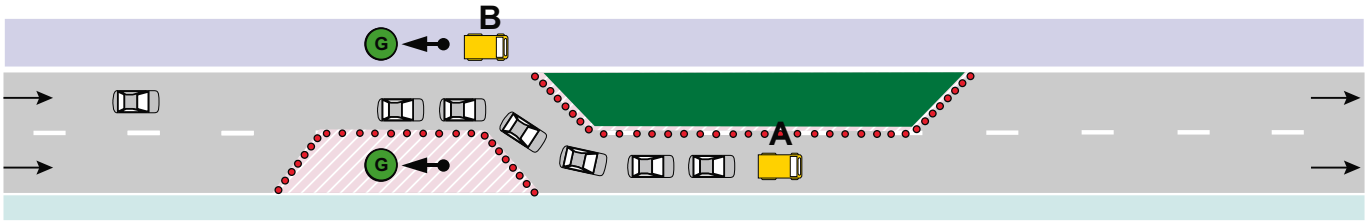


9.1.10. This process is then repeated from Step 2, but from the opposite direction.

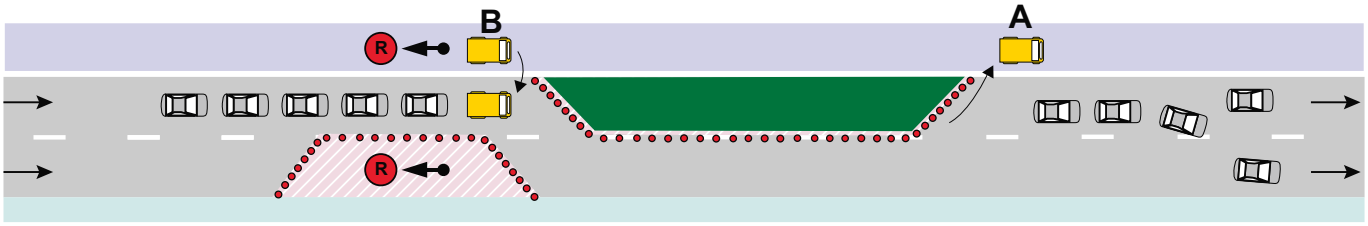
DUAL CARRIAGEWAY - MULTIPLE VEHICLE WORKING



1. With the signs showing ‘STOP’, vehicle A moves to the head of the queue in front of the ‘… WAIT HERE FOR CONVOY VEHICLE’ sign to diagram 7011 (S14-2-58; **Figure 9.1**).



2. Signs are changed to ‘GO’ once a queue of 20-30 vehicles has formed, or no more than five minutes have passed since the first vehicle arrived. Vehicle A leads traffic through the works at 10 mph or less.



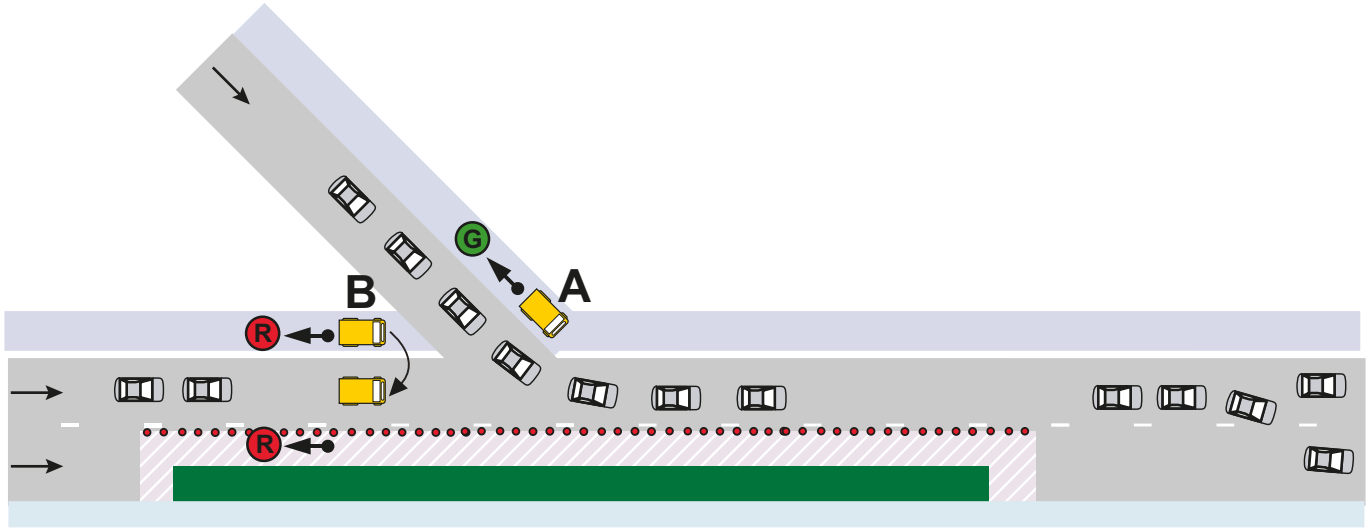
3. Signs are changed to ‘STOP’ once the last vehicle in the queue has entered the works area. Vehicle B moves into place. The sequence is then repeated from Step 1.

9.1.11. Convoy escort vehicles return to the start by turning at nearby interchanges, or by using site accesses, slip roads or lane closures.

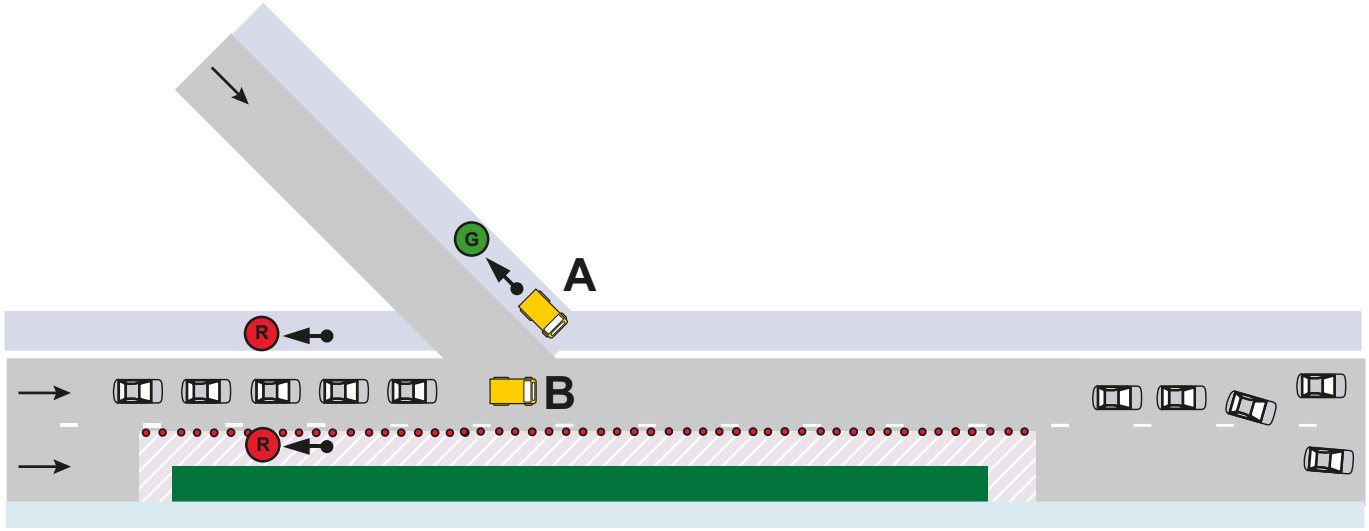
9.1.12. The running lane is not recommended for returning to the starting position as it will increase the time required to run the system. It may also negatively affect its capacity and safety.

SLIP ROAD MERGES

9.1.13. When using convoy working at slip road merges, the same procedure outlined in Steps 1 and 2 for 'Dual carriageway – multiple vehicle working' is followed. However, Step 3 is substituted for the below.



1. When the end of the queue passes the signal head, the traffic control supervisor switches the main carriageway signals to red. Vehicle B positions on the main carriageway to prevent vehicles from travelling through the site. The traffic control supervisor changes slip road traffic signals to green, allowing slip road traffic to join the end of the previous convoy. When the slip road queue has passed, the slip road signals are switched to red.



2. Vehicle B moves forward to a position to prevent all unrestrained vehicles from the main carriageway and slip road from travelling through the site.

9.1.14. If convoy working is not appropriate for use on the main carriageway of a dual carriageway (see **9.2.1**), an alternative approach is to divert all traffic from the main carriageway at the interchange (see **Section 7.20**). Traffic re-joins the main carriageway via the entry slip road and convoy TTM on the slip road is used to control traffic past the works. Queueing traffic on the slip road should not extend onto the interchange and cause congestion.



Figure 9.1 Diagram 7011 (S14-2-58) When red light shows wait here for convoy vehicle

9.2 Traffic flows

9.2.1. Convoy working can be used successfully on single carriageway roads with two-way peak hour flows of 900-1000 veh/hr. However, at these flow levels it may be necessary to restrict peak time working or make provision to withdraw convoy TTM periodically to disperse queues. In this event, the work activity must also be suspended until the passing speed of traffic can again be reduced to 10 mph or less and convoy TTM reinstalled.

9.2.2. On dual carriageways, convoy TTM can be used successfully where the one-way hourly traffic flow does not exceed 600 veh/hr.

9.3 Planning

9.3.1. For general planning of the works, refer to **Section 2**.

9.3.2. The pre-planning should include:

- planning the works and individual operations to minimise their possible effect on traffic delay and interference with convoy working. If applicable, provision for pedestrians should also be considered.
- arranging the works to avoid junctions occurring within the convoy site.
- planning an appropriate convoy working which ensures the speed of all traffic passing the works is reliably reduced to 10 mph or less.
- determining a queue management strategy, including levels of congestion which trigger special action, and safe methods of working for the withdrawal of convoy working.
- determining the method to be adopted for the management of side road traffic.
- determining suitable locations for the convoy escort vehicle to pull out of the running lane at the end of the works.

9.3.3. A risk assessment must be conducted on the actual work activity and the effects of convoy TTM on the workforce and highway users. This is to determine whether this system is appropriate for the task and location. Risk assessments are dealt with in detail in **Section 2.3**, **3.6**, and **3.7**.

9.4 Legal issues

9.4.1. A temporary mandatory speed limit (see **Section 9.10**) must be imposed to prevent accusations of convoy escort vehicles being driven without due consideration for other road users or of causing an obstruction of the highway when travelling at a low speed.

9.4.2. Provided that a mandatory speed limit has been lawfully imposed and the traffic signals or manually operated ‘STOP/GO’ signs are lawfully placed and operated, no other statutory authority for operating convoy working is required. The driver of the convoy escort vehicle would be exercising their legal right to proceed along the restricted length of road at or near the maximum permitted speed. Since there is no primary legislation which enables drivers of

convoy escort vehicles to do anything which an ordinary driver cannot do, it is essential that a temporary mandatory speed limit is imposed (see **Section 9.10**).

9.4.3. Convoy escort vehicle drivers should be instructed that they are not empowered to carry out manoeuvres other than those which any other driver could do. They should observe speed limits and comply with traffic signals or manually operated 'STOP/GO' signs as other drivers are required to do. A convoy escort vehicle driver who breaks any traffic laws or drives in an unsafe manner could be prosecuted.

9.4.4. The convoy escort vehicle must conform with the 'Road Vehicles (Construction and Use) Regulations' 1986, and the 'Road Vehicles Lighting Regulations' 1989. It must also be fit to travel on the public highway in all respects, including having a vehicle excise licence and insurance.

9.5 Signing

9.5.1. All traffic signs used in connection with the convoy working technique should be to be a minimum of Class RA2/R2 of BS EN 12899-1 'Fixed, vertical road traffic signs'. There may be a benefit in using Class R3B-UK material to the National Annex to BS EN 12899-1, particularly for convoys on dual carriageways.

9.5.2. A 'CONVOY VEHICLE NO OVERTAKING' sign to diagram 7029 (S13-6-36; **Figure 9.2**) must be displayed on the rear of each convoy escort vehicle. The sign and beacons should not.

9.5.3. On dual carriageways, the 'NO OVERTAKING' sign legend may be omitted if the vehicle is unable to turn around within half a mile of the works. In this case, static mandatory 'NO OVERTAKING' signs to diagram 632 (S3-2-5; **Figure 9.3**) should be used if appropriate. An order prohibiting overtaking must be in force to allow the use of this sign.

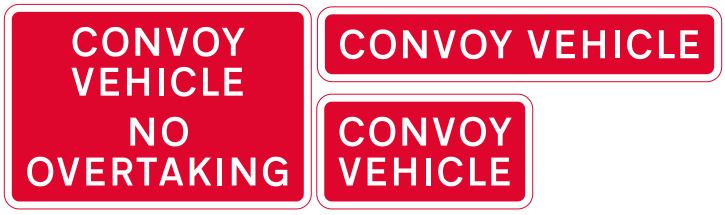


Figure 9.2 Diagram 7029 (S13-6-36) Convoy vehicle no overtaking (Alternative types)



Figure 9.3 Diagram 632 (S3-2-5) No overtaking

9.5.4. The working space (see **Section 4.2**) must be adequately delineated. Alternative safe working practices may be used to compensate for an omission of delineation. In this case, adequate warning must be provided to road users.

9.5.5. At the start of the works and anywhere that traffic may join from a side road, 10 mph speed limit signs must be positioned on both sides of the carriageway. Repeater signs should be placed every 200 m. A sign to diagram 7001 with an 'End' plate (S13-2-9; **Figure 9.4**), or a pair of speed limit signs showing the permanent limit must be positioned at the end of the works. **Section 4.8** gives guidance on speed control and temporary speed limits.



Figure 9.4 Diagram 7001(S13-2-9) with supplementary plate end

9.5.6. A warning sign to diagram 7025 (S13-6-34; **Figure 9.5**) should be placed on the offside carriageway on single carriageways with:

- two-way peak hourly traffic flows in excess of 900 vehicles;
- very high traffic speeds, or.
- restricted forward visibility.

9.5.7. **Plan CW1** also requires an instruction sign to diagram 7011 with appropriate variants S14-2-58; **Figure 9.6**) placed in the same location. The x-height of the warning sign should be 150 mm. Cones should be 750 mm where possible.



Figure 9.5 Diagram 7025 (S13-6-34) Convoy system in operation ahead



Figure 9.6 Diagram 7011 (S14-2-58) When green light shows follow convoy vehicle

9.5.8. On single carriageways where visibility on the approach to traffic control is restricted, a ‘traffic queues likely’ sign to diagram 584 with supplementary plate ‘Queues likely’ (S2-2-50; **Figure 9.7**) should be used. The requirements for the size of these signs are in Chapter 4 of the TSM (Appendices A and B).



Figure 9.7 Diagram 584 (S2-2-50) Traffic queues likely with queues likely supplementary plate

9.5.9. On dual carriageways (**Plan CW2**), a single lane closure should be used to reduce traffic to single file. This should be positioned at least 500 m in advance of the traffic control. This acts as a stacking lane for queueing traffic. A ‘traffic queues likely’ sign to diagram 584 with

supplementary plate ‘Queues likely’ (S2-2-50) should be positioned at the start of the stacking lane.

9.5.10. The position of the first sign in advance of the works should be at a distance equal to or greater than the highest figure given in the second column of **Table A1.1** (**Appendix A1**), as convoy working has an increased likelihood of causing long queues to develop.

9.5.11. On a dual carriageway where convoy working is to take place during hours of darkness, a ‘Night-time works Expect delays’ sign to diagram 7005 (S13-6-43; **Figure 9.8**) should be placed two miles upstream of the works where practicable. This should be left in place during daylight hours.



Figure 9.8 Diagram 7005 (S13-6-43) Example of Information sign for overnight works

9.5.12. See **Section 9.13** for signs on side roads.

9.6 Vehicles

9.6.1. This section covers issues specifically relating to convoy escort vehicles. General issues relating to vehicles used at work sites are covered in **Section 14**.

9.6.2. Vehicle drivers should always be in radio contact with the signal operator, traffic control supervisor and works supervisor.

9.6.3. Convoy escort vehicles should have good all-round visibility. A tight turning circle is useful for single carriageway roads.

9.6.4. Only four-wheel vehicles capable of travelling at 10 mph or less through the works should be used. Vehicles should have a speedometer capable of indicating 10 mph.

9.6.5. The vehicle type should be appropriate for the nature of the operation. Small hatchbacks, quad bikes and mini tractors have been used successfully on shorter single carriageway works. However, medium-sized pickup vans are more appropriate on dual carriageway works.

9.6.6. Convoy escort vehicles should be fitted with roof-mounted flashing amber beacons (see **Section 14.4**).

9.7 Number of vehicles

9.7.1. The number of convoy escort vehicles required will depend on the traffic flow, the characteristics of the site and the method of employment of the convoy working system. Three-vehicle and single-vehicle systems have both been used successfully on single carriageways.

9.7.2. The three-vehicle system is particularly suited to higher traffic flow sites or sites where the convoy escort vehicle must turn at a location which is remote from the works, increasing the cycle time of the system and hence the delays to traffic.

9.7.3. When traffic flows are low, a single-vehicle system may be satisfactory. Traffic control in the single-vehicle system should be provided by manually operated ‘STOP/GO’ signs.

9.7.4. On dual carriageway roads, the system does not operate on a shuttle basis. A typical method of convoy working on dual carriageways is described in **Section 9.1**. The ease with which convoy escort vehicles can turn and get back to the start of the works therefore influences the number of vehicles required. The empirical formula below may be used to give an indication of the likely requirement on dual carriageway working.

$$No.of\ convoy\ escort\ vehicles\ for\ dual\ carriageway = \frac{X}{Y} + 1$$ Where:

- X = estimated time taken for the convoy escort vehicle to travel through the works and return back to the start position, mins (i.e. the cycle time)
- Y = time taken for the maximum allowable queue to develop, mins (calculated as below)
  - Y = $\frac{maximum\ queue\ length,\ \ veh}{vehicles\ arriving\ per\ minute,\ \ veh/min}$

9.7.5. The maximum queue is site-dependent but is generally around 30 vehicles.

9.7.6. During long-term work, at least one standby convoy escort vehicle should be provided in case of breakdown, and for use when they are being refuelled. If at any time insufficient vehicles are available to operate the system as planned, convoy operations should be suspended. A full safety zone should also be put in place or the work activity suspended.

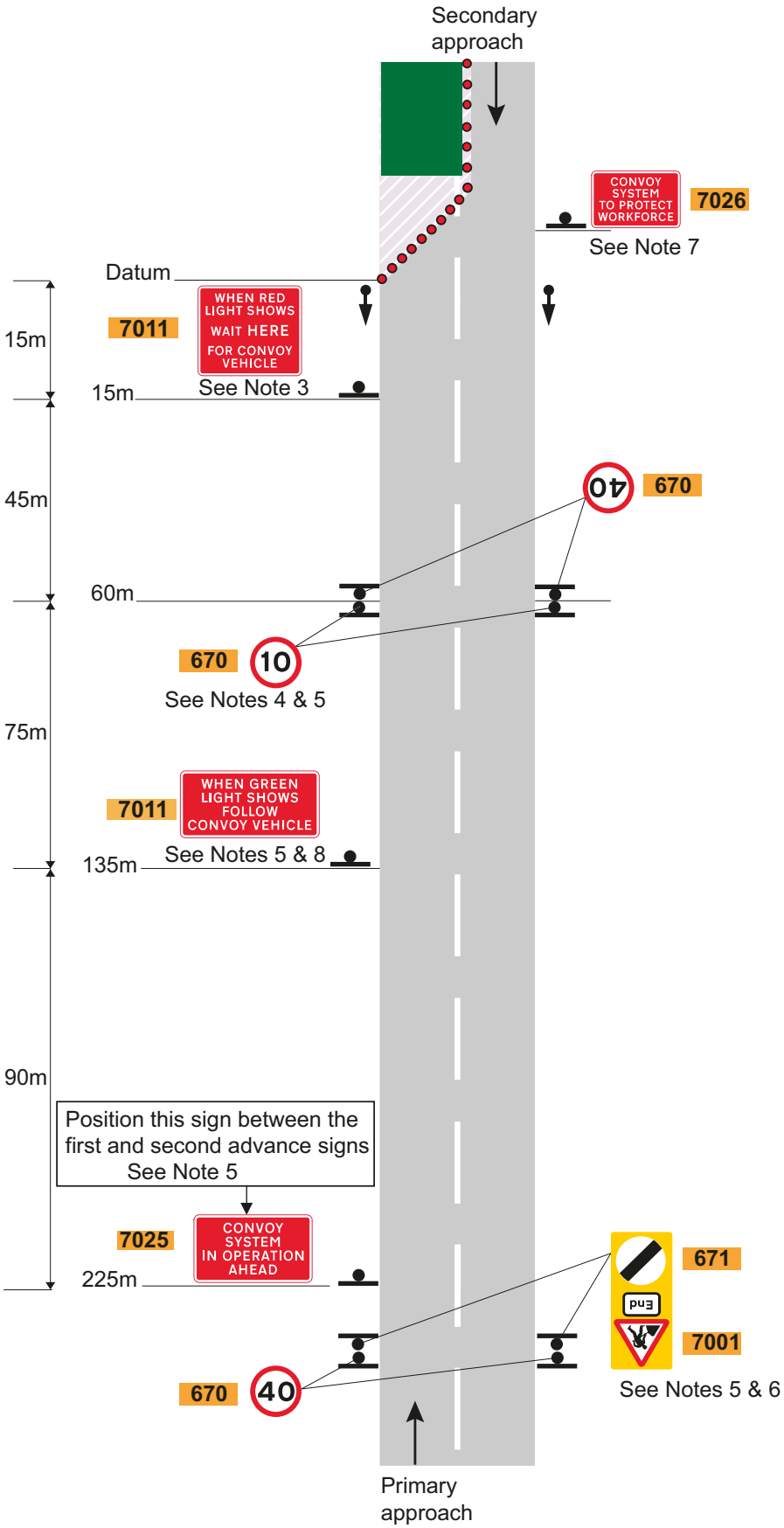
9.8 Plans

9.8.1. **Plan CW1** shows the signing required for convoy TTM on single carriageway roads (signs also shown in **Figure 9.1**, **Figure 9.5** and **Figure 9.9**). These are in addition to the normal TM signing. They may be used with either manually operated traffic signals or 'STOP/ GO' signs.



Figure 9.9 Diagram 7026 (S13-6-35) Convoy system to protect workforce

Plan CW1 Convoy working on a single carriageway



NOTES:

1. For one-way working, signs should be provided only for traffic in the relevant direction.

2. For two-way working, the same signing is used on the primary and secondary approaches to the works.

3. When ‘STOP/GO’ signs are used, the legend on diagram 7011 (S14-2-58) ‘RED LIGHT’ is replaced with ‘STOP SIGN’. The position of the sign in relation to the signals or ‘STOP/GO’ signs should be the same as the sign to diagram 7011 shown in **Plan SC7**.

4. A pair of speed limit signs to diagram 670 (S10-2-1; **Figure 9.10**) must be placed at the point where the temporary limit begins. Repeater signs should be placed every 200 m throughout the works site on alternate sides of the road.

5. Signs must not be obscured.

6. The end of the restrictions may be indicated by a sign to diagram 7001 with an ‘End’ plate (S13-2-9). If the temporary speed limit masks a change in the permanent speed limit within the works, a sign showing the new limit must be placed on each side of the carriageway at the end of the works.

7. The sign to diagram 7026 (S13-6-35) should be repeated at 200 m intervals through the site.

8. When ‘STOP/GO’ signs are used, the legend on diagram 7011 (S14-2-58) ‘WHEN GREEN LIGHT SHOWS’ is replaced with ‘AT TRAFFIC CONTROL’.

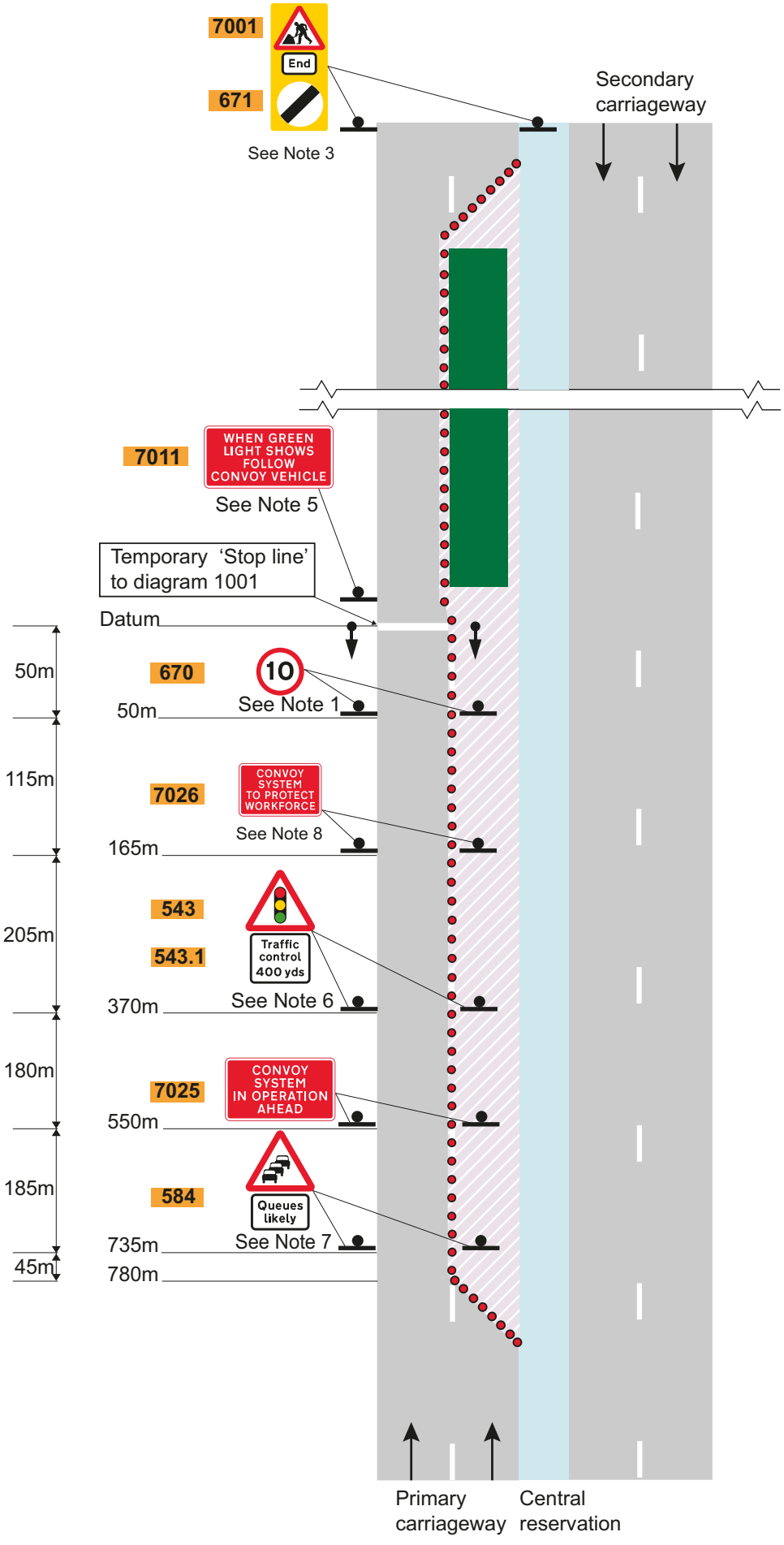
9. The area provided for convoy escort vehicles to turn should be assessed to ensure adequate clearances.



Figure 9.10 Diagram 670 (S10-2-1) Speed limit

9.8.2. Plan CW2 shows the signing required for convoy TTM on dual carriageways (signs also shown in **Figure 9.1**, **Figure 9.5** and **Figure 9.9**). These are in addition to the normal TM signing. They may be used with either manually operated traffic signals or ‘STOP/GO’ signs.

Plan CW2 Convoy working on a dual carriageway



NOTES:

1. A pair of speed limit signs to diagram 670 (S10-2-1) must be placed at the point where the temporary limit begins. Repeater signs should be placed every 200 m throughout the works site on alternate sides of the road.

2. Where the nearside lane is closed, traffic should be directed into the offside lane immediately after passing the traffic signals.

3. The end of the restrictions may be indicated by a sign to diagram 7001 (S13-2-9) with an 'End' plate (S13-2-9). If the temporary speed limit masks a change in the permanent speed limit at some point within the works, a sign showing the new speed limit must be placed on each side of the carriageway at the end of the works.

4. For works during the hours of darkness, sign to diagram 7005 (S13-6-43) should be placed between the 1-mile and 2-mile advance signs. This should be left in place during the daylight hours.

5. When 'STOP/GO' signs are used, the legend on diagram 7011 (S14-2-58) 'WHEN GREEN LIGHT SHOWS' is replaced with 'AT TRAFFIC CONTROL'.

6. When 'STOP/GO' signs are used, the sign and supplementary plate to diagrams 543 (S14-2-28) and 543.1 (S14-2-29) are replaced with the variant 'TRAFFIC CONTROL AHEAD'.

7. The sign to diagram 7026 (S13-6-35) should be repeated every 200 m through the site.

9.9 Traffic control

9.9.1. On single and dual carriageways, traffic control should be provided by either manually operated portable traffic signals (see **Section 6.3**) or 'STOP/GO' signs (see **Section 6.7**). At side road junctions with dual carriageways, only manually operated 'STOP/GO' signs should be used. During the hours of darkness, each sign face must be adequately illuminated by its own source of light (see **5.5.5**).

9.9.2. On single carriageways, the maximum site length subject to traffic control should be restricted to 300 m for portable traffic signals and 500 m for manually operated 'STOP/GO' boards (see **Section 6.7**). Maximum site lengths may be increased subject to agreement with the relevant Authority.

9.9.3. On dual carriageways, the maximum site length subject to traffic control should be restricted to 1500 m for both portable traffic signals and manually operated 'STOP/GO' signs. Maximum site lengths may be increased subject to agreement with the relevant Authority.

9.9.4. Two signal heads should be used on high-speed single carriageways and dual carriageways. These should be positioned on the nearside verge and the offside verge. On other roads, a single signal head may be permissible. It should be positioned to optimise visibility to approaching traffic. In most cases, this will be to the centre of the carriageway behind the TM coning at each end of the works.

9.9.5. While convoy working is operating, signals should be manually operated. However, signals should be able to switch to vehicle-actuation for periods when no work is taking place. Manually operated 'STOP/GO' signs may be preferred for single-vehicle convoy working as they can reduce instances of 'red light' jumping. However, 'STOP/GO' signs must be directly lit during hours of darkness. See also **Sections 5.5** and **13.8**.

9.9.6. The optimum convoy length and cycle time for the site layout and traffic flows should be calculated as early as possible before operations commence. Ideally, cycle time should be no more than 5 minutes in one direction. The transportation of materials (e.g. chippings) should be planned to work in behind or between convoy flows.

9.9.7. Once a convoy has passed the traffic control (manually operated ‘STOP/GO’ signs or portable traffic signals), the next convoy escort vehicle should position itself to prevent traffic entering the restricted lane. Manually operated ‘STOP/GO’ signs should be used in single vehicle working, as the presence of operatives can encourage enforcement with signing. If a gap appears in the traffic passing the traffic control, the operator should immediately signal ‘STOP’ to prevent ‘late’ vehicles rushing through.

9.10 Speed limits

9.10.1. Arrangements for imposed mandatory speed limits should be discussed and agreed with the police and authority.

9.10.2. Where convoy working is in place, a temporary mandatory speed limit of 10 mph must be imposed through the length of the works. It should extend beyond the works to ensure vehicles at the rear of the convoy maintain the speed limit until they have passed the works. The coned section should be extended to prevent overtaking of the convoy escort vehicle.

9.10.3. Depending on the underlying design speed of the TTM layout, a variable speed limit should be considered to allow a 30 or 40 mph limit to be enforced when convoy working has ceased. Where the permanent limit is 30 mph, existing terminal and repeater signs would therefore be uncovered during this time (subject to any carriageway lighting). Where the permanent limit is greater than 30 mph, a temporary 40 mph limit would be imposed, and appropriate signing would be required. Existing speed limit signs must then be covered or removed.

9.10.4. On high-speed roads, a temporary mandatory limit of 20 mph (or by exception 30mph) below the permanent speed limit should be imposed in advance of the 10 mph limit (see **Section 4.9**). This should be at a distance that allows traffic to reduce speed comfortably, while not being so far in advance to restrict speeds for unnecessarily long periods. **Section 4.9** covers further details on temporary mandatory speed limits (including signing and related issues).

9.10.5. Repeater temporary speed limit signs must be provided at the intervals indicated in **Plans CW1** and **CW2**. Repeater signs should have 600 mm diameter on single carriageways and 750 mm diameter on dual carriageways.

9.10.6. Where a side road joins a road operating convoy working, 10 mph speed limit signs must be placed on each side of the side road. Any conflicting signs must be fully covered or removed.

9.10.7. The 10 mph signs must be covered or removed whenever convoy working is ceased. When there are changes in speed limit, checks should be made to ensure there are no conflicting signs. This is particularly important at the end of the working day.

9.10.8. If required, an Order or Notice may be sought from the authority under section 14 or section 84 of the Road Traffic Regulation Act 1984.

9.11 Radio communication

9.11.1. There should always be radio communications between the operators of the signals (or ‘STOP/GO’ signs), operatives in the convoy escort vehicles, traffic control supervisor, and the works supervisor. The role of traffic control supervisor may be combined with one of these other roles in appropriate circumstances. The main purposes of using radio communication are:

- to inform the signal (or ‘STOP/GO’ sign) operator of the time to effect a change.

- to tell the driver of the leading convoy escort vehicle when the end of the convoy has cleared the 10 mph speed limit zone, allowing the speed to be increased.
- to inform the works supervisor to suspend the work and re-establish the safety zone as necessary.

9.11.2. All operatives should be fully familiar with the radio communication system. They should be carefully briefed about their role and the agreed method of radio control.

9.11.3. Operatives should have precise predetermined radio instructions for the changing of the traffic control, dealing with emergency vehicles, and other key steps in the operation of convoy working.

9.11.4. Operatives should take special care when operating radios that they maintain concentration on the driving task. It can be beneficial to use an additional person in each vehicle to act as radio operator. This person also allows for frequent driver changes which aid concentration and alertness. Where an additional person is not provided, the radio should be capable of hands-free operation.

9.12 Queue management

9.12.1. A system of monitoring queue lengths should be implemented. It should be able to identify any excessive build-up of traffic at an early enough stage to enable action to be taken to avoid long delays. If unacceptably large queues of traffic occur, it may be necessary to suspend convoy working in order to clear the delay.

9.12.2. If convoy working is suspended, the 10 mph speed limit signing should be replaced with 30 or 40 mph signing. The works will also need to be suspended or modified so that the appropriate safety zone can be implemented. A 30 mph restriction would be applicable if this is the usual permanent limit on the road. A 40 mph limit would apply where the permanent limit exceeds 30 mph. Once the queue has cleared, then normal 10 mph convoy operations may resume. Depending on the nature of the works, it may take longer to implement these measures on some schemes than on others.

9.12.3. Where a suitable safety zone cannot be established at a site, plant and operatives must cease working and should be moved to a place of relative safety (furthest from traffic) until convoy working has been re-established.

9.13 Side roads within the site

9.13.1. Works which will make use of convoy working should be designed to avoid encompassing junctions. Where this is not possible, the following procedures should be adopted.

9.13.2. Side road traffic should be controlled by manually operated ‘STOP/GO’ signs, except when the minor road has high flows (see **9.13.5**). These signs must be adequately lit by their own source of lighting during hours of darkness (see **5.5.5**). The following signs are required when manually operated ‘STOP/GO’ signs are used:

- ‘TRAFFIC CONTROL AHEAD’ sign to working drawing 7010.1 (S13-9; **Figure 9.11**) placed after a ‘road works ahead’ sign to diagram 7001 (S13-2-9) at every side road leading to an uncontrolled junction within a road with traffic control;



Figure 9.11 Sign to working drawing 7010.1 (S13)-9 Traffic control ahead

These signs should be supplemented with:

- convoy signs to diagram 7025 (S13-6-34) and variant to diagram 7011 (S14-2-58) 'AT TRAFFIC CONTROL FOLLOW CONVOY VEHICLE', 100 m and 50 m respectively in advance of the junction.

9.13.3. The traffic control supervisor should maintain contact via radio with the 'STOP/GO' sign operator on the side road. The supervisor should advise the operator when the convoy is moving through the works. The operator should signal the side road traffic to join the convoy as the tail of the convoy passes his position. Side road traffic should only travel in the same direction as the convoy. Once the last vehicle in the side road queue has joined the convoy, the operator should turn the sign to 'STOP'.

9.13.4. On single carriageways, side road traffic should be directed to join the tail of the convoy travelling in the direction they wish to turn. If side road traffic flows are too great that this procedure may create difficulties, the advice given in **9.13.2** should be followed.

9.13.5. A road closure should be implemented near the junction of a side road that has high flows and a suitable diversion. Where a suitable diversion does not exist, the works should be positioned so that the junction falls beyond the section of road subject to convoy working. Signal control should then be provided for the side road flow. Where this is not possible, a convoy escort vehicle may be required to guide side road traffic also **9.13.3**).

9.13.6. Arrangements should be made to minimise the possibility of a gap being created between the end of the convoy and traffic joining from the side road.

9.14 Emergency vehicles

9.14.1. Contingency measures should be pre-planned by the designer to allow the free passage of emergency vehicles through the convoy lane. This should include discussion with the local emergency services during contract preparation. One method is for a single radio call to instigate the suspension of work and the implementation of an all-red stage. This would clear the running lane and enable emergency vehicles to overtake the waiting queue on the offside, 'jump' the signals (or manually operated 'STOP/GO' sign) and proceed unobstructed through the works.

9.14.2. Before the emergency vehicle enters the site, the traffic control supervisor should ensure that any convoy travelling in the opposite direction to it has cleared the works or has been halted at a location where the emergency vehicle can pass. They should also obtain confirmation from the works supervisor that the running lane is clear, and that plant and operatives have been stood down.

9.15 Publicity

9.15.1. The public must be made aware of the reasons for carrying out the convoy method. Wherever possible, the opportunity should be taken to detail the method of working and the benefits to the workforce and the public in local newspapers, local radio and TV.

10 MOBILE LANE CLOSURES

10.1 General

10.1.1. The Mobile Lane Closure (MLC) technique used on dual carriageway roads uses similar signing to that used for a static closure.

10.1.2. The intervals between the signs concentrate the warning information presented to passing drivers by ensuring that they may see at least two consecutive signs at any instant. To improve the signs' conspicuity, the prescribed design incorporates a yellow sign display board and high intensity flashing amber lanterns mounted at each corner.

10.1.3. All MLC operations on motorways and dual carriageways should comply with the following guidance and the advice detailed in **Section 10.17** should be considered. Operational aspects are described in this section and illustrated in **Plans MLC1** to **MLC7**. Note that single vehicle works are dealt with in **Section 12.1**.

10.1.4. Particular care should be taken when planning MLCs through the following highway features, with additional planning and detailed risk assessments:

- junctions;
- urban roads or roads with speed limits up to 40 mph;
- carriageways without a hard shoulder.
- carriageways of four or more lanes.

10.1.5. MLCs should not be used on carriageways with more than five lanes unless matrix and/or VMS signals are used (see **Section 10.5**) in conjunction with light arrow signs (see **Section 10.8**).

10.1.6. MLCs should only be used where there is adequate stopping sight distance, as specified as the desirable minimum visibility requirement in CD 109 'Highway link design'. Transient relaxations, particular to the low point, may be acceptable. For most dual carriageways, subject to the national speed limit, this is 295 m.

10.1.7. Works and/or signing vehicles should have their flashing amber warning beacons switched on, and approach signing to the junction placed as appropriate, when:

- working near junctions or roundabouts where approaching vehicles are unable to see the rear-mounted signing, or.
- rear illumination is ineffective due to the angle of the approach.

10.1.8. All equipment should be checked to be in full working order before starting MLC operations.

10.2 Planning

10.2.1. Those responsible for planning the works should ensure that appropriate risk assessments are completed. Where MLCs are found to be suitable, the system of work should be carefully planned. Operations should be planned to follow in sequence as far as practicable to eliminate unnecessary lane closures.

10.2.2. Other works taking place near MLC operations should be considered. Road space should be booked in advance with the authority to ensure no conflicts are likely to arise.

10.2.3. Slow-moving MLCs are at greater risk and should be used with more caution. Operations which involve repeated movement along the road with periodic stops may also use this technique. The maximum time that an MLC vehicle should be planned to remain stationary is expected to be 15 minutes. Actual periods where the MLC is stationary will need to be recorded and the data used to validate future risk assessments and planning. Where there may be a benefit in combining a single longer stop (up to 45 minutes) into a MLC, the principles in this section, along with those in **Section 12** and **14**, may be suitable for use to develop a site and time specific method of working. As this would require knowledge of departures, relaxations and time specific traffic flows this option would need to be consulted on, and agreed with, the authority.

10.2.4. The choice of which technique is to be used will be informed by a risk assessment with the proposed method of working minimising the risk compared with alternative options. An evaluation of the degree of risk, time of exposure to risk, and ways of minimising risk. Risk can be minimised through use of the higher visibility light arrow (see **10.7.6**), matrix signals, and VMS. In Northern Ireland, the assessment should include an analysis of the operation to determine the measures needed to eliminate or control the sources of harm.

10.2.5. When using MLCs to deploy static signs on the central reservation, consideration should be given to avoiding conflicts between static and mobile signs. Such conflict may be avoided by operating the MLC on the other carriageway.

10.3 Training and personnel issues

10.3.1. The general training and competency requirements of those involved in mobile and static works are detailed in **Section 15.1**. Specific training and competency requirements for MLCs are outlined below.

10.3.2. All MLC personnel must be competent and have received relevant training in MLC techniques.

10.3.3. Organisations engaged in MLC operations must check contractual requirements to comply with any competence based training certification i.e. Sector Scheme 12C documents. In addition to requirements in this document NHSS 12C is listed as a requirement in GG 117 ‘The design and implementation of temporary traffic management and road works’. The contractor should ensure that all operatives (including any sub-contract personnel) have relevant training i.e. to NHSS 12C. In particular, they should check at the start of each contract and at regular intervals thereafter that MLC operatives are appropriately qualified and hold valid relevant registration cards. The results of these checks should be recorded.

10.3.4. Personnel or their employer who are engaged in MLC operations should provide (when requested) a means of identification and appropriate evidence to demonstrate their competency as an MLC operative. The employer should maintain records of operatives registration.

10.3.5. Sub-contractors should be competent and should attend a briefing to familiarise themselves with the operation of the MLC technique.

10.3.6. Operatives should be assessed to ensure they are fit, with no physical impediments which would prevent them from safely carrying out their MLC operational duties. If appropriate, their suitability for working at night should also be assessed (see also **Section 15**).

10.4 Traffic parameters

10.4.1. MLCs on dual carriageways are restricted by traffic volume parameters (see **Table 10.1**).

10.4.2. When working past slip roads (and inter motorway links), the maximum flow on the slip road should not exceed 500 veh/hr. Police, traffic officer, or MCC/EMCC assistance should be considered.

10.4.3. **Table 10.1** gives absolute maximum flows for MLCs which relate to level and well-aligned sites with hard shoulders. These figures may need to be reduced for sites on roads with steeper gradients, difficult horizontal alignments (in particular, left-hand bends), or roads lacking an adequate hard shoulder, verge or hard strip.

10.4.4. Traffic volume parameters in **Table 10.1** are given in terms of vehicles without regard to the percentage of HGVs. Traffic on these major roads typically include 15-20% of HGVs. Any markedly higher or lower proportion of HGVs will affect the capacity of the layout. The tabulated figures should therefore be amended accordingly (e.g. if the HGV content is 30% of the vehicle flow, levels should be reduced by 10%).

10.4.5. Providing adequate care is taken, the flow figures in **Table 10.1** are generally considered to apply equally to day/night time mobile works.

10.4.6. Queues are unlikely to form when MLCs are implemented at flows below those outlined in **Table 10.1**, as the remaining open lanes will have sufficient traffic capacity to accommodate traffic.

10.4.7. When specific MLCs can be established or removed will be dependent on the appearance of acceptable gaps in traffic, in which MLC vehicles move into and out of position. Consideration for how and when an MLC can be set out and removed should form part of the planning for the work.

Table 10.1 MLC operations: Absolute maximum allowable traffic flow

Type of closure	Maximum allowable traffic flow	
	Veh/hr	Veh/3 mins
Dual two-lane carriageway		
Lane 1	1200	60
Lane 2	1200	60
Dual three-lane carriageway		
Lane 1	2400	120
Lane 3	2700	135
Lane 1 + 2	1200	60
Lane 2 + 3	1200	60
Dual four-lane carriageway		
Lane 1	3600	180
Lane 4	3900	195
Lane 1 + 2	2400	120
Lane 3 + 4	2700	135

NOTES:

1. When two lanes are closed, central reservation matrix signals, VMS (**Section 10.5**) and the light arrow sign (**10.7.6**) should be used.

2. For work on four-lane dual carriageways, three advance sign vehicles are the absolute minimum required. MLCs should not be used on such carriageways unless matrix and/or VMS signals (**Section 10.5**) are employed, preferably in conjunction with a light arrow sign (**10.7.6**).

10.5 Mobile lane closures and matrix signals

10.5.1. Where roads are suitably equipped, the use of matrix signals and VMS is recommended for MLCs which encroach on live running lanes. This is often facilitated through agreement between the contractor and the relevant control centre (police or authority / traffic officers).

10.5.2. Arrangements made for the use of matrix signals and VMS to support MLCs must include advance notice requirements. They should also include an agreed method for the control centre to contact the MLC supervisor while the closure is in operation, as in the event of an incident, the signals/signs may have to be altered in line with a previously agreed signing plan identified by the contractor and agree with the control centre.

10.5.3. In establishing these arrangements, reference may need to be made to 'National Highways guidance for the use of Variable Signs and Signals (VSS)' (National Highways 2024).

10.5.4. The code of practice outlined in **10.5.3** relates to trunk roads in England. For details of the appropriate rules that apply in Scotland, Wales, and Northern Ireland, refer to the appropriate overseeing organisation.

10.5.5. Contact should be made at an early stage with the relevant control centre if the proposed operations:

- involve the use of matrix/VMS signs;
- pass through areas where the layout is not straightforward, or.
- require other police or traffic officer assistance.

10.5.6. When establishing an MLC on carriageways with matrix signals, the first step is to contact the control centre, giving them advance notice of the works and letting them know which signals/signs are going to be needed. The control room will need to know which lanes are going to be closed in order to display the correct messages.

10.5.7. On site, the MLC supervisor should be positioned on the hard shoulder/verge where they can see the first of the signals/signs and confirm with the control room that they are operating correctly. The method of communication should be agreed in advance, however contact with the control room may be made using emergency roadside telephones where connectivity issues may occur.

10.5.8. Work can begin when the signals/signs are confirmed to be operating correctly.

10.5.9. As soon as the MLC is removed, the control centre should be informed so that the signals/signs can be returned to normal use. They must be informed promptly in order to maintain credibility of the matrix signals/VMS.

10.6 Vehicles

10.6.1. This section relates specifically to MLC vehicles. General works vehicle issues are dealt with in **Section 14**.

10.6.2. The block vehicles used to form the closure in live traffic lanes should be as specified for an Impact Protection Vehicle (see **Section 14.6** and **14.9**), except that signing must be in accordance with the relevant parts of **10.6.10**.

10.6.3. All vehicles and trailers should be fitted with either of the following and be visible through 360° whether the sign display board is displayed or in the transport position:

- a roof-mounted amber warning light bar (comprising at least two independent light sources), or.
- two independent roof-mounted flashing amber warning beacons.

10.6.4. The amber warning beacons should be visible to oncoming drivers when the signs are being erected or folded. Subject to the requirements of **10.1.7**, when light arrow signs or rear mounted amber lanterns are in operation any amber beacons positioned to the rear of the vehicle should not be in operation. Beacons should comply with **Section 14.8**.

10.6.5. Block vehicles should be loaded to have a minimum on-the-road weight of 10 tonnes and a maximum weight not exceeding 15 tonnes. The choice of block vehicles should be decided by the acceleration and manoeuvrability needed for the method of working.

10.6.6. In view of the very low speeds at which some of these operations are undertaken, it may be advantageous to select vehicles with an appropriate low ratio drive.

10.6.7. To minimise the risk of vehicles cutting in between the working vehicle and the block vehicle, a sign to diagram 7403 (S13-6-10; **Figure 10.1**) should be fitted to the rear of the working vehicle or be trailer-mounted and towed by the working vehicle. If these options are not possible, then the working vehicle should carry a ‘keep left/ right’ sign to diagram 610 (S13-6-11; **Figure 10.2**) with a diameter of 1500 mm.

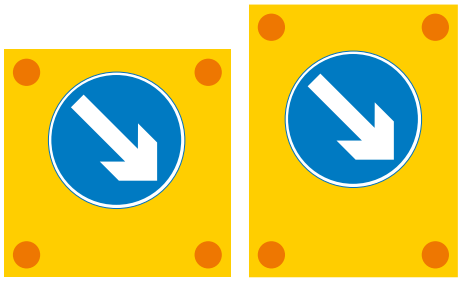


Figure 10.1 Diagram 7403 (S13-6-10) Other traffic keep to the right of vehicles carrying out mobile road works

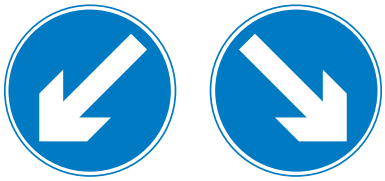


Figure 10.2 Diagram 610 (S13-6-11) Keep left/right

10.6.8. The number of working vehicles may be varied according to the nature of the work being undertaken.

10.6.9. Personnel may have difficulty reading marker posts during hours of darkness. The fitting of an adjustable spotlight is therefore advised. All lighting equipment should be checked before leaving the depot.

10.6.10. When working vehicles or personnel are operating on the hard shoulder a block vehicle with a truck mounted attenuator (TMA) is required. The working vehicles should carry a ‘keep right’ sign to diagram 610 (S13-6-11; **Figure 10.2**), which should be 1500 mm diameter. If this is not practicable then the largest possible sign should be used. The block vehicle on the hard shoulder should carry a sign to diagram 7403 (S13-6-10; **Figure 10.1**) or the recommended alternative light arrow sign (see **Section 10.8**). The light arrow sign should be activated when a vehicle is stopped in a live lane to provide protection to the scene of the incident or operation. The device should not be active on a two-way single carriageway, unless at the scene of an incident or there is a specific authorised aspect for this use. If the works

vehicle carrying the sign to diagram 7403 (or alternative) is substantial (e.g. a gully emptier or sweeper) and is fitted with a TMA, the block vehicle may not be needed.

10.7 Signs

10.7.1. During MLCs, signs on the carriageway should always be vehicle/trailer-mounted and attended at all times. Signs on the verge may be vehicle/trailer-mounted or static and do not need to be attended.

10.7.2. All traffic signs used in connection with MLC must comply with the relevant requirements of:

- the Traffic Signs Regulations and General Directions (TSRGD) (TSR in N.I.);
- the Road Vehicles Lighting Regulations 1989.
- BS EN 12899-1 'Fixed, vertical road traffic signs'.

10.7.3. Advance sign vehicles should use signs to diagram 7402 (S13-6-9; **Figure 10.3**) using 300 mm wide arrow heads. Design details are shown in working drawing P7402 (S13-6-9).

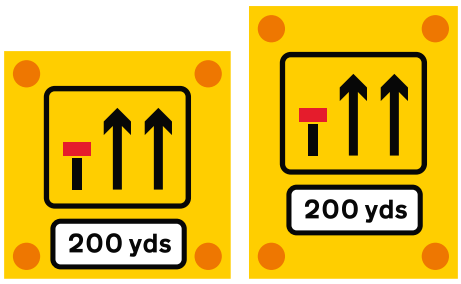


Figure 10.3 Diagram 7402 (S13-6-9) 'Lanes closed to traffic ahead by vehicles carrying out mobile road works'

10.7.4. The MLC signs to diagrams 7402 (S13-6-9; **Figure 10.3**) and 7403 (S13-6-10; **Figure 10.1**) must be reflectorised. This includes the yellow background in which the flashing amber lamps are installed. External illumination is not needed when signs are reflectorised in accordance with the appropriate specification (except in Northern Ireland). The sheeting material should be maintained in accordance with the manufacturer's guidelines (see also **Section 5.4**).

10.7.5. The sign to diagram 7403 (S13-6-10; **Figure 10.1**) may be used with the block vehicle. However, a higher visibility light arrow alternative sign is recommended. This sign incorporates a flashing light arrow to supplement the message given by the 'keep left/right' sign to diagram 610 (S13-6-11; **Figure 10.2**). A description of this sign is given in **Section 10.8**.

10.7.6. On the light arrow sign and the sign to diagram 7403 (S13-6-10), the arrow on the 'keep left/right' sign to diagram 610 (S13-6-11; **Figure 10.2**) must be capable of indicating either 'keep left' or 'keep right'. The rotation of the arrow, or covering of the sign, should be carried out remotely from the driver's cab. The driver must be able to verify the arrow direction or state of the sign from this position.

10.7.7. Sign display boards should be adequately supported, accounting for possible operating speeds. The lower edge of every sign display board when mounted on a vehicle should be at least 0.75 m above the road surface. When fitting a sign display board to a vehicle, the vehicle's rear lights, reflectors and number plate must not be obscured.

10.7.8. Signs may need to be covered or removed from the view of following drivers when not in use. If a blind is used, it should be opaque and preferably yellow. It should fully reveal or

fully cover the sign. When visible to other road users, the ‘keep left/right’ sign to diagram 610 (S13-6-11; **Figure 10.2**) must not be rotated to a vertical position.

10.7.9. Flap type variable message signs may also be used. If used, the appearance and performance of the sign should not be compromised, especially by the flap hinge detail. The sign should be able to be operated by a person in a safe position. They should be fitted with a means of securing them in both the open and closed positions.

10.7.10. On lane closure signs, each arrow symbol should be capable of being flapped to show a red bar symbol as an alternative to the arrow. Each flap should be fitted with a means of securing it in either of these positions. The red bars must be at the correct height, otherwise the legibility of the lane closed symbol is affected (particularly at night). The correct configuration for the flaps is detailed on diagram 7402 (S13-6-9; **Figure 10.3**).

10.7.11. Signs should not be manually changed when the sign vehicle is standing on a live traffic lane unless there is a failure of the system.

10.8 Light arrow system for block vehicles

10.8.1. The uses of a light arrow system attached to vehicles is not covered by TSRGD (Schedule 13, General Directions 4, 6(3)). As such, the light arrow sign needs separate authorisation and type approval from the appropriate Secretary of State on an authority specific basis.

10.8.2. Except where an authorisation identifies a different requirement, the colours of the system shown in **Figure 10.4** are as follows:

- upper sign display board – non-reflective grey;
- lower sign display board – retroreflective yellow in the same material as for MLC sign diagram 7403 (S13-6-10; **Figure 10.1**), see **10.7.5**.
- lamps – amber.

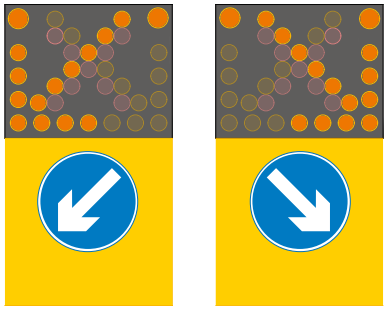


Figure 10.4 Light arrow arrangement

10.8.3. The sign to diagram 610 (S13-6-11; **Figure 10.2**) on the lower panel should be reflectorised in accordance with the relevant authorisation. The lower sign panel should be reflectorised using the same material as that specified for signs to diagram 7403 (S13-6-10; **Figure 10.1**), see **10.7.5**.

10.8.4. The lamp layout shown is indicative. For details of the precise number and layout of lamps or LED light sources, refer to the relevant authorisation. The halogen light-emitting arrow lamps under the current signs’ authorisation are required to:

- pulse at a rate of 30 to 50 flashes per minute;
- have an on-period twice the length of the off-period.
- when the light-emitting arrow lamps are operating, have the two synchronised flashing lanterns only flash during the off-period of the light-emitting arrow lamps.

10.9 Flashing amber lanterns

10.9.1. Depending on the signs' authorisation, four flashing amber lanterns may be fitted to the lower panel of the light arrow arrangement for block vehicles, see **Section 10.8**. These may be used in place of a sign to diagram 7403 (S13-6-10; **Figure 10.1**) when the upper light arrow panel is lowered. The four flashing amber lanterns should only be operated when the upper light arrow panel is lowered and is not visible to approaching drivers.

10.9.2. Rear-mounted flashing amber lanterns must comply with the Road Vehicles Lighting Regulations 1989 (RVLR), with a lens diameter of 300 mm ±10 mm. Each lamp must show an intermittent amber light at a rate of flashing between 60-90 flashes per minute. The lights of one horizontal pair must always be shown when the lights of the other horizontal pair are not shown. The optimum flash rate has been found to be 65 (±5) flashes per minute. Each lamp needs to have a minimum time between flashes of at least 0.67 seconds.

10.9.3. Unless otherwise identified in the signs authorisation, the light intensity of the lanterns on the principal axis should be measured when the lamps are continuously energised and should be as follows:

- daylight – 2000 candelas (minimum).
- hours of darkness (during lighting up time) – 400 to 800 candelas.

10.9.4. The light intensity during hours of darkness should not exceed the maximum value of 800 candelas as this may cause glare and make the sign difficult to read. Day and night intensities should be measured with amber lenses in place, and with the measuring device 7 m from the lanterns. Amber lenses should preferably be to C yellow 1 in Table 4 of BS EN 12352 or otherwise signal yellow (Class A) as specified in BS 1376: 1974.

10.9.5. The angle of half intensity should be between 2.25° and 2.5°.

10.9.6. For night-time operations, the light intensity of the lanterns should be adjusted by an automatic light-sensitive multistage light dimming device.

10.10 Vehicle checks

10.10.1. All equipment should be checked to be in full working order prior to starting MLC operations. In particular:

- the flash rate of the lanterns should be in accordance with the values given in **10.9.1**;
- the lenses on the lanterns are orientated correctly;
- there is consistent brightness between lamps and that they are not too bright or too dim.
- the light sensor functions correctly.

10.11 Communications

10.11.1. The supervisor will need to communicate with members of the team during the operation. A reliable two-way radio communication system should be provided between all vehicles, including contractor's vehicles. A radio channel for dedicated use during MLC operations should be used, where possible. A plan should be prepared to deal with a loss of communication with the supervisor.

10.11.2. At least one member of the team (usually the supervisor) should carry a mobile phone for contacting the emergency services. This method of communication must be agreed beforehand with the police and, if appropriate, with control centre / traffic officers. Signal strength for any relearnt service providers should be checked before undertaking the MLC.

10.12 Establishing a closure

10.12.1. MLCs are put into effect by driving a vehicle or convoy of vehicles in a particular sequence, displaying signs at the rear. Drivers should operate as a team, with a supervisor in charge of all operations. This includes the activities of contractors who may be carrying out works from their own vehicles with their own drivers (**10.3.5**). A deputy supervisor should also be appointed.

10.12.2. The supervisor will require all drivers to report to the depot for final briefing and equipment checks.

10.12.3. Drivers should then take their vehicles to a prearranged rendezvous where they will be instructed to space their vehicles out, on the hard shoulder if possible, at the requisite distance apart. Each one should move as necessary to a prearranged marker post position.

10.12.4. The supervisor will normally be based in the block vehicle, or the leading block vehicle if more than one is used. They can be based in the advance warning vehicle nearest the block vehicle if that is preferable.

10.12.5. At this stage, all signs are covered or flapped shut, except for block vehicles which should have the TMA lowered in the operating position and signs to diagram 610 (S13-6-11) showing ‘keep right’.

10.12.6. The supervisor should arrange for a three-minute traffic count to be made to ensure that the flow matches with the value that has been determined as appropriate by the safety risk assessment (see **Section 10.4**). This should be done while the warning vehicles are being moved to their initial positions along the hard shoulder.

10.12.7. A further check count may be made after waiting for ten minutes. The closure procedure should only continue when the supervisor is certain that the traffic flow is within limits and is not too close to the limit and rising.

10.12.8. If the result of the count is satisfactory, the relevant control centre should be contacted to check that no incidents have been reported on the stretch of carriageway where the mobile works are to be undertaken and to set matrix signals/VMS where appropriate (see **Section 10.5**).

10.12.9. The signs should now be uncovered showing the correct lane closure indications. As the vehicles are positioned on the left, the sign to diagram 610 (S13-6-11; **Figure 10.2**) should all be indicating ‘keep right’. For offside closures, the sign to diagram 610 on the vehicles will later need to rotate to indicate ‘keep left’ as they take up their closure positions.

10.12.10. The supervisor should check by radio that all drivers are in position and that the appropriate signs are displayed with flashing beacons switched on. The lanterns are not to be lit yet. When everything is confirmed to be in order, the team should be instructed to start the operation.

10.12.11. The warning vehicle lanterns should now be switched on. The block and working vehicles should move at normal speed into the lanes to be closed some distance away. They should approach with the traffic flow, switch on their lanterns, and slow down into the working position.

10.12.12. Alternatively, the working vehicle may wait until the closure has been established by the block vehicle and then take up position. In this case, the supervisor should inform the driver of the working vehicle when the closure is in place. The working vehicle can then get

into position at the front of the MLC, with the driver using his own judgement as to the timing of any manoeuvre. For a right lane closure, the supervisor should assist the driver of the working vehicle during this operation.

10.12.13. Another option for establishing the closure is for the vehicles to move from the hard shoulder directly across into their appropriate position on the carriageway as soon as practicable.

10.12.14. When establishing and removing an offside lane closure, the direction of the arrow on signs to diagram 610 (S13-6-11; **Figure 10.2**) and/or flashing light arrow on the vehicle should be changed remotely from the driver's cab to direct traffic accurately.

Traffic count form for mobile lane closure

Date:	Closure operatives:
Location:	Supervisor:
Operation:	Block vehicles:
Contractor:	200 yard vehicle:
Client supervisor:	500 yard vehicle
Weather:	800 yard vehicle
	Other (state):
Time closure on:	Time closure off:

10.12.15. Traffic flow limits applicable during the MLC operation.

Traffic flow level above which the closure cannot be put into effect.	**Maximum allowable traffic flow level (see Table 10.1)**

10.12.16. Traffic count

Time of count	**Marker post**	**Vehicles per 3 minutes**			**In limit? Yes/No**	**Remarks, incidents and stops**
		Cars	**HGVs**	**Total**		

10.13 During a closure

10.13.1. The supervisor is responsible for warning other members of the team by radio of hazards on the road or hard shoulder (e.g. debris, stationary vehicles). When such a hazard is encountered, each driver is responsible for negotiating the hazard and returning to station, in relation to the other MLC vehicles, as safely and quickly as possible. They must keep the supervisor informed of their progress.

10.13.2. The supervisor is responsible for deciding what action to take (if any) if an incident occurs which may affect the safety of all parties (road worker and/or road users).

10.13.3. When working near junctions or roundabouts, road users approaching from the side may not be able to see the rear-mounted signing or lanterns on the main route. In these circumstances, the works and/or signing vehicles should have their warning beacons switched on. Appropriate signing should also be provided on the side roads.

10.13.4. Ensuring that the hard shoulder sign vehicles keep station, relative to the working vehicle, may be problematic. One method found to be effective is for the driver of the leading warning vehicle to broadcast each marker post number as it is passed, as well as the vehicle's approximate speed every kilometre. The challenge of station keeping increases as the speed increases.

10.13.5. Where there is no hard shoulder or the hard shoulder is of a restricted width less than 3.3 m, the vehicle/trailer-mounted advance signs should be located on the verge where possible. Consideration should be given to installing hard standings on the verge to locate these vehicles. Advice on the installation of such hard standings is included in CD 169 'The design of lay-bys, maintenance hardstandings, rest areas, service areas and observation platforms'.

10.13.6. Advance signs vehicles should not encroach into the nearside lane unless moving position. Where verges are restricted, the use of lay-bys or field gate entrances may be considered. In ideal circumstances, drivers approaching a mobile closure should always be able to see at least two consecutive signs. Where there is no hard shoulder (**Plan MLC1**), the warning vehicles should be positioned so that:

- block vehicle B and vehicle C are clearly visible from warning vehicle D;
- vehicles C and D are clearly visible from warning vehicle E.
- the distance between warning vehicle E and block vehicle B are less than 1 km.

10.13.7. If suitable stopping points are not available for all three advance warning vehicles, then Vehicle D may be omitted. This decision should be based on a site-specific risk assessment. Vehicle D should always be used unless there are very sound reasons not to do so.

10.13.8. If it is not possible to find sufficient stopping points, then the use of static traffic management will be necessary.

10.13.9. The supervisor should be aware of the activities taking place during the work and co-ordinate and align the distances to be travelled to any operational requirements (e.g. recharging the tanks of working vehicles).

10.13.10. Strict control of additional vehicles is essential, especially when working in the right or centre lane. Any additional vehicles should be conspicuous and fitted with flashing amber warning beacons to the same standard as the works vehicle (see **Section 10.9**).

10.13.11. If the working vehicle must stop for more than a few seconds, the driver should inform the supervisor. They will then stop the remainder of the convoy until informed by the driver of the working vehicle that it is mobile again.

10.13.12. Where there is a hard shoulder with a discontinuity of up to 400 m, the working vehicles and block vehicles should proceed together and advise the rest of the MLC of their position. When the leading warning vehicle reaches the discontinuity, all warning vehicles should stop. The leading warning vehicle should proceed on its own to regain the hard shoulder after the discontinuity when the rearmost block vehicle is about 100 m past its far end.

10.13.13. If the train is slow-moving, this distance will need to be increased to ensure the leading warning vehicle does not catch the train up and reduce the actual distance between itself and the block vehicle to less than 200 m. The following warning vehicles should then negotiate the discontinuity in turn in a similar manner. Maintaining station with the leading warning vehicle while negotiating the discontinuity is temporarily less important.

10.13.14. Work on reduced width sections longer than 400 m should be carried out by means of a lane closure using static signs and cones.

10.13.15. On some stretches of dual carriageway, it may be necessary to reduce the distance between advance warning vehicles to ensure that the next vehicle in the convoy can be seen by road users before they have passed the preceding one. Drivers should be instructed to make this temporary adjustment as necessary.

10.13.16. The closure should not be removed simply on the grounds of traffic flow levels until either of the following occurs:

- two successive counts give results above the appropriate value, or.
- the counts show a rising trend with the last one above the appropriate value.

10.13.17. If the supervisor considers the situation to be dangerous, the operation should be aborted.

10.13.18. If the MLC vehicle is still stationary when the planned stop time has elapsed, a dynamic risk assessment should be completed immediately to determine the next course of action. If this assessment results in a decision to continue with the MLC operation, an absolute maximum additional 15 minutes should be allowed.

10.14 Working through junctions without a hard shoulder

10.14.1. As the MLC approaches a junction without a hard shoulder, the supervisor needs to confirm to team members by radio on the previously agreed procedure to be adopted. This will depend on:

- the nature of the works being undertaken;
- the nature of the junction.
- the volume of traffic.

10.14.2. When the MLC is operating on the nearside lanes of the main carriageway, consideration should be given to temporarily closing the slip road whilst the convoy passes. If the slip road is not closed, either of the following signs should be displayed to the joining traffic just prior to the arrival of the convoy, and removed after it has passed (see **Section 10.18**):

- a static road works ahead sign to diagram 7001 (S13-2-9; **Figure 10.5**) displaying a ‘Mobile road works’ plate, or.
- a mobile sign to diagram 7402 (S13-6-9; **Figure 10.3**) displaying an ‘Ahead’ plate.
- the assistance of the police or a traffic officer, if available.

10.14.3. The driver of each vehicle should exercise special care when negotiating the junction.

10.15 Working through junctions with a hard shoulder

10.15.1. As the MLC approaches a junction or a motorway service area where a hard shoulder is present, the supervisor needs to confirm to team members by radio on the previously agreed procedure to be adopted. This will depend on:

- the nature of the works being undertaken.
- the nature of the junction.
- the volume of traffic.

The slip road may be closed by the police or a traffic officer. Alternatively, the arrangement described in **10.15.2** should be used.

10.15.2. If the police or a traffic officer are not being used to close the slip road, then either of the following signs should be displayed on the entry slip road, just before it is reached by the leading working vehicle (see **Plan MLC7**):

- a static ‘road works ahead’ sign to diagram 7001 (S13-2-9; **Figure 10.5**) displaying a ‘Mobile road works’ plate, or
- mobile sign to diagram 7402 (S13-6-9; **Figure 10.3**) displaying an ‘Ahead’ plate.

10.15.3. As the last sign-bearing vehicle clears the entry slip road, the supervisor should ask for this sign on the slip road to be removed. The sign should be moved forward ready for display at the next junction or motorway service area to be negotiated by the closure train.



Figure 10.5 Diagram 7001 (S13-2-9) Road works ahead with supplementary plate mobile road works

10.15.4. On reaching an exit slip road the working vehicles and lane closure vehicles should be prepared to stop if necessary, to give way to traffic leaving the main carriageway. They should then continue in their normal line at the prearranged speed. As the sign-bearing vehicles on the hard shoulder reach the exit slip road they should follow the same procedure. Each warning vehicle driver waiting to cross a slip road should notify drivers behind that they have stopped (to prevent bunching). When they have successfully crossed the slip road, they should notify following warning vehicle drivers so that they can recover lost ground. Each vehicle should then continue along the hard shoulder of the main carriageway and regain station as quickly as possible.

10.15.5. On reaching an entry slip road, each sign-bearing vehicle should stop in turn at the end of the hard shoulder. The vehicle should be driven across the slip road on to the hard

shoulder as and when a suitable gap in the traffic occurs and regain station as quickly as possible. Drivers waiting to cross, or crossing, a slip road should advise following drivers of their status. Drivers should exercise special care when executing these manoeuvres.

10.15.6. When work is to be carried out on the main carriageway and then on an exit slip road, the rest of the MLC should stop and the closure be removed as the working vehicle reaches the start of the slip road.

10.15.7. The distance plate on each of the advance sign vehicles should then be changed to the 'On slip road' plate. If the number of lanes on the slip road is different from that on the main carriageway, the lane closure signs should also be changed.

10.15.8. The working vehicle should then work along the slip road escorted by a block vehicle showing a 'keep left/right' sign to diagram 610 (S13-6-11; **Figure 10.2**). The remaining mobile signs should maintain station on the hard shoulder of the main carriageway. When the working vehicle reaches the end of the slip road, the closure should be removed.

10.15.9. When it is necessary to work on an entry slip road and then on the main carriageway, one of the following signs should be displayed at the start of the slip road:

- a static 'road works ahead' sign to diagram 7001 (S13-2-9; **Figure 10.5**) displaying a 'Mobile road works' plate, or
- a mobile sign to diagram 7402 (S13-6-9; **Figure 10.3**) displaying an 'Ahead' plate.

10.15.10. The working vehicle should work along the slip road while the remaining mobile signs are sited on the hard shoulder of the main carriageway prior to the junction. Their beacons should be switched off.

10.15.11. The working vehicle should be escorted by a block vehicle showing a sign to diagram 7403 (S13-6-10; **Figure 10.1**). As both vehicles reach the main carriageway, the beacons on the waiting vehicles should be switched on. They should then move off and take up station in the normal way.

10.15.12. If the slip road is longer than 400 m, additional mobile signs to diagram 7402 (S13-6-9; **Figure 10.3**) are required. If the number of lanes on the slip road is different from that on the main carriageway, the lane closure signs should be changed when appropriate. The drivers of the hard shoulder sign vehicles should exercise special care when crossing the entry slip road.

10.16 Removing a closure

10.16.1. When a closure is to be removed, either because work is complete or the traffic flows are getting too high (see **Section 10.4**), the supervisor should instruct the drivers of the block/works vehicles to move off the carriageway. They should move on to the hard shoulder if one is available. The rest of the team should maintain station. For a right lane closure, this may involve accelerating in the lane occupied and manoeuvring to the left as gaps in the traffic occur.

10.16.2. Once the lane closure vehicles are off the carriageway, the supervisor should instruct the vehicles to stop and have the signs covered. Any static signs should be recovered. Drivers can then be instructed to leave the site. From this stage in the procedure, drivers should proceed independently and at a normal pace.

10.16.3. Where there is no hard shoulder, as soon as the work has been completed and the block/works vehicles have moved off, the signs on the advance warning vehicles should be covered at their last stationary position clear of live traffic.

10.16.4. If the MLC is required to move further along the road to commence work elsewhere, the supervisor should direct the drivers accordingly. On roads with a hard shoulder, where traffic flows are light and there is a short distance between works sites (e.g. 2-3 km), the train can be kept together with the closure operational and travelling at 20-25 km/h (12-15 mph) to the next site.

10.16.5. Otherwise, the closure should be removed, and the signs covered. The drivers should then be instructed to take their vehicles to the next site independently.

10.17 Operations at night

10.17.1. As with daytime use, MLCs should be employed only where visibility is good (see **Section 10.1**). MLCs may be used on both lit and unlit carriageways. Care should be taken when operating an MLC around dusk or dawn.

10.17.2. Using an MLC at night on roads with no proper hard shoulder can present difficulties in safely siting and relocating the advance warning sign vehicles off-carriageway. MLCs should only be used in these circumstances by very experienced practitioners.

10.17.3. The guidance in this document for daytime use on roads with no hard shoulders should be supplemented by a site and time specific risk assessment. A detailed analysis for each case is required. This must be preceded by a site inspection, carried out by a competent responsible person having relevant MLC experience to determine exactly where sign vehicles can pull off safely. Findings should be included in the site-specific quality plan and instructions.

10.17.4. Additional stresses and premature fatigue brought about by working at night may require the use of a relief driver (see **Section 10.3**).

10.18 Plans and principles for mobile lane closures

10.18.1. The plans and principles for the operation of MLCs are given in **Plans MLC1** to **MLC7**. They relate to the free-flowing conditions found on motorways and dual carriageways with grade-separated junctions. The separation distance between block/working vehicles is a compromise between the need to keep the gap small to discourage other vehicles from breaching the closure and allowing sufficient room to avoid the block vehicle being pushed into the working vehicle should it be struck from behind. The block vehicle shown in the plans has the same specification as an Impact Protection Vehicle (see **Section 14.6** and **14.9**).

10.18.2. If an MLC is used on a road with at-grade junctions (e.g. signals, roundabouts), then gaps between vehicles may need to be reduced near these junctions. At this type of location, the speed of the traffic reduces and there is therefore an increased risk of vehicles invading the closure. This is worsened if the larger gaps normally used when traffic is passing at higher speeds are maintained.

10.18.3. Where the closure of two lanes is being carried out, lanes 2 and 3 should be closed if the choice is available (instead of lanes 1 and 2) since it does not require slower-moving traffic to change lanes.

10.18.4. The block vehicle should always maintain station with the working vehicle in front of it. When there is a risk of other vehicles getting between the MLC vehicles, the distance given as 50 -100 m in the plans should be kept as close to 50 m as possible. This distance should never be less than 50 m in normal operation.

10.18.5. Where the working vehicle is operating in the centre lane of three (**Plan MLC3**), three block vehicles should be used. These are shown as B1, B2 and B3 on the plan. This

arrangement minimises any risk of errant vehicles passing between the block vehicles. Extending the length of the taper also allows smoother merging of approaching traffic.

10.18.6. When the nearside and centre lane are closed, then consideration should be given to providing an additional block vehicle on the hard shoulder alongside vehicle B3. This will depend on the location of the workforce within the closure.

Working on foot

10.18.7. MLCs allow for work on the carriageway to be carried out on foot. **Plan MLC4** illustrates the principles involved. In the example depicted, the working area is shown as extending forwards and into part of the middle lane. In this situation, the working area should be protected by vehicles front and rear. The rear vehicle should itself be protected by a block vehicle as shown. A lateral clearance or safety zone of no less than 1.2 m should be provided between the working space and the carriageway remaining open to traffic.

10.18.8. Steps should be taken to ensure that the workforce does not stray into the safety zone (e.g. when a team member is acting as a lookout).

10.18.9. When work is being carried out on foot, additional block vehicles may be needed to protect the working area from errant vehicles. Where an additional block vehicle is positioned within the area protected by the main block vehicles (e.g. alongside vehicle B1), its flashing lanterns should be switched off.

10.18.10. The arrangement may be adapted for other situations (e.g. work on lanes 2 and 3 may be carried out using a mirror image of the plan).

10.18.11. When working on foot alongside a wide central reservation, block vehicles should be positioned to prevent errant vehicles from passing between the central reservation safety barrier and the block vehicles.

10.18.12. When work is undertaken on foot on a hard shoulder, lateral clearance of no less than 1.2 m should be provided between the working space and the carriageway open to traffic (see **Section 4.2**).

Plan MLC1: Mobile Lane Closure on a dual carriageway road without a hard shoulder

10.18.13. Three vehicle or trailer-mounted signs are required on the nearside, off the carriageway, up to 1 km from the initial block vehicle that is positioned in the carriageway:

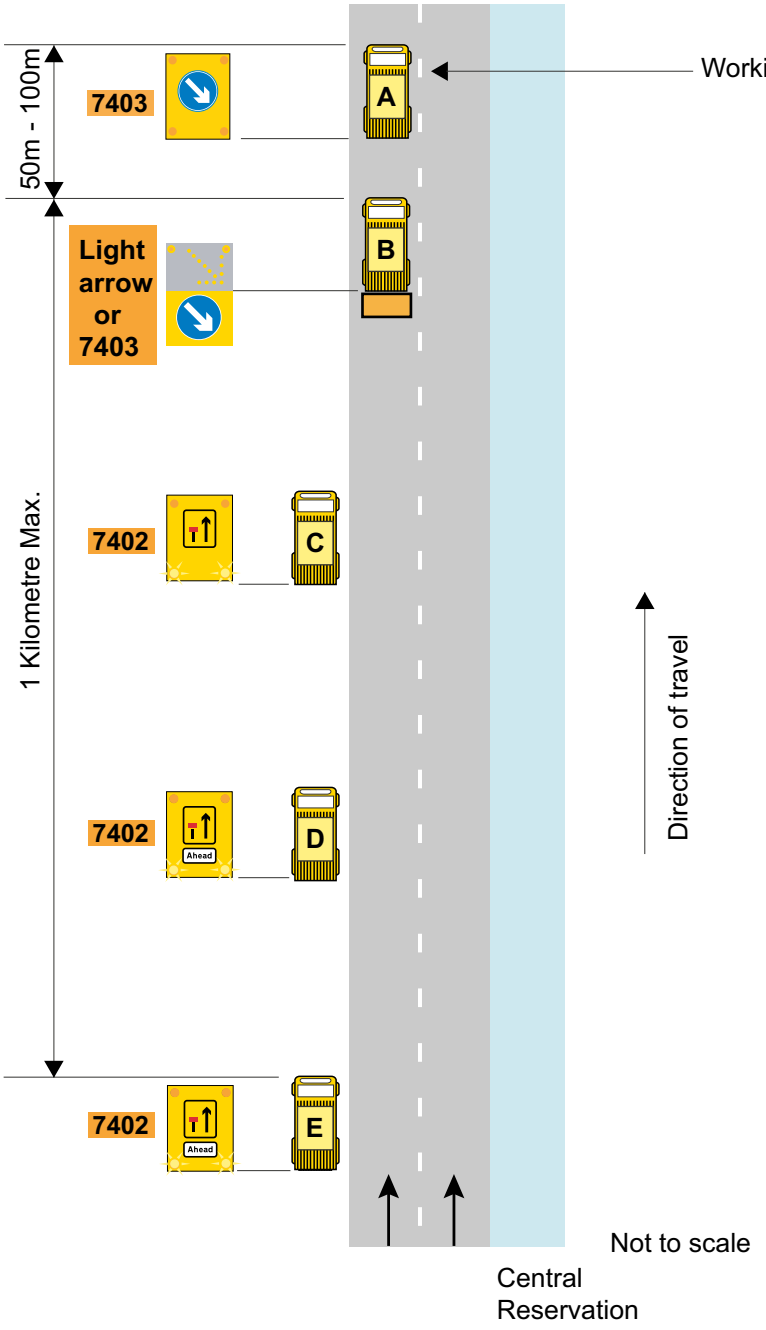
- initial two (or more) signs to diagram 7402 (S13-6-9) showing supplementary plate ‘Ahead’.
- final advance sign to diagram 7402 with no supplementary plate.
- one block vehicle B carrying a light arrow sign or sign to diagram 7403 (S13-6-10) 50-100 m in advance of the working vehicle A carrying sign to diagram 7403.

10.18.14. Vehicles C, D, and E should be evenly spaced with a spacing between 200-350 m. These vehicles will move from their current positions to the next available hard standing as the work progresses, while maintaining an overall distance of no more than 1 km from vehicle B. Advance sign vehicles should be positioned so that approaching drivers are always able to see at least two consecutive signs (see **10.13.4**).

10.18.15. If suitable stopping points are not available for all three advance warning vehicles, then Vehicle D may be omitted. This decision should be based on a site-specific risk assessment. Vehicle D should always be used unless there are sound reasons not to do so.

10.18.16. For a closure of the middle lane on a three-lane dual carriageway without a hard shoulder, the advance signs should be as **Plan MLC1**. The position of the block vehicles and working vehicle should be as **Plan MLC3** or **MLC5**.

Plan MLC1 Mobile Lane Closure on a dual carriageway road without hard shoulder

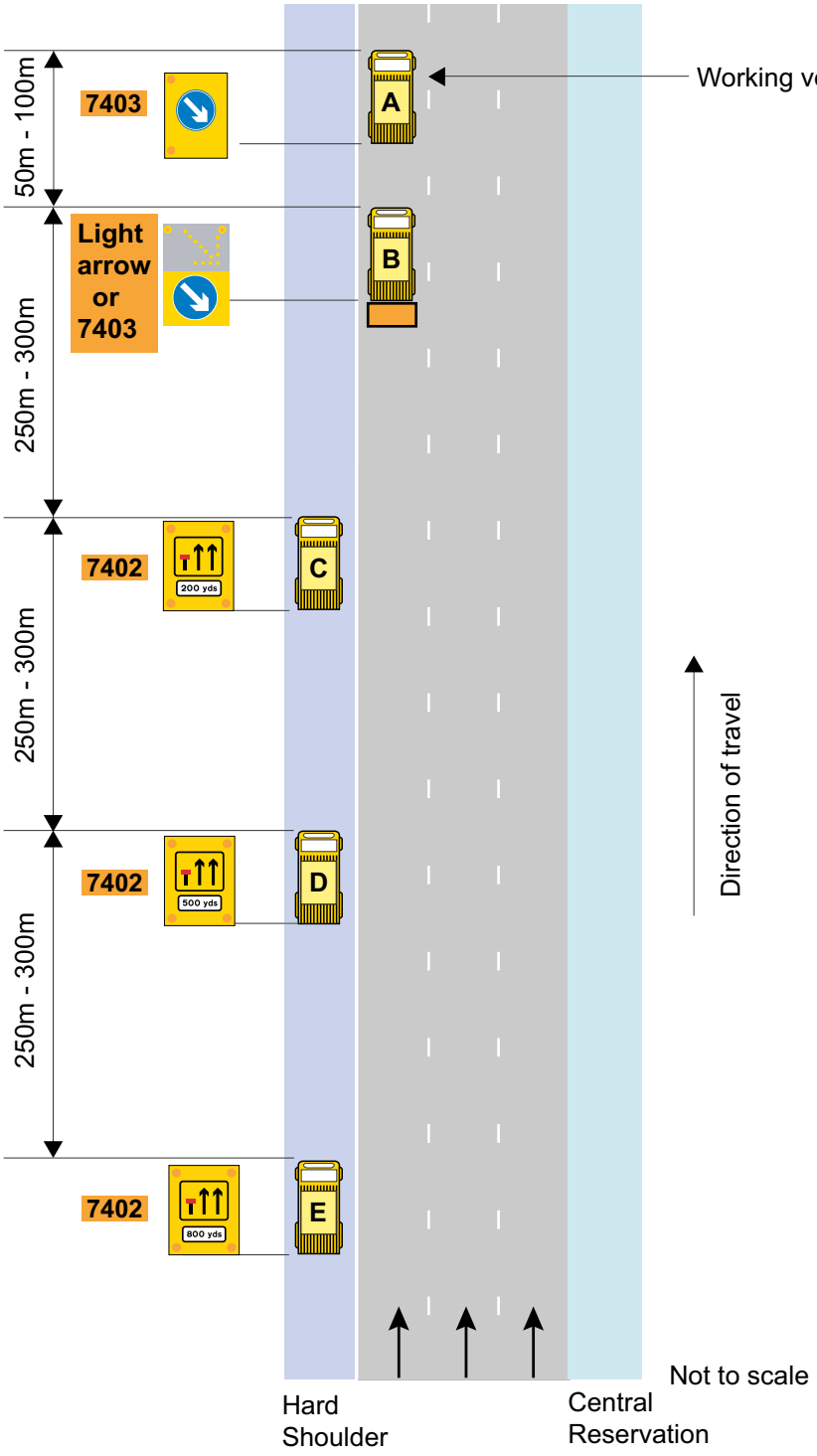


Plan MLC2: Mobile Lane Closure on a dual carriageway road with a hard shoulder

10.18.17. Three vehicle or trailer-mounted signs are required on the hard shoulder in advance of the initial block vehicle that is positioned on the carriageway:

- three vehicle or trailer-mounted signs to diagram 7402 (S13-6-9) showing supplementary plate ‘800 yds’, ‘500 yds’, and ‘200 yds’. These should be spaced at intervals of 250-300 m, starting 200-250 m in advance of the initial block vehicle B.
- one block vehicle B carrying a light arrow sign or sign to diagram 7403 (S13-6-10) 50-100 m in advance of the working vehicle A carrying sign to diagram 7403.

Plan MLC2 Mobile Lane Closure on a dual carriageway with a hard shoulder



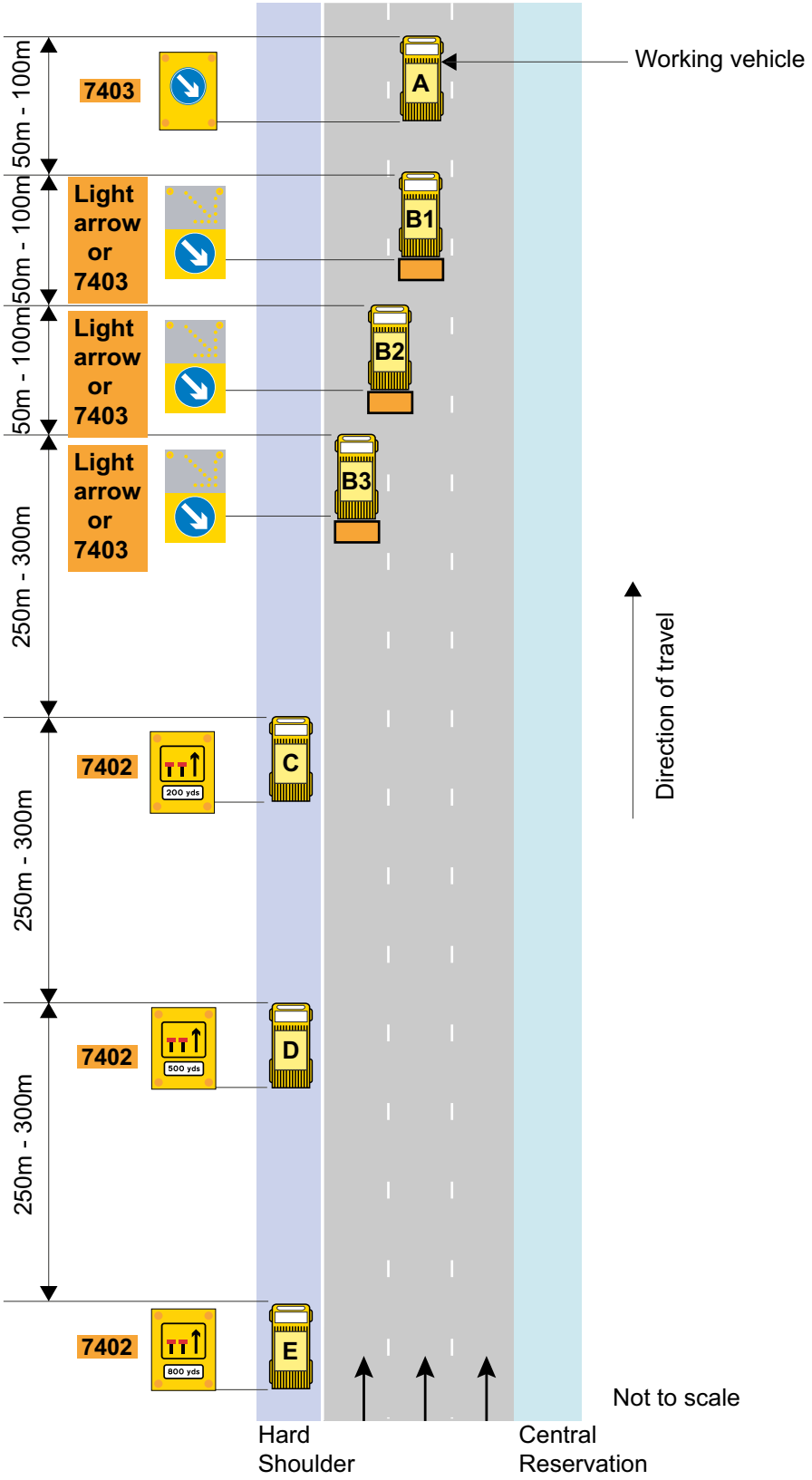
Plan MLC3: Mobile Lane Closure of two nearside traffic lanes (lanes 1 and 2) with a hard shoulder, working vehicle only

10.18.18. Three vehicle or trailer-mounted signs are required on the hard shoulder and three block vehicles are positioned on the carriageway:

- three vehicle or trailer-mounted signs to diagram 7402 (S13-6-9) showing supplementary plate ‘800 yds’, ‘500 yds’, and ‘200 yds’. These should be spaced at intervals of 250-300 m, starting 200-250 m in advance of the initial block vehicle B3;
- one block vehicle B3 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 1, 50-100 m in advance of the next block vehicle;
- one block vehicle B2 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) straddling lane line between lanes 1 and 2, 50-100 m in advance of block vehicle B3.
- one block vehicle B1 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 2, 50-100 m in advance of the working vehicle A carrying sign to diagram 7403. See **Plan MLC4** for the position of lane 2 block vehicles where works are being carried out on foot.

NOTE: Where the closure of two lanes is being carried out, lanes 2 and 3 should be closed if the choice is available since it does not require slower-moving traffic to change lanes (see **Plan MLC5**).

Plan MLC3 Mobile Lane Closure of two nearside traffic lanes (lanes 1 and 2) with a hard shoulder, working vehicle only



Plan MLC4: Mobile Lane Closure of two nearside traffic lanes (lanes 1 and 2) with and without a hard shoulder, working on foot

10.18.19. The requirements are:

- three vehicle or trailer-mounted signs to diagram 7402 (S13-6-9) showing supplementary plate ‘800 yds’, ‘500 yds’, and ‘200 yds’. These should be spaced at intervals of 250-300 m (not shown on plan), starting 200-250 m in advance of the initial block vehicle B4;
- one block vehicle B4 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) positioned on hard shoulder (when this is present), 50 m in advance of block vehicle B3. Unless at the scene of an incident, the light arrow sign should not display any form of arrow when the vehicle is on a two-way single carriageway road or when on a hard shoulder of a dual carriageway;
- one block vehicle B3 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 1, 50 m in advance of block vehicle B2;
- one block vehicle B2 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) between lanes 1 and 2, 50 m in advance of block vehicle B1;
- one block vehicle B1 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 2, 50 m in advance of the initial block vehicle B;
- one block vehicle B carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 2 adjacent to the upstream limit of the safety zone;
- consideration should be given to using an additional block vehicle (with lanterns switched off) alongside either block vehicle B1 or B in lane 1 to protect the working area. This will depend on the nature of the works;
- working vehicle A carrying a sign to diagram 7403 (S13-6-10) is positioned in front of block vehicle B. The distance between the front of block vehicle B and the rear of the working vehicle A should be 40 m. The position of vehicles A and B may be swapped over if required;
- the downstream limit of the working space is adjacent to the front of working vehicle A;
- a 1.2 m safety zone will need to be maintained between the edge of the working space and the adjacent live traffic lane.
- a 10 m safety zone should be maintained in front of block vehicle B.

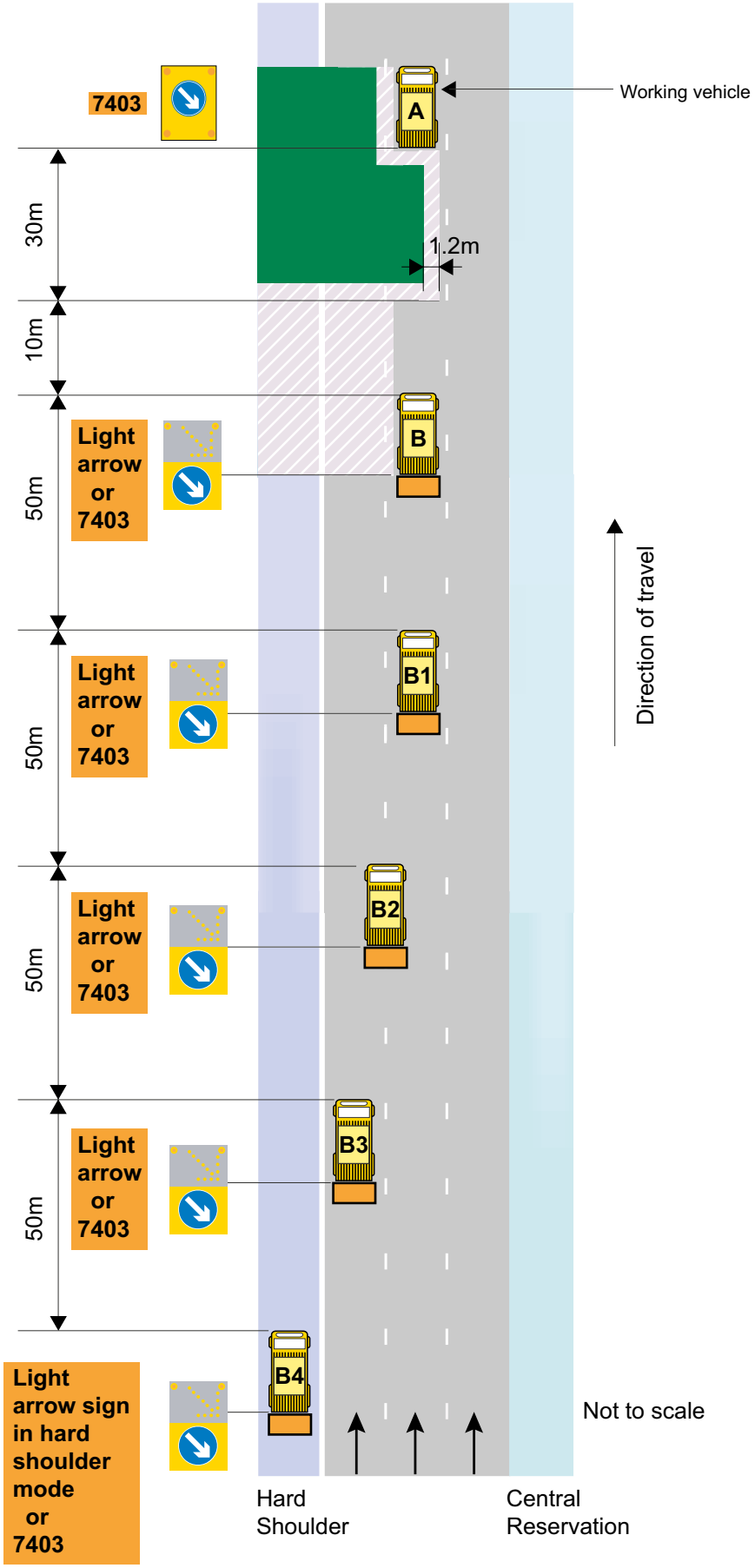
10.18.20. The arrangement may be adapted for other situations (e.g. work on lanes 2 and 3 may be carried out using a mirror image of **Plan MLC4**). When working alongside a wide central reservation, block vehicles should be positioned to prevent errant vehicles from passing between the central reservation safety barrier and the block vehicles.

NOTES:

For clarity, the three vehicle or trailer-mounted advance signs have been omitted.

Unless at the scene of an accident or incident, the light arrow sign should not display any form of arrow when the vehicle is on a two-way single carriageway road or when on a hard shoulder of a dual carriageway.

Plan MLC4 Mobile Lane Closure of two nearside traffic lanes (lanes 1 and 2) with and without a hard shoulder, working on foot

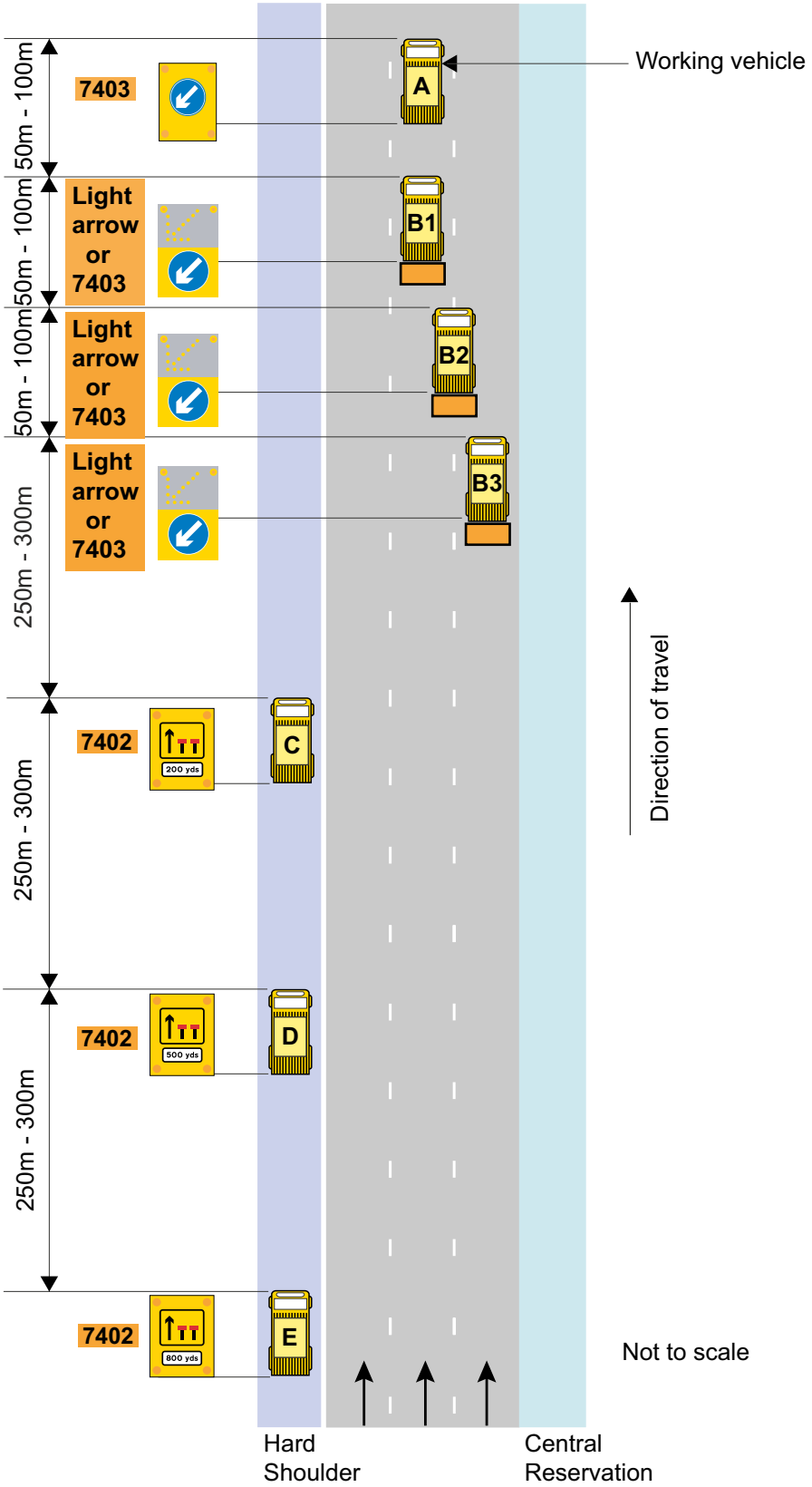


Plan MLC5: Mobile Lane Closure of two offside traffic lanes (lanes 2 and 3 on a three-lane carriageway) with and without a hard shoulder

10.18.21. Three vehicle or trailer-mounted signs are required on the hard shoulder and three block vehicles are positioned on the carriageway:

- three vehicle or trailer-mounted signs to diagram 7402 (S13-6-9) showing supplementary plate ‘800 yds’, ‘500 yds’, and ‘200 yds’. These should be positioned at intervals of 250-300 m in advance of the initial block vehicle B3;
- one block vehicle B3 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 3, 50-100 m in advance of next block vehicle B2;
- one block vehicle B2 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) straddling the lane line between lanes 2 and 3, 50-100 m in advance of block vehicle B1.
- one block vehicle B1 carrying a light arrow sign or sign to diagram 7403 (S13-6-10) in lane 2, 50-100 m behind the working vehicle A carrying sign to diagram 7403 (see **Plan MLC4** for the position of the lane 2 block vehicles where works are being carried out on foot).

Plan MLC5 Mobile Lane Closure of two offside traffic lanes (lanes 2 and 3 on a three-lane carriageway) with and without a hard shoulder



Plan MLC6: Mobile Lane Closure (Impact Protection Vehicle), working vehicle on a hard shoulder

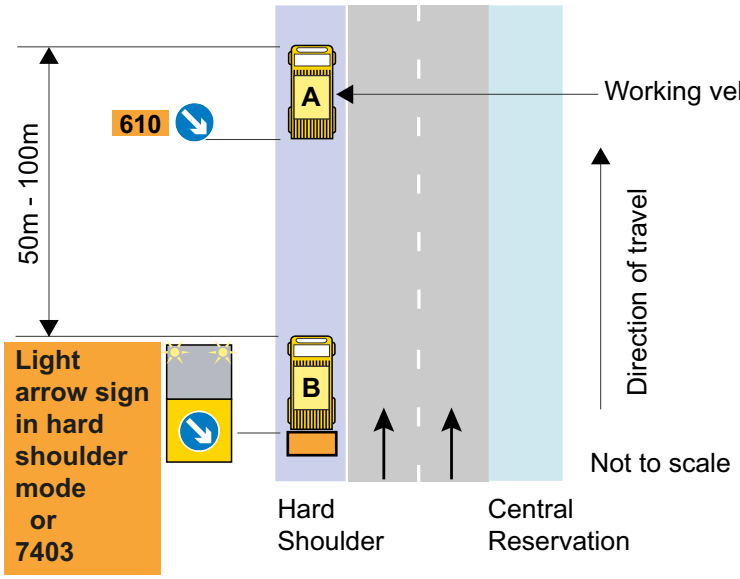
10.18.22. The requirements are:

- one block vehicle B carrying a light arrow sign or sign to diagram 7403 (S13-6-10) on the hard shoulder;
- working vehicle A carrying a 'keep left/right' sign to diagram 610 (S13-6-11) is positioned in advance of block vehicle B;
- the block vehicle B may be dispensed with if:
  - the works vehicle A carries a light arrow sign or a sign to diagram 7403 (S13-6-10).
  - is fitted with a TMA, meets the requirements of a block vehicle, and is substantial (e.g. a sweeper weighing in excess of 10 tonnes).

NOTE: Unless at the scene of an accident or incident, the light arrow sign should not display any form of arrow when the vehicle is on a two-way single carriageway road or when on a hard shoulder of a dual carriageway.

NOTE: The block vehicle B is more commonly referred to as an Impact Protection Vehicle.

Plan MLC6 Mobile Lane Closure (Impact Protection Vehicle), working vehicle on a hard shoulder



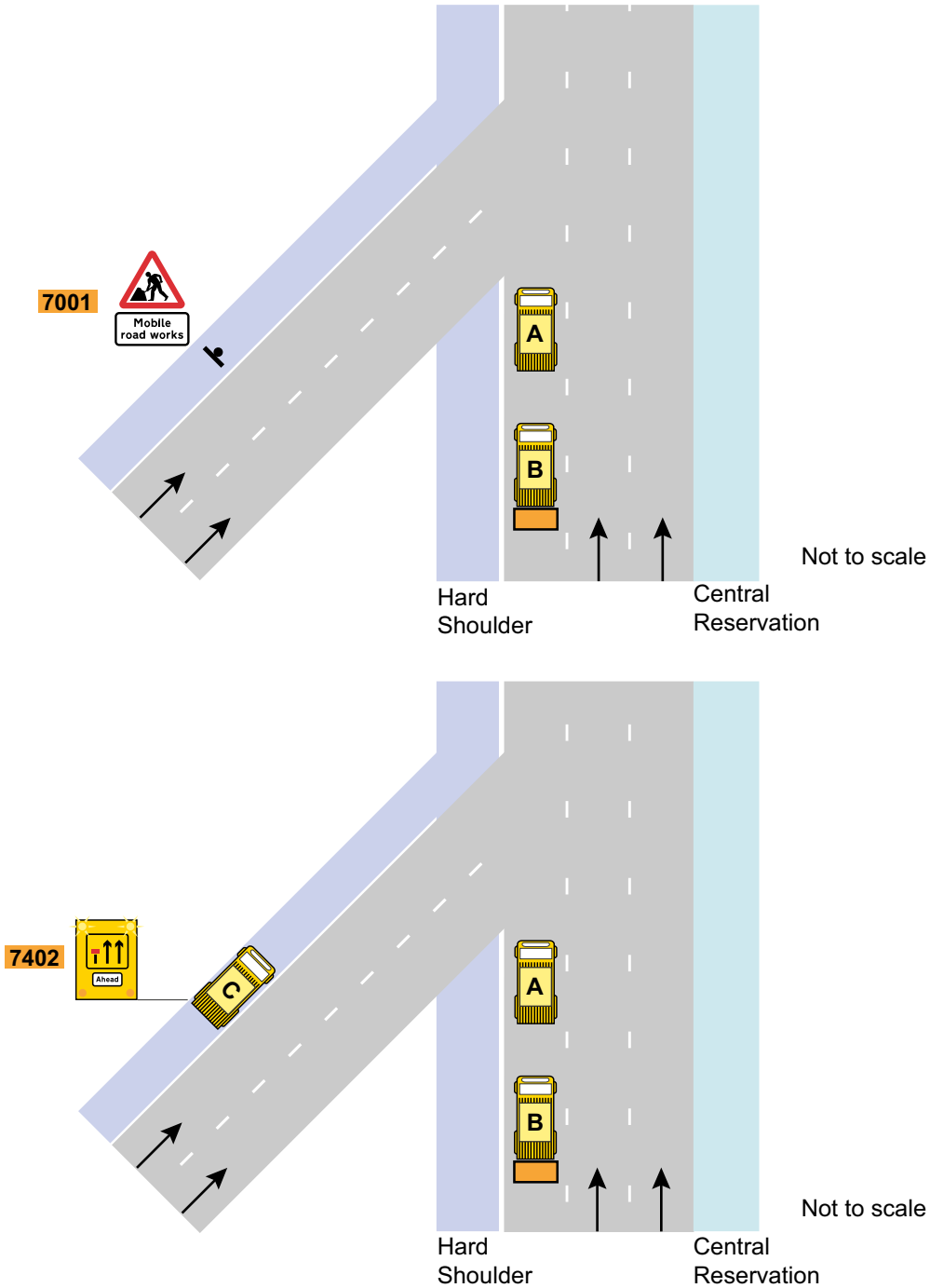
Plan MLC7: Mobile Lane Closure, working through junctions – slip road signing options

10.18.23. Either:

- a static ‘road works’ sign to diagram 7001 (S13-2-9) in combination with a ‘Mobile road works’ plate, or.
- a mobile sign to diagram 7402 (S13-6-9) displaying an ‘Ahead’ plate should be displayed on the slip road just prior to the arrival of the convoy. This should be removed after all the advance signing vehicles have passed the slip road.

10.18.24. Alternatively, consideration should be given to the need for partial or complete closure of the slip road using either static signing or police/traffic officer assistance to improve safety and flow of traffic during the MLC operation.

Plan MLC7 Mobile Lane Closure, working through junctions; slip road signing options



NOTE: For clarity, the three vehicle or trailer-mounted advance signs have been omitted from these plans.

11 MOBILE CARRIAGEWAY CLOSURES

11.1 Background

11.1.1. Consideration should be given in the early stages of planning to the use of an approved Mobile Carriageway Closure technique to support the safe installation, maintenance, and removal of TTM operations. For trunk roads (and relevant roads in Northern Ireland) reference may be made the enhanced MCC procedure in Appendix A of GG 117 'The design and implementation of temporary traffic management'. The enhanced MCC procedure uses technology, such as incursion warning systems, to enable a subset of both control measures and the recommended number of vehicles to provide the same level of road worker and road user safety. Most MCC signs, including the enhanced MCC signs, require authorisation; contractors will need to check with the relevant authority if one is in place when considering the implementation of an MCC.

11.1.2. Some TTM and maintenance activities on high-speed dual carriageway roads require the carriageway to be clear of traffic to be conducted safely. A common example is a minor reconfiguration of a TTM layout during major road works. An approved mobile carriageway closure technique may be used to support this and other TTM installation, maintenance, and removal activities. Mobile carriageway closure techniques should be considered for TTM operations early at the planning stage.

11.1.3. Mobile carriageway closure techniques are only intended for planned TTM operations. They are not intended to be used in emergency situations to protect the scene of an incident, but they may be used if the resources needed are already on site.

11.1.4. On wider carriageways the mobile carriageway closure technique can be used to set up and remove offside traffic signs and cones. This avoids the need for personnel to cross live traffic lanes.

11.2 Definitions

11.2.1. The following terms are used throughout this section.

'Access point' An area that allows entrance to, or exit from the carriageway (e.g. a junction entry slip road or the access from a service area).

'Advance warning vehicle' A vehicle equipped with a queue warning sign (either directly or on an attached trailer) which is positioned on the hard shoulder or verge.

'Assembly point' An area off the main carriageway where vehicles involved in carrying out the closure will assemble prior to beginning the closure.

'Closure control vehicle' The closure vehicle driven by the person responsible for the manoeuvres of the closure vehicles.

'Control Centre' The Police or authority centre responsible for monitoring traffic and the setting of matrix and VMS signs for the closure.

'Closure vehicle' A vehicle which operates alongside other closure vehicles to form the carriageway closure. They are equipped with impact protection and closure vehicle signing.

'Closure start point' The point on the carriageway where the closure vehicles start manoeuvring across the carriageway to travel line abreast, prior to slowing down.

‘Hard shoulder vehicle’ A closure vehicle that travels adjacent to the other closure vehicles on the hard shoulder. It is only used where a hard shoulder is present.

‘Mobile carriageway closure’ The temporary closure of a carriageway created by a number of closure vehicles, travelling at low speed in line abreast across the carriageway.

‘Monitor vehicle’ The vehicle that travels ahead of the closure to monitor and mark the boundary of the traffic-free zone in front of the closure. Its driver also identifies and reports to the supervisor any stationary vehicles within the traffic-free zone.

‘Supervisor’ The person who is responsible on site for the co-ordination of the entire closure operation. They are usually situated in the closure control vehicle.

‘Traffic-free zone’ The section of carriageway ahead of the closure that is clear of traffic.

‘Working area’ The area of a carriageway in which works activities take place.

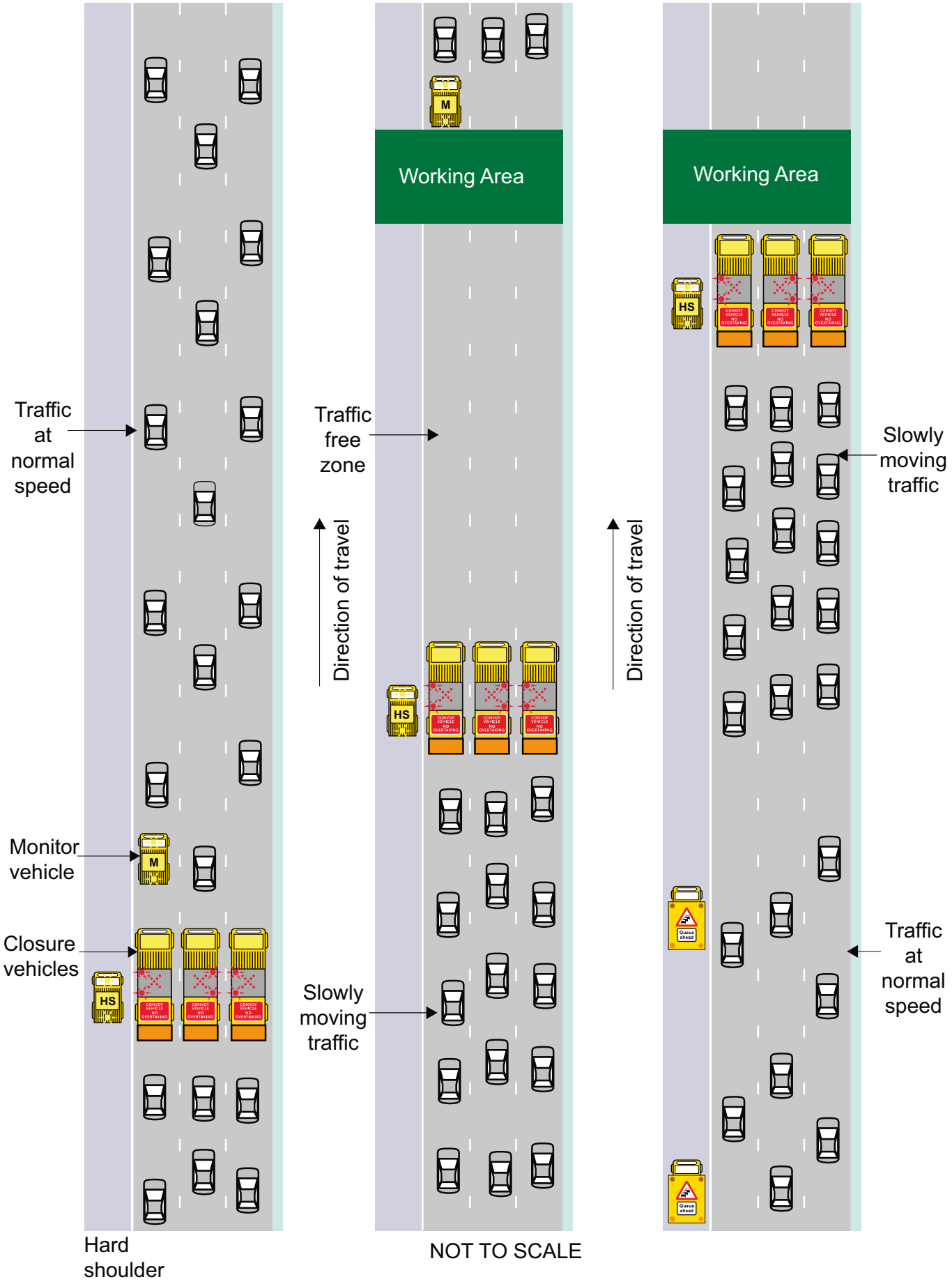
‘Working window’ The time during which the working area is free from non-works traffic.

11.3 Principles of mobile carriageway closures

11.3.1. A mobile carriageway closure is formed by a group of closure vehicles travelling along the carriageway. Usually, one closure vehicle per lane is used. Starting in free flow traffic conditions, the closure vehicles manoeuvre to align laterally along the carriageway (**Plan MCC1a**) then gradually slow to a target speed (between 20 mph to 30 mph). Since traffic cannot pass, a speed differential between traffic on either side of the closure is formed. This speed differential creates a moving traffic free zone which creates a period of time that works can be carried out in the absence of passing traffic (i.e. a working window). Work can commence when all traffic downstream of the closure passes the proposed working area (**Plan MCC1b**).

11.3.2. All work must have ceased and the carriageway must be completely clear for passage of traffic by the time the closure vehicles have reached the working area (**Plan MCC1c**). When the closure vehicles have passed the working area, they resume normal speed and move to the left-hand lane of the carriageway to allow traffic to pass. The operation is then complete

Plan MCC1 Principles of the Mobile Carriageway Closure technique (a)(b)(c)



11.4 Planning

11.4.1. The design process starts with identifying the location of the works area and the duration of time needed to complete the works activity. The working window should comprise of the time required to complete the task plus 2 minutes. The working window should usually not exceed seven minutes in total.

11.4.2. The distance between the working area and the closure start point must be selected based on the required working window and will depend on the closure speed. **Table 11.1** shows distances for different working windows and closure speeds of 20 and 30 mph. This assumes that traffic downstream of the closure vehicles are travelling at a minimum speed of 50 mph.

Table 11.1 Closure start point

Duration of working window required (minutes)	**Closure start point – upstream of the works zone (km)***	
	Closure speed	
	20 mph	30 mph
3	4.7	8.0
4	5.6	10.1
5	6.5	12.1
6	7.4	14.1
7	8.3	16.1

*Includes an allowance of 2 km for the closure vehicles to move from the nearside lane into position across the carriageway.

11.4.3. The presence of any entry slip roads or lane gain/drops on the length of carriageway between the works area and closure start point given by **Table 11.1**. should then be identified.

11.4.4. An assessment should be made in the design process of the likely queues arising from the operations. **Tables 11.2** and **11.3** gives estimated queue lengths at different working windows and flow rates, for closure speeds of 20 mph and 30 mph respectively. Mobile Carriageway Closures should be scheduled to take place during moderate traffic flows where high approach speeds are less likely. In general, they should not be carried out if the traffic flows exceed 1200 veh/hr per lane.

Table 11.2 Queue length when closure reaches works – closure speed: 20 mph

Demand flow (veh/hr for each lane open through the works)	**Queue length (km)**				
	Working window (minutes)				
	3	4	5	6	7
50	0.1	0.1	0.1	0.1	0.1
100	0.1	0.2	0.2	0.2	0.3
200	0.3	0.3	0.4	0.5	0.6
300	0.4	0.5	0.6	0.8	0.9
600	0.8	1.0	1.3	1.6	1.8
900	1.2	1.6	2.1	2.5	2.9
1200	1.7	2.3	2.9	3.5	4.1

Table 11.3 Queue length when closure reaches works – closure speed: 30 mph

Demand flow (veh/hr for each lane open through the works)	Queue length (km)				
	Working window (minutes)				
	3	4	5	6	7
50	0.1	0.1	0.2	0.2	0.2
100	0.2	0.2	0.3	0.4	0.4
200	0.4	0.5	0.6	0.7	0.9
300	0.6	0.8	0.9	1.1	1.3
600	1.2	1.6	2.0	2.4	2.7
900	1.8	2.5	3.1	3.7	4.3
1200	2.6	3.5	4.3	5.2	6.1

11.4.5. **Tables 11.2** and **11.3** show that queues are unlikely to extend past the closure start point. Appropriate advance signing using both permanent and temporary signs should be used to warn approaching traffic of the queue.

11.4.6. A closure speed of 20 mph allows for the closure start point to be closer to the works area and also reduces the length of the traffic queue compared to a 30 mph closure speed. However, a 20 mph closure speed means that vehicles approaching the back of the queue have to brake more sharply.

11.4.7. After identifying the closure start point, the assembly point for the closure vehicles and the access point to join the carriageway should then be identified.

11.4.8. The equipment and vehicles required should then be determined. This comprises of:

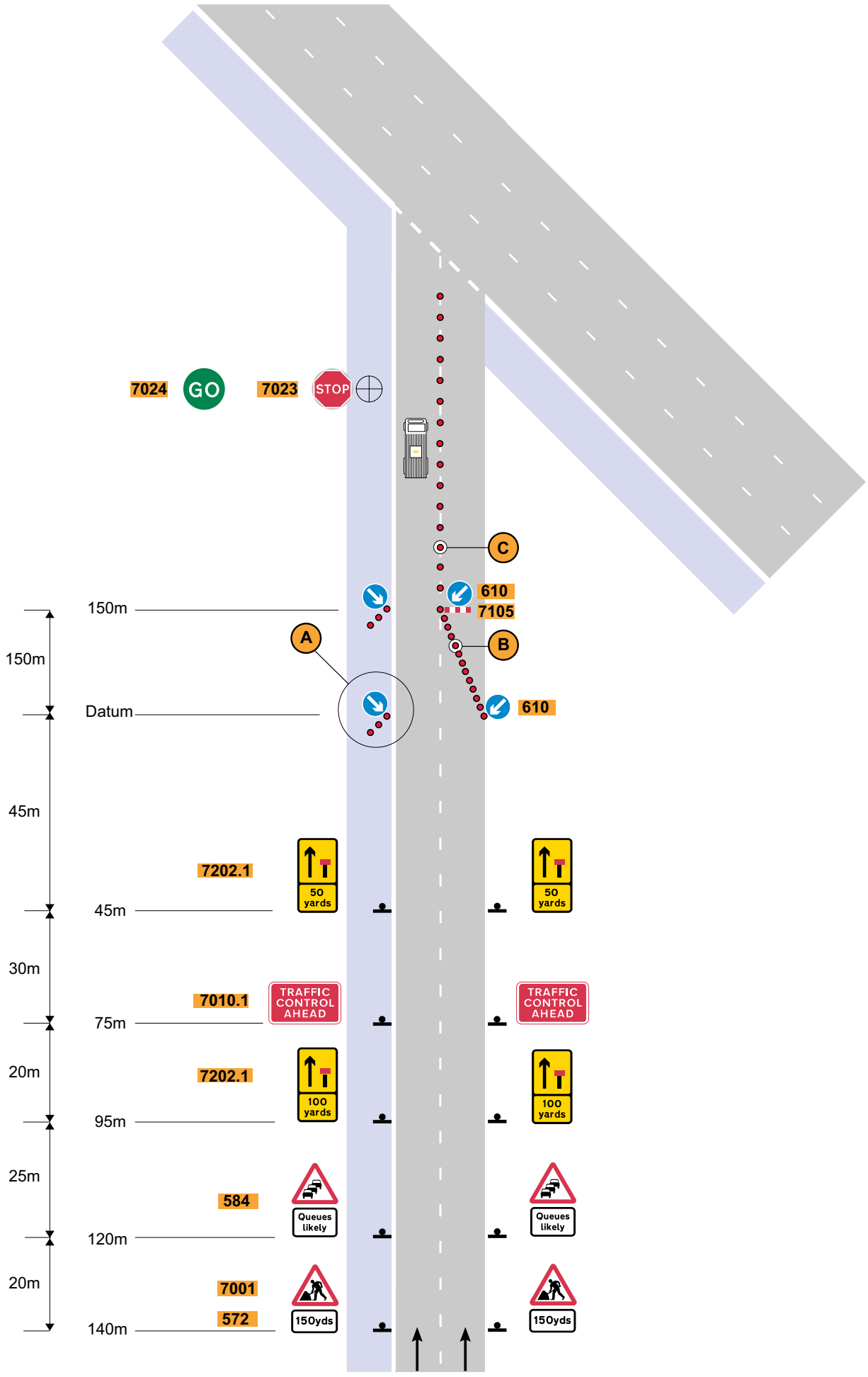
- usually one closure vehicle per lane;
- a hard shoulder vehicle, if required;
- a monitor vehicle;
- two advance warning vehicles.
- the signing equipment and/or vehicles, as required, to temporarily close any access points.

11.5 Closure of access junctions

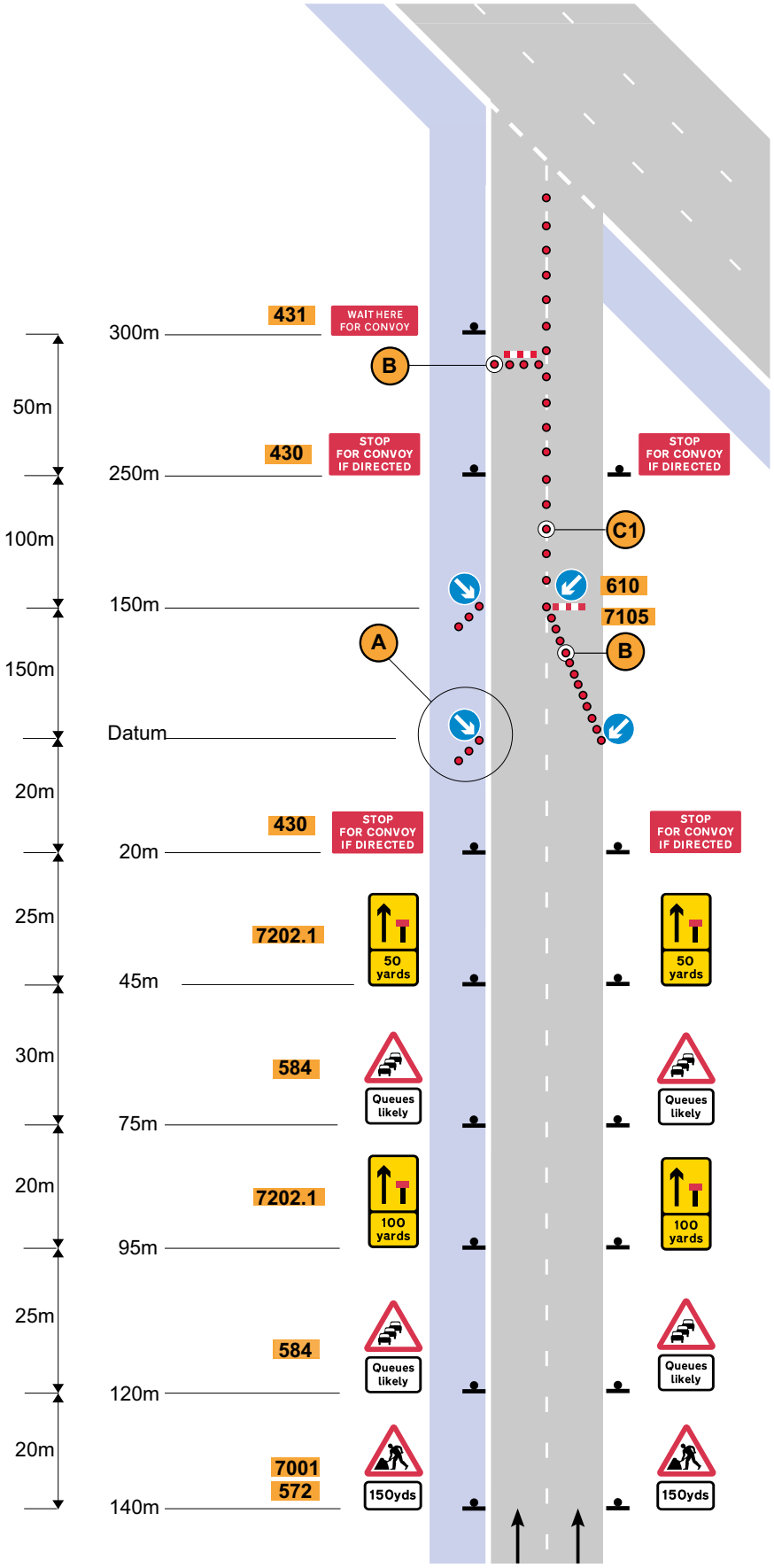
11.5.1. Traffic access points between the closure start point and the works area should be temporarily closed when the closure convoy passes to prevent traffic from entering the traffic free zone. The slip road should be closed just before the monitor vehicle passes it and should only be reopened when the closure vehicles have passed it. A Traffic Order may be required for the slip road closure.

11.5.2. The three possible slip road closure options are shown in **Plans MCC2**, **MCC3**, and **MCC4**. Keys to the plan are given in **Tables A1.4** and **A1.5** of **Appendix A1**.

Plan MCC2 Mobile Carriageway Closure, closure of the downstream end of the access slip road using a works vehicle

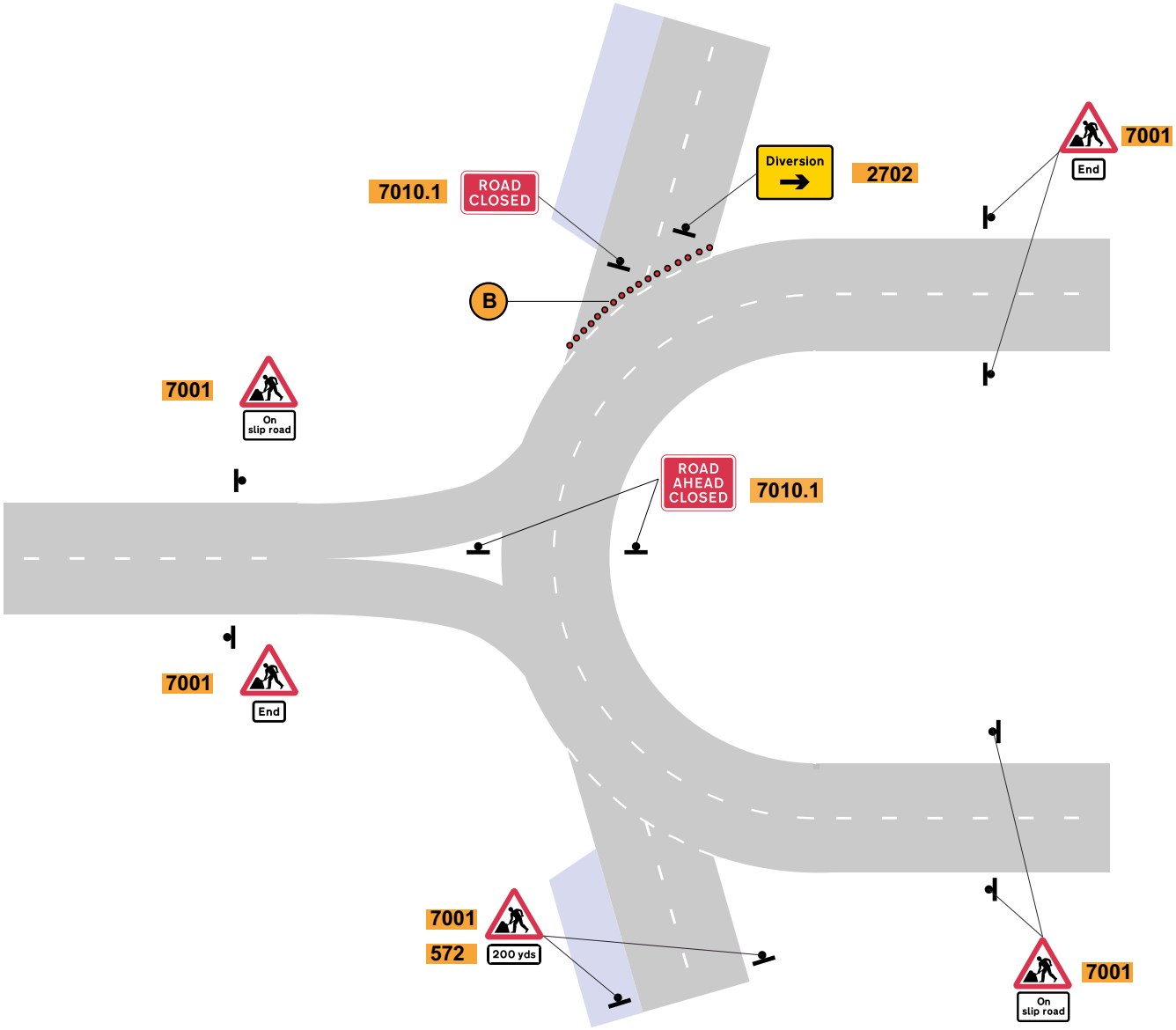


Plan MCC3 Mobile Carriageway Closure, closure of the downstream end of the access slip road not using a works vehicle



NOTE: When it is to be closed temporarily, cones are placed across the slip road and a ‘lane closed’ barrier to diagram 7105 (S13-6-8) is placed behind the cones.

Plan MCC4 Mobile Carriageway Closure, closure of the upstream end of the access slip road – example of traffic management



NOTE: 'ROAD CLOSED' sign to working drawing 7010.1 (S13-9) should be located so that drivers can see that it is the slip road ahead and not the roundabout that is closed.

11.5.3. The decision on which option to use will depend on:

- the anticipated traffic flow on the slip road;
- the length of the slip road;
- the topography and sight lines at the junction (e.g. if the sight lines are poor then closing the slip road at its entry may be preferable).
- the length, quality and signing of the diversion route should the slip road be closed.

11.5.4. The most usual option is the closure of the downstream end of the access slip road (the end closest to the main carriageway) using a works vehicle (**Plan MCC2**). Requirements for the works vehicle are given in **Section 11.8**.

11.5.5. Closure of the downstream end of the access slip road not using a works vehicle (**Plan MCC3**) involves personnel operating on the carriageway. As such, it should only be used when traffic flows on the slip road are very low and the risk assessment identifies it as the most appropriate.

11.5.6. When the slip road is being closed at the downstream end (**Plan MCC2** or **MCC3**) during the hours of darkness, the area in the vicinity of the actual closure should be well illuminated. Faces of the 'STOP -WORKS' or 'STOP FOR CONVOY IF DIRECTED' and 'WAIT HERE FOR CONVOY' signs and the surrounding areas should also be well illuminated. Temporary lighting will be required if the slip road is unlit or existing lighting does not fulfil the above requirements.

11.5.7. When closing traffic signal-controlled junctions, the signal controller may manually set the signals to all-red on the arms approaching the slip road. If this all-red period is likely to be prolonged (e.g. in excess of four minutes) then additional warning signs advising of this should be considered.

11.5.8. If the slip road is being closed at its downstream end (**Plan MCC2** or **MCC3**), high traffic flows may cause congestion on the slip road. If this is the case, additional signing will need to be provided on the approach roads to the junction.

11.5.9. When the slip road is closed at its entry (**Plan MCC4**), a suitable diversion route should be signed. It may be appropriate to divert traffic onto to the opposing carriageway so that traffic can join the affected carriageway at the previous junction.

11.5.10. Remotely operated signs may be considered for all options to minimise the period that the slip road signs are displayed.

11.6 Roads without a hard shoulder

11.6.1. Guidance given on the Mobile Carriageway Closure technique may also be used on carriageways without a hard shoulder. The following guidance should be considered where a hard shoulder is not present:

- It may not be possible to locate vehicle-mounted queue warning signs off the carriageway at convenient locations. In this case, appropriate static queue warning signing should be used. Prior to the operation, the 'traffic queues likely on road ahead' sign to diagram 584 (S2-2-50) with plate 'Queues likely' should be placed alternating on the nearside and offside of the carriageway. They should be placed at 500 m intervals from the point where it is planned to first establish the closure up to the start of the works area.
- The monitor vehicle should remain in a safe location off the carriageway while the traffic counts are being taken prior to the closure.
- Guidance referring to the use of a hard shoulder vehicle does not apply.

11.7 Signing

Vehicle mounted carriageway closure signs

11.7.1. Closure vehicles in live traffic lanes should be able to display a red cross with red lanterns flashing with equivalent meaning to diagram 6031.1 (S15-2-14) and an amber light arrow in accordance with the upper portion of the sign described in **Section 10.8**. This arrangement (shown in **Figure 11.1**) requires the appropriate signs authorisation.

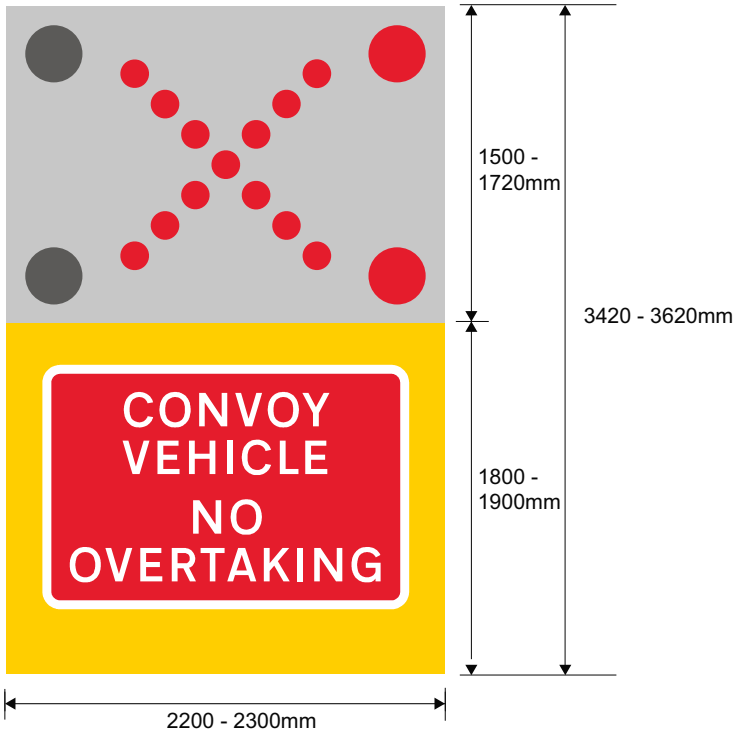


Figure 11.1 Closure vehicle sign

11.7.2. The four corner red lamps must flash in alternate vertical pairs as per the authorisation.

11.7.3. The red cross on the upper panel must be illuminated by a steady light. It may be composed of individual lamps or take the form of an LED panel. Whichever option is used, the form of the red cross on adjacent closure vehicles should be the same.

11.7.4. The lamp layout shown in **Figure 11.1** are indicative, for details of the precise number and layout of lamps refer to the relevant special signs authorisation.

11.7.5. The lower panel should show a 'CONVOY VEHICLE NO OVERTAKING' sign similar to diagram 7029 (S13-6-36). The lower panel should be reflectorised using the same material as the sign to diagram 7403 (S13-6-10) in accordance with the relevant special signs authorisation. A means of obscuring the sign remotely from the driver's cab should be fitted.

11.7.6. Alternatively, a VMS sign may be installed for the lower panel which provides more flexibility for signing. However, for this application the lower panel VMS sign should display the same 'CONVOY VEHICLE NO OVERTAKING' legend.

Slip road closure/signing

11.7.7. Comprehensive advance signing is essential to facilitate the temporary closure of entry slip roads and is required regardless of whether the slip road is closed at its downstream end (**Plan MCC2** or **MCC3**) or at its entry (**Plan MCC4**). See also **Section 11.5**.

11.7.8. When **Plan MCC2** is used, the manually operated 'STOP-WORKS' sign to diagram 7031 (S14-2-65) should be 540 mm in diameter. The manner in which this sign is used is described in **Section 11.18**.

11.7.9. The works vehicle may be fitted with a TMA if a risk assessment identifies it is needed. If a TMA is fitted, the sign used on this vehicle is shown in **Figure 11.2** below. This sign should be used in accordance with **11.7.12** to **11.7.14** and requires the appropriate signs authorisation.

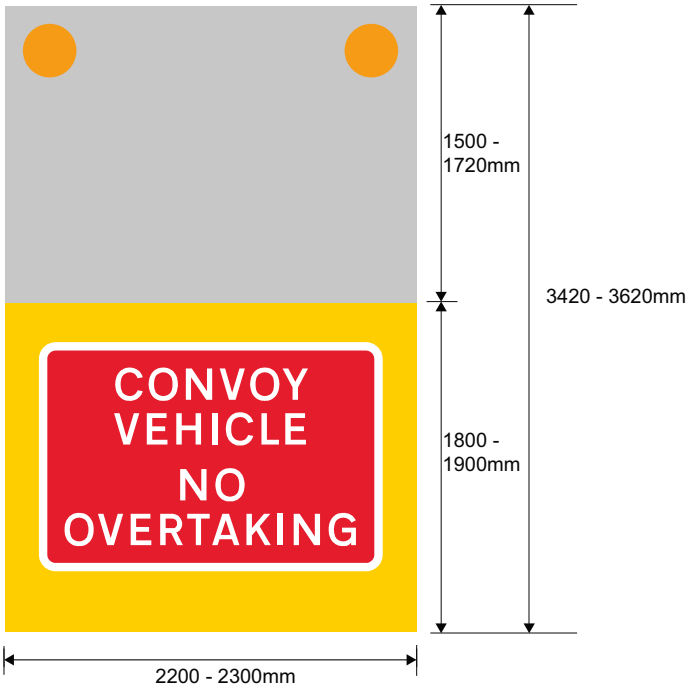


Figure 11.2 Sign used with a slip road closure vehicle when it is fitted with a truck mounted attenuator (TMA)

11.7.10. The red cross on the upper panel must be illuminated by a steady light. It may be composed of individual lamps or take the form of a VMS sign. Whichever option is used, the form of the red cross on all the closure vehicles should be the same.

11.7.11. The lower panel should show a 'CONVOY VEHICLE NO OVERTAKING' sign similar to diagram 7029 (S13-6-36). The lower panel should be reflectorised using the same material as the sign to diagram 7403 (S13-6-10) in accordance with the relevant special signs authorisation. A means of obscuring the sign remotely from the driver's cab should be fitted.

Warning of queuing traffic

11.7.12. Road users to the rear of the convoy should be well informed of slow-moving traffic ahead. Existing permanent variable message signs (VMS) and matrix signals in the central reservation should be fully utilised if available to provide advance warning. The location of these signs should be determined early in the planning stage of the closure. Arrangements should be made with the appropriate control centre to request full use of this signing.

11.7.13. The speed limit should be set to 50 mph and displayed using gantry-mounted signals to diagram 6021 (S15-2-11) and post-mounted signals to diagram 6022 (S15-2-12), see **Figure 11.3**. If possible, VMS signs should show the 'QUEUE SLOW DOWN' legend.

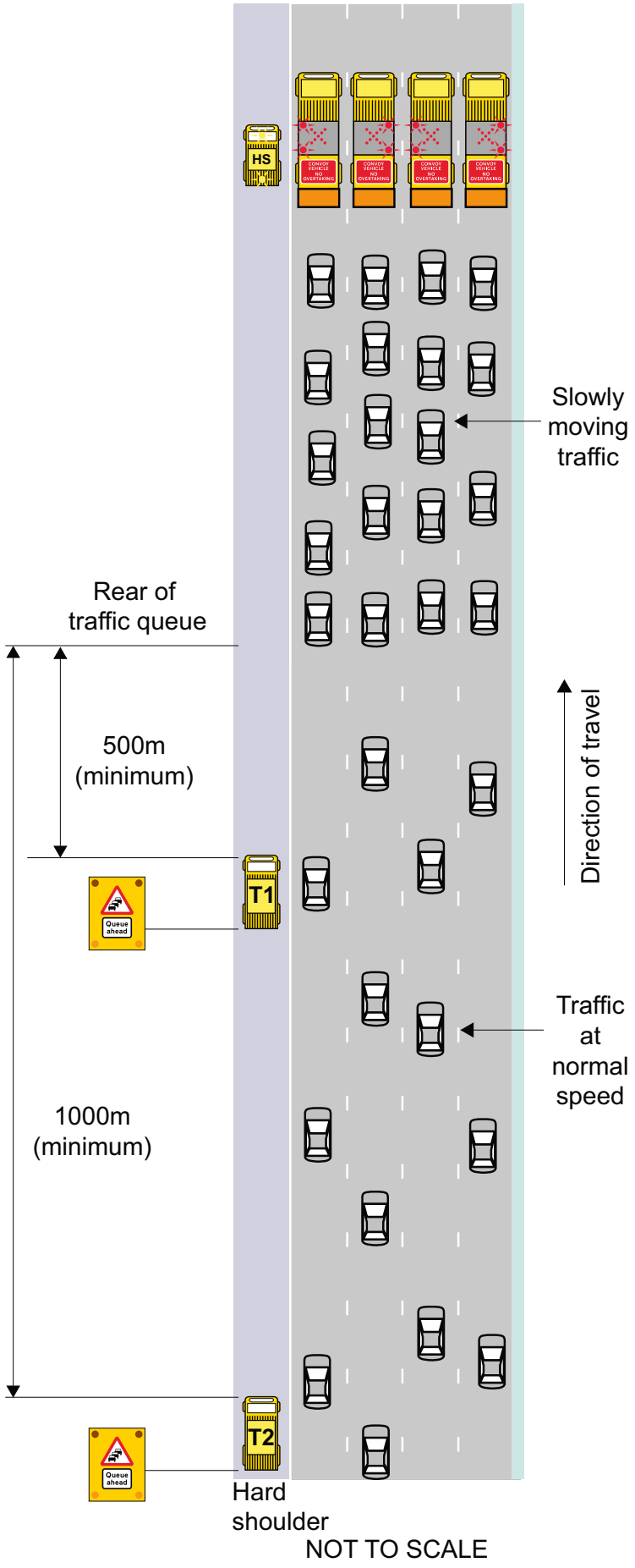


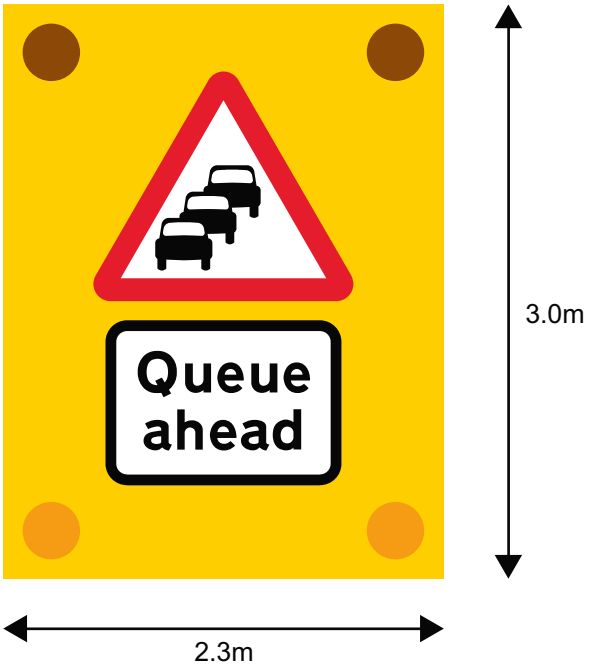
Figure 11.3 Examples signs to Diagram 6021 (S15-2-11) and 6022 (S15-2-12), gantry and post-mounted signals

11.7.14. At least two VMS signs should be used to warn upstream traffic of the presence of a queue. If VMS are not available, at least two vehicle-mounted signs warning of queues ahead should be positioned on the hard shoulder or verge as appropriate. However, these vehicle

mounted signs are not prescribed for use and will require authorisation by the Overseeing Organisation. See **Plan MCC5** and **Figure 11.4**.

Plan MCC5 Mobile Carriageway Closure, vehicle-mounted queue warning signing





Sign Sizes:
Upper: 1500mm
Lower: “x” height 150mm

Figure 11.4 Vehicle-mounted queue warning sign

NOTES:

This sign requires authorisation by the Secretary of State.

A sign 2.5 m x 2.5 m may also be used.

11.8 Vehicles

11.8.1. This section addresses requirements for vehicles used in the Mobile Carriageway Closure technique. Information relating to general works vehicles can be found in **Section 14**.

11.8.2. Closure vehicles that operate in live traffic lanes should be to the same specification as an IPV in **Section 14.6** and **14.9** but signing is required to be in accordance with the relevant parts of **Section 11.7**.

11.8.3. This vehicle should have the following features:

- a conspicuous colour (yellow is recommended);
- a roof-mounted amber light bar complying with **Section 14.8**.
- a sign to diagram 7404 (S13-6-12; **Figure 11.5**) ‘HIGHWAY MAINTENANCE’ (x-height: 50 mm, character height: 70 mm).



Figure 11.5 Diagram 7404 (S13-6-12) HIGHWAY MAINTENANCE

Hard shoulder vehicle

11.8.4. This vehicle should have the following features:

- a 3 tonne minimum on-the-road weight;

- a van-type vehicle with full height rear retroreflective chevron markings complying with **Section 14.7**. A pickup-type vehicle is not suitable. If a vehicle with these markings cannot be used, a vehicle to the same specification as the closure vehicle should be used **10.7.2**);
- a conspicuous colour (yellow is recommended);
- a roof-mounted amber light bar with a minimum of two independent light sources, towards the rear of the vehicle complying with **Section 14.8**.
- a sign to diagram 7404 (S13-6-12) 'HIGHWAY MAINTENANCE' (x-height: 100 mm, character height: 140 mm);
- In Northern Ireland, the hard shoulder vehicle must be to the same specification as the lane closure vehicles (see **11.8.5**).

Slip road closure vehicle

11.8.5. There are two options for slip road closure vehicles. The choice of which vehicle to use will depend on the nature of the slip road and the outcome of a completed risk assessment **11.5.3**). The options are:

- Option A: The vehicle should have the same features as the hard shoulder vehicle **11.8.4**), or.
- Option B: The vehicle should have the same features as an IPV (see **Sections 14.6** and **14.9**) except that signing needs to be in accordance with **Figure 11.2**.

Advance warning vehicle

11.8.6. This vehicle should have the following features:

- a conspicuous colour (yellow is recommended);
- a roof-mounted amber light bar with a minimum of two independent light sources, towards the front of the vehicle, complying with **Section 14.8**.
- a sign to diagram 7404 (S13-6-12) 'HIGHWAY MAINTENANCE' (x-height: 50 mm, character height: 70 mm).

11.9 Communications

11.9.1. A Mobile Carriageway Closure requires good communication to operate safely and efficiently. Clear communication should be maintained between:

- all the vehicles forming the convoy;
- the monitor vehicle;
- the vehicles and personnel forming the closure at each access slip road.
- the person responsible for activities in the working area.

11.9.2. A dedicated radio channel should be provided for the closure. The radio equipment should be checked along the length of the planned closure. Any issues with reception (e.g. due to the site topography) should be rectified before starting the operation, such as by sourcing better equipment.

11.9.3. The supervisor in the closure control vehicle should also have a clear communication link with the appropriate control offices. Key personnel should carry a mobile phone for dealing with communications failures, see also **Section 11.21**.

11.10 Training

11.10.1. All personnel involved in a Mobile Carriageway Closure must have the appropriate competence based training i.e. Sector Scheme 12A, 12B and 12C, certification as appropriate

(see also GG 117 ‘The design and implementation of temporary traffic management and road works’), see **Section 15.1**.

11.10.2. All drivers for closures on motorways and trunk roads in England are required to have the appropriate training certification i.e. NHSS 12C training. The supervisor of the operation should be qualified i.e. NHSS 12C Supervisor.

11.11 Operational issues prior to the operation

11.11.1. The police and the authority should be informed well in advance by the contractor of the nature and location of the operation.

11.11.2. Before starting, the supervisor should confirm readiness to commence the closure with the personnel:

- at the control offices;
- at the working area;
- in advance warning vehicles.
- at downstream access points, if applicable

11.12 Establishing a closure

11.12.1. The closure vehicles, advance warning vehicles and monitor vehicle should gather at the assembly point for driver briefing and final vehicle and sign checks to be carried out. Vehicles should then travel to the predetermined access point to join the carriageway ahead of the closure start point.

11.12.2. The advance warning vehicles should then move into position 500 m and 1000 m upstream of the closure start point. At the same time, the monitor vehicle should move to the pre-agreed location, which should be within sight of a matrix or VMS signal to confirm that they are operating.

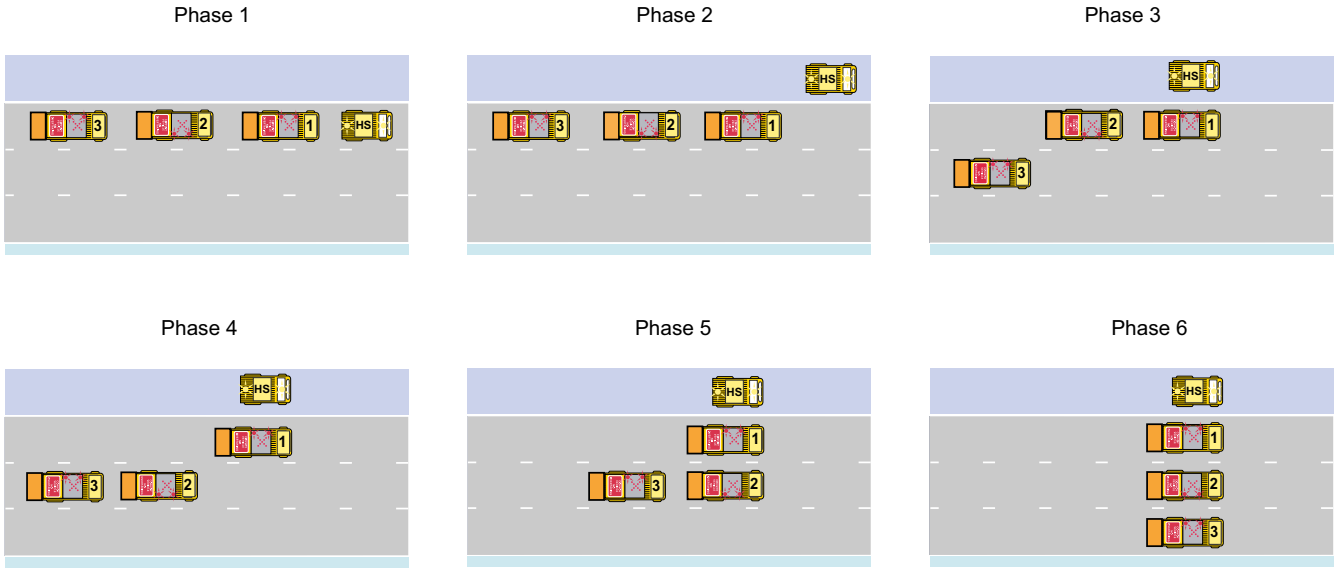
11.12.3. The supervisor should then request a traffic count be conducted by the monitor vehicle personnel. The operation should not take place if the flow at the works site exceeds 1200 veh/hr (60 vehicles in 3 minutes) per lane left open.

11.12.4. The supervisor should then consult with the control office to set the appropriate VMS signs/signals and check for incidents that might conflict with the planned operation.

11.12.5. Before the closure proceeds further, the personnel in the monitor vehicle should confirm that the matrix signals and/ or VMS signals have been activated.

11.12.6. **Plan MCC6** shows the sequence for establishing the closure. The phases referenced in the following paragraphs refer to this plan.

Plan MCC6 Sequence for establishing the Mobile Carriageway Closure



11.12.7. When the supervisor is satisfied that the operation can continue, they should inform all closure vehicles to proceed. All closure vehicles should lower the truck mounted attenuator (TMA), if not done so already. The closure vehicles and the hard shoulder vehicle should then join the nearside lane behind one another (Phase 1).

11.12.8. The advance warning vehicles should activate the flashing amber lanterns on their signs as soon as the closure vehicles passes them.

11.12.9. When the closure vehicles are ready to set out the closure (Phase 2), the supervisor should instruct each closure vehicle to uncover the 'CONVOY VEHICLE NO OVERTAKING' sign and switch on the red cross and flashing red warning lights.

11.12.10. The supervisor should then instruct the closure vehicles to complete the sequence of manoeuvres shown in Phases 2-6. The hard shoulder vehicle should move over to the hard shoulder and the other closure vehicles move to a line abreast formation.

11.12.11. The closure control vehicle should signal to all closure vehicles to gradually slow to the agreed closure speed (20 or 30 mph).

11.12.12. The monitor vehicle should travel in line with the last of the traffic downstream of the closure.

11.12.13. Advance warning vehicle T1 (see **Plan MCC5**) should maintain a 500 m distance behind the rear of the forming queue. Vehicle T2 should maintain a 500 m separation distance with vehicle T1.

11.13 Speed of the closure

11.13.1. The monitor vehicle should continually monitor the speed of vehicles downstream of the closure as their speed determines the duration of the working window. The supervisor should be informed if the traffic speed downstream falls below 50 mph. In this case the supervisor may reduce the closure speed to achieve the desired closure window, however it must not fall below 20 mph. Changes in downstream traffic speed may also create an emergency situation **11.14.2**).

11.13.2. The driver of the monitor vehicle should inform the supervisor when they have passed the proposed working area (**Plan MCC1b**). The supervisor should then relay this to the person responsible for the activities in the working area and inform them that work can now commence in a traffic free area.

11.14 Working window

11.14.1. All work on the carriageway must have ceased and the carriageway been cleared for the passage of traffic before the closure vehicles reach the working area (**Plan MCC1c**).

11.14.2. An emergency situation is likely to be created if the highway remains obstructed past the available working window, in which case the convoy may have to stop. Emergency situations must immediately be reported to the police and the authority.

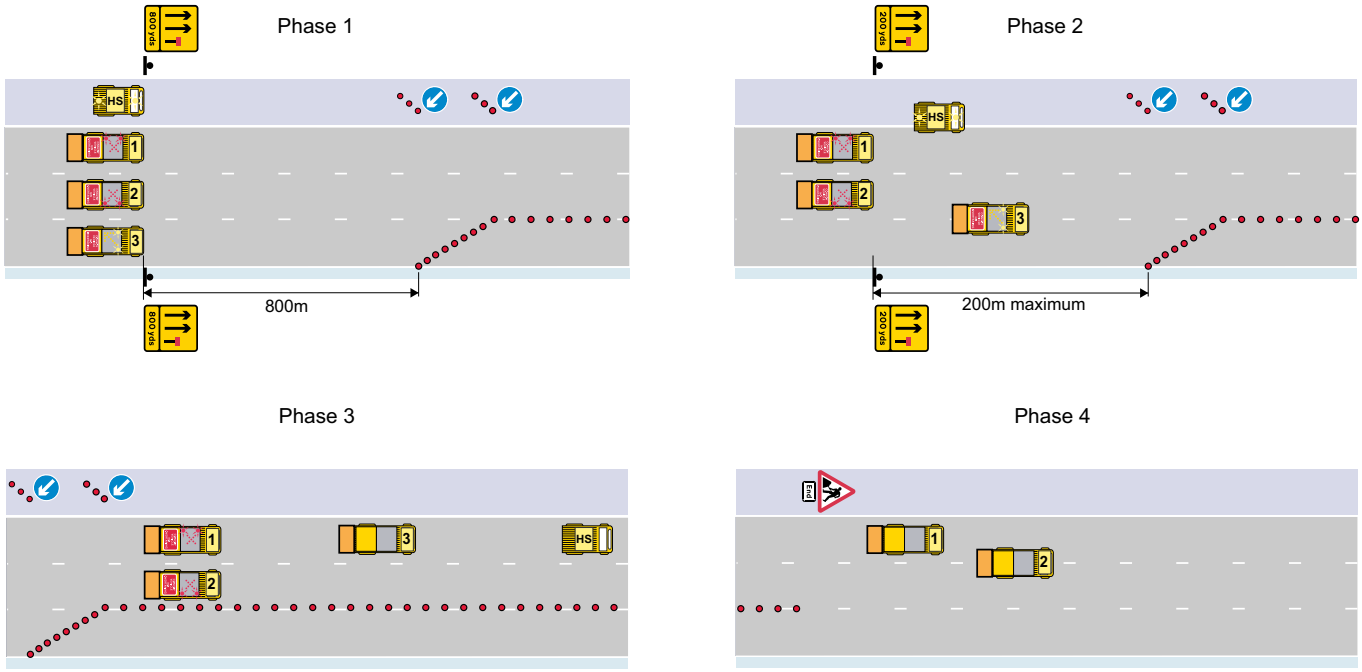
11.14.3. If the convoy has to stop, the following queue may grow rapidly, As soon as the closure vehicles stop, the advance warning vehicles should stop to warn traffic approaching the end of the queue. VMS and matrix signs should also be set in the same manner if available.

11.15 Removing the closure

11.15.1. If there are no lane closures, removal should be the reverse of the procedure detailed in **Section 11.12** used to establish the closure. With the exception that each closure vehicle will accelerate to normal road speed in turn and merge in front of the adjacent closure vehicle, i.e. the lane 3 vehicle will merge in from of the lane 2 vehicle.

11.15.2. Where an offside lane closure is installed, the Mobile Carriageway Closure should be removed according to **Plan MCC7**.

Plan MCC7 Sequence for removing the Mobile Carriageway Closure



The steps are as follows:

- the closure vehicle in the affected lane (vehicle 3 in **Plan MCC7**) should switch from the red cross sign to the flashing ‘keep left’ light arrow sign (Phase 1) when it is 800 m in advance of the closure;
- when vehicle 3 reaches 200 m in advance of the closure, it should then accelerate and then merge in front of vehicle 2 giving following traffic a clear view of the approaching lane closure. if possible, an impact protection vehicle displaying a ‘keep left’ light arrow sign should be positioned within the works area to reinforce the presence of the lane closure;
- the hard shoulder vehicle rejoins the main carriageway in front of Vehicle 1 approximately 200 m before hard shoulder signing commences;

- the closure vehicles increase their speed to the limit applicable within the work site but maintain the closure through the works area (Phase 3), then
- when the closure vehicles have passed the working area, they resume normal speed and move to the left-hand lane of the carriageway to allow traffic to pass (Phase 4). The operation is then complete, and the closure vehicles may return to their rendezvous point.

11.15.3. Note that for a nearside closure, this operation is reversed with vehicle 1 merging, etc.

11.16 Role of the monitor vehicle

11.16.1. The driver of the monitor vehicle is responsible for:

- checking for and identifying stationary vehicles on the hard shoulder in the path of the convoy and communicating any instances to the supervisor who will then inform the person responsible for activities in the works area.
- notifying the supervisor when the monitor vehicle passes the one mile advance sign of a junction or service area access that needs to be closed. The supervisor will then instruct the access slip to be closed and seek confirmation that the closure is complete.

11.17 Breach of the closure/passage of emergency vehicles

11.17.1. Emergency vehicles should be allowed to pass the closure via the hard shoulder or otherwise (if a hard shoulder is not available).

11.17.2. If the closure is breached by an emergency vehicle or other vehicles (e.g. a motorcycle squeezing through the closure vehicles) the supervisor should notify the person responsible for activities within the working area. A procedure should be in place for this notification, such as a klaxon and a pre-planned signal.

11.18 Junctions

11.18.1. Access points to the carriageway should be closed only as long as they are required to be to prevent unnecessary queuing on adjoining roads. The slip road should be reduced initially to a single lane using coning and signing. See **11.7.7** to **11.7.9**.

11.18.2. The principles of a junction closure are given in **Section 11.7**. The procedures for carrying out the temporary closure are given below, for the two methods of setting out the closure.

11.18.3. Closing a slip road using a works vehicle:

- The works vehicle should be located in the immediate vicinity of the slip road.
- When the request to close the slip road is made by the supervisor, the works vehicle should join the slip road and gradually slow down to create a lane reduction.
- An operative should display a ‘STOP -WORKS’ sign to diagram 7031 (S14-2-66).
- The works vehicle should stop at this sign to complete the closure.
- When the supervisor gives the signal to reopen the slip, the ‘STOP-WORKS’ sign should be removed after the works vehicle should pull off the carriageway, allowing traffic to pass, reopening the slip road.

11.18.4. Closing a slip road using coning and signing:

- When the request to close the slip road is made by the supervisor, and when it is safe to do so, operatives should place the cones and a ‘lane closed’ barrier to diagram 7105 (S13-6-8) across the traffic lane that has remained open (see **Plan MCC3**).

- When the supervisor gives the signal to reopen the slip, and when it is safe to do so, operatives should remove the cones and sign.

11.18.5. The driver of the monitor vehicle should confirm as it passes the slip road that it is securely closed. They should relay the status of the closure to the supervisor. If the slip road is not adequately closed, the operation should be aborted.

11.18.6. The slip road should be reopened when the closure convoy has passed the access allowing waiting traffic to merge with the traffic queueing on the carriageway.

11.19 Dealing with a lane drop/lane gain

11.19.1. The closure vehicle approaching a lane drop should merge in front of the adjacent closure vehicle in such a way that prevents traffic breaching the closure during the manoeuvre.

11.19.2. Two closure vehicles should travel in the same lane that is approaching a lane gain on the nearside or offside). At the lane gain, the leading closure vehicle should move out into the lane gain and proceed to travel in line with the closure convoy. The manoeuvre should be undertaken in such a way that prevents traffic breaching the closure.

11.20 Role of the control centre

11.20.1. The procedures used by control centres for dealing with operations including the Mobile Carriageway Closure technique should be in accordance with a framework of national guidance. Advice given in this section is intended to supplement this guidance.

11.20.2. The control centre should be given details of the planned closure including the procedure, its location, and the anticipated length. This should be provided at an early stage so that the control office can plan how to best support the operations with the use of available VMS and matrix signs.

11.20.3. Additionally, the supervisor may need to notify the relevant control centre immediately before the closure starts and then again immediately after the closure is removed. This is so that emergency services can avoid using this carriageway where possible or notify the emergency vehicles to pass the closure on the hard shoulder (see **11.1.2**) if the emergency services must use the affected carriageway.

11.20.4. Communications and procedures for emergency situations should be established between the control centre and the supervisor early in the planning stage.

11.20.5. Where the extent of the operation spans more than one control centre's area of responsibility, the communication links and procedures between the control centre and the vehicles involved in the operation should be established at an early stage of the planning process.

11.21 Communication failure

11.21.1. If a total communication failure occurs, the closure should not be aborted as this may introduce risks to personnel in the traffic-free zone. Instead, the closure should progress as intended until reaching the works site. If the highway is still obstructed at this time, the convoy should be stopped in accordance with **11.14.2**.

11.22 Other works/weather conditions

11.22.1. Planning should take into account the presence of other planned works on the affected carriageway and any diversion routes which may be impacted by the closure.

11.22.2. The forecast weather conditions should also be checked prior to starting the operation. The closure should not be carried out in slippery or low visibility conditions.

11.23 Use of the technique to set up temporary traffic management

11.23.1. The Mobile Carriageway Closure technique may be used on dual carriageways to support the installation of traffic management in the approach zone (see **Section 7.15**) and lane change zone (see **Section 7.16**) of a lane closure. The principles in **Section 11** apply (see **Plan MCC1**). Approach signs for the lane closure may be placed on the nearside and offside in the traffic-free zone after the monitor vehicle has passed but before the closure vehicles arrive. Works vehicles placing approach signing should either:

- be stationed on the hard shoulder in advance of the monitor vehicle, or.
- travel with the monitor vehicle and stop off at the sign locations.

11.23.2. The working window would be sufficient to allow the same works vehicle to set up both the 2 mile and the 1 mile advance sign. Two additional works vehicles are required for setting up the signs within the lane change zone. Sufficient personnel and works vehicles should be provided to set up the taper.

11.23.3. Careful pre-planning and assessment of the site circumstances and experience of the personnel should be undertaken to determine the actual number of vehicles and personnel required.

12.1 Single vehicle works

12.1.1. Single vehicle works are those which involve a vehicle either standing for a short-duration or operating at low speed in the carriageway where a MLC (see **Section 10**) is inappropriate and when risk is low. The works vehicle used must display a 'keep left/ right' sign to diagram 610 (S13-6-11; **Figure 12.1**) on the rear or front of the vehicle to show approaching drivers which side to pass. TSRGD 2016 (Schedule 13, General Directions 4, 6(3)) gives details on the use of signs attached to vehicles.



Figure 12.1 Diagram 610 (S13-6-11) Keep Right

12.1.2. Vehicle-mounted 'keep left/right' signs to diagram 610 (S13-6-11) must be covered when the vehicle is travelling to and from the site. They must never be pointed directly up or down. A suitable authorised light arrow may be used in place of the rear facing vehicle mounted 'keep left/right' sign.

12.1.3. Single vehicle works should not be carried out on dual carriageways where the national speed limit applies, except for works such as gritting, salting, and damping down of dust (see **Section 12.2**).

12.1.4. Single vehicle works should only be carried out on the nearside lane of a carriageway (see also **12.1.20** and **Figure 12.1**).

12.1.5. On roads where the speed limit is 40 mph or more, subject to a risk assessment, consideration should be given to fitting a truck mounted attenuator (TMA) to the working vehicle and/or any escort vehicles. TMA may be inappropriate on roads less than 5.5 m wide and with poor alignment, as they may create an additional hazard to road users.

12.1.6. On roads where the speed limit is 40 mph or more, the working vehicle will need to carry a sign to diagram 7403 (S13-6-10; **Figure 12.2**), or suitable authorised light arrow, on the rear. If an escort vehicle carrying a sign to diagram 7403 is provided, the sign on the works vehicle can be to either diagram 610 (S13-6-11) or 7403 (S13-6-10).

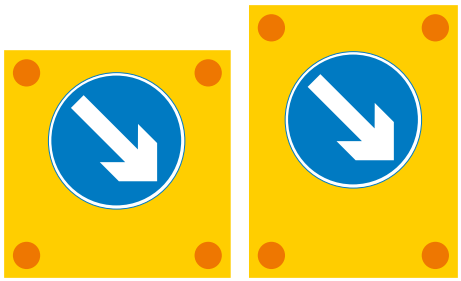


Figure 12.2 Diagram 7403 (S13-6-10) Other traffic keep to the right of vehicles carrying out mobile road works

12.1.7. On single carriageway roads the use of the sign to diagram 610 (S13-6-11), or suitable authorised light arrow, on the works vehicle may be preferable to a sign to diagram 7403

(S13-6-10) as this will help retain forward visibility past the works vehicle. The size of the sign to diagram 610 (S13-6-11) to be used is given in **Table A1.2** (**Appendix A1**).

12.1.8. A relevant authorised full light arrow sign (**Section 10.8**) may be used to replace the sign to diagram 7403 (S13-6-10) on either the escort or works vehicle. The light arrow aspect of the sign should not be used on two-way single carriageway roads, unless there is a specific authorised aspect for this use. Light arrow authorisations are on limited to each road authority and not all authorities have relevant authorisations. Contractors should check with the authority which, if any, lights arrows can be used on their network.

12.1.9. Based on a risk assessment, the works vehicle may also substitute its sign to diagram 610 (S13-6-11) or sign to diagram 7403 (S13-6-10) for a small light arrow sign. Small light arrows are generally authorised for use in place of diagram 7403 on roads with a permanent speed limit of 40 mph or lower. The authority may apply for special authorisation to use a small light arrow sign in place of diagram 7403 on roads with speed limits above 40 mph.

12.1.10. Advance warning to traffic in each direction on single carriageway roads should be provided by:

- a ‘road works ahead’ sign to diagram 7001 (S13-2-9; **Figure 12.3**) with an appropriate supplementary plate variant.



Figure 12.3 Diagram 7001 (S13-2-9) with plate Mobile road works

- a ‘road narrows ahead’ sign variant to diagram 517 (S2-2-14; **Figure 12.4**) with a ‘single file traffic’ supplementary plate



Figure 12.4 Diagram 517 (S2-2-14) Road narrows right with single file traffic plate

12.1.11. The distance between the signs should enable moving work to progress before the signs are moved and should not exceed 1 mile. Repeater signs to diagram 7001 (S13-2-9) may be required if the road alignment is poor.

12.1.12. Subject to a risk assessment, the supplementary plate ‘Mobile road works’ to the ‘road works ahead’ sign to diagram 7001 (S13-2-9) may be replaced to show the type of mobile

operation taking place. An optional ‘for’ and a distance may also be included as part of the supplementary plate variant e.g. ‘Hedge cutting for 1 mile’.

12.1.13. Single vehicle working may be used with or without traffic control by means of manually operated ‘STOP/GO’ signs, if:

- the system is operated on a two-lane single carriageway.
- when the two-way flow past the site is less than 1300 veh/hr.

12.1.14. Where ‘STOP/GO’ signs are used as traffic control:

- those involved with the operation should be equipped with two-way radios or other suitable communication methods.
- in daylight.
- when the forward visibility is less than 150 m, or.
- circumstances require traffic control.

12.1.15. **Plans SVW1** is the basic layout. It may be used if it is not considered necessary to use traffic control by means of manually operated ‘STOP/GO’ signs. This would be determined by a risk assessment.

12.1.16. When traffic control is used, the ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘Mobile road works’ should be repeated at approximately 400 m intervals. Additional signs may be required at junctions and to suit the carriageway alignment.

12.1.17. The systems illustrated in **Plans SVW1** and **SVW2** are only to be operated on two-lane single carriageways, and when the two-way flow past the site is less than 1300 veh/hr. The system shown in **Plan SVW2** is only to be operated in daylight.

12.1.18. Keys to all plans are given in **Tables A1.4** and **A1.5** of **Appendix A1**.

12.1.19. Providing the vehicle is adequately marked (see **Section 14.7**), advance warning signs may be unnecessary where:

- the road alignment is good, and congestion is unlikely to occur.
- on single carriageway roads, adequate remaining width for two-way traffic is available (see **Section 4.3**).

12.1.20. Works and/or signing vehicles should have their flashing amber warning beacons switched on and approach signing to the junction placed, when:

- working near junctions or roundabouts, where approaching vehicles are not able to see the rear-mounted signing, or.
- rear illumination is ineffective due to the angle of approach.

12.1.21. When it is necessary to work across junctions, a static ‘road works ahead’ sign to diagram 7001 (S13-2-9) should be displayed to traffic on the side road. Signs will not be required at minor junctions and accesses, providing there is good visibility for drivers emerging from the junction.

12.1.22. It may not be feasible to locate the advance vehicle mounted signs (see also **12.1.2**) where mobile works are carried out in the nearside or offside lane of an urban dual carriageway with a permanent speed limit of 40 mph or less. The requirements of **Section 10** may also be inappropriate. When traffic flows are less than those given in **Table 10.1**, advance warning should be given by:

- ‘road works ahead’ signs to diagram 7001 (S13-2-9), with a supplementary plate ‘Mobile road works’.
- ‘lane restriction’ signs to diagram 7202.1 (S13-6-13; **Figure 12.5**).

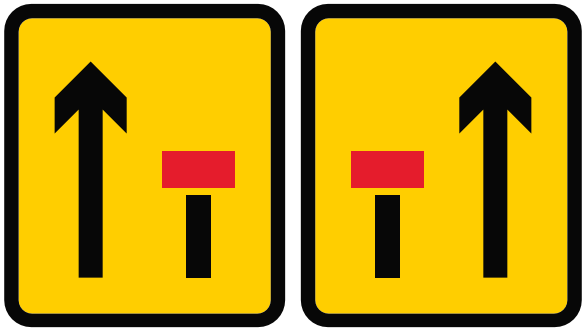


Figure 12.5 Diagram 7202.1 (S13-6-13) Information on lane availability ahead

Single vehicle works on single carriageway roads, basic layout

12.1.23. The following principles for single vehicle works on two-lane single carriageway roads, where the use of traffic control by the means of manually operated ‘STOP/GO’ signs is not considered necessary, are illustrated in **Plan SVW1**.

Two advance signs are required:

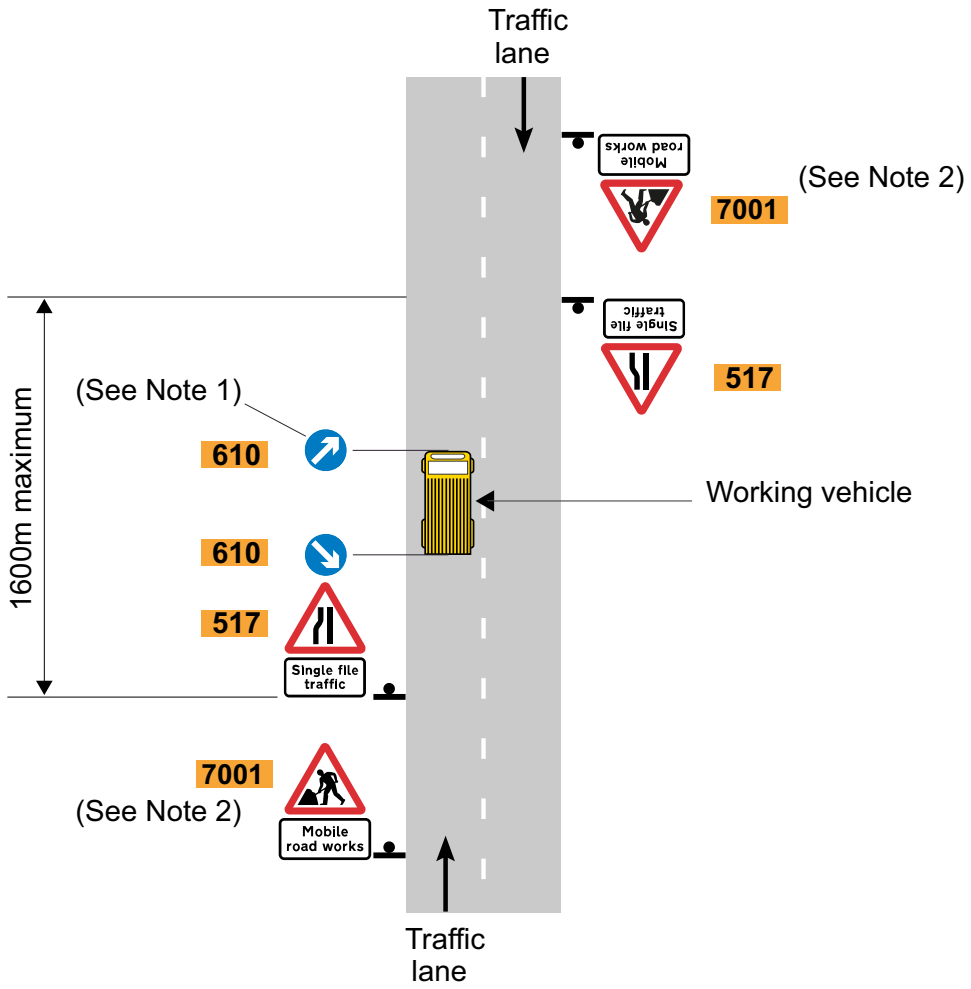
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with a ‘distance over which hazard extends’ supplementary plate 570 on the nearside only, in both directions. A supplementary plate showing the type of mobile operation taking place (**Table 5.1**), ‘for’ and a distance may be used.
- a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) with supplementary plate ‘Single file traffic’ on the nearside only, in both directions.

Additional signs may be required at junctions and to suit the carriageway alignment.

Working vehicle signing:

- a ‘keep right’ sign to diagram 610 (S13-6-11) to the rear of the working vehicle, or a sign to diagram 7403 (S13-6-10) (see **12.1.6**). An authorised vehicle mounted small light arrow sign may be used in place of signs to diagram 610 (S13-6-11) and 7403 (S13-6-10) (see **12.1.8**).
- optionally, ‘keep left’ sign to diagram 610 (S13-6-11) to the front of the working vehicle.

Plan SVW1 Single vehicle works on a single carriageway road, basic layout



NOTES:

1. Sign to diagram 610 (S13-6-11) on the front or rear of the working vehicle should only be used on roads with a maximum speed limit of 30 mph or less (see **12.1.6**). The use of such a sign on the front of the vehicle is optional.

2. Sign to diagram 7001 (S13-2-9) is to be repeated at approximately 400 m intervals. Additional signs may be required to suit the carriageway alignment and at junctions. The supplementary plate to sign diagram 7001 (S13-2-9) may also show a distance.

3. On roads with a speed limit of 40 mph or more, consideration should be given to fitting a TMA and/or a sign to diagram 7403, or an authorised light arrow, on the rear of the working vehicle. If neither are provided, an escort vehicle must be employed (see **12.1.5** and **12.1.6**).

12.1.24. The following principles for single vehicle works on two-lane single carriageway roads with ‘STOP/GO’ traffic control, are illustrated in **Plan SVW2**.

Four advance signs are required:

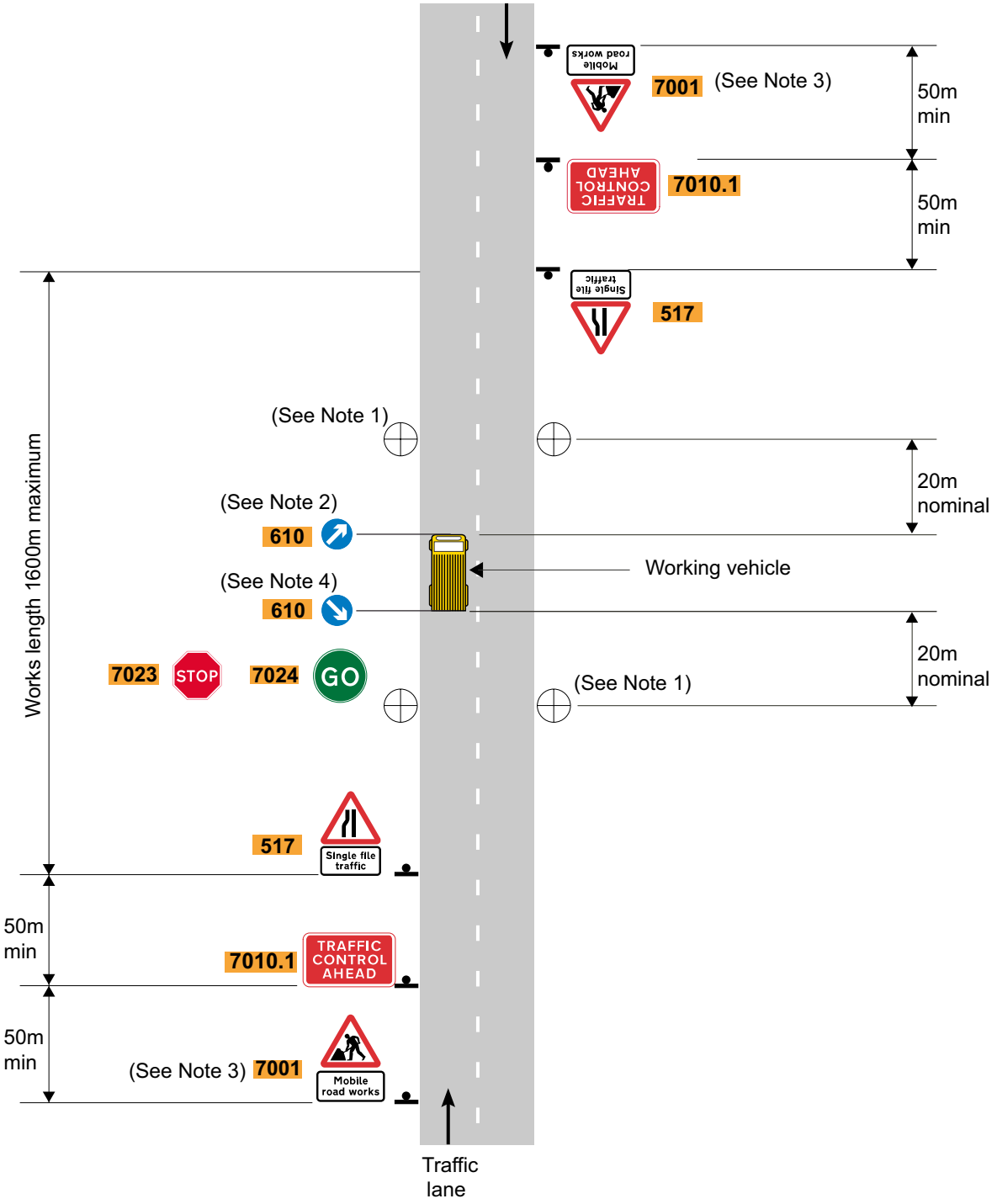
- a ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘Mobile road works’ on the nearside only, in both directions.
- a ‘TRAFFIC CONTROL AHEAD’ sign to working drawing 7010.1 (S13-9) on nearside only in both directions.
- a ‘road narrows ahead’ sign to diagram 517 (S2-2-14) with supplementary plate ‘Single file traffic’ on nearside only, in both directions.
- ‘STOP/GO’ signs to diagram 7023 (S14-2-64) and 7024 (S13-2-65) nominally 20 m in advance of the working vehicle.

The ‘road works ahead’ sign to diagram 7001 (S13-2-9) with supplementary plate ‘mobile road works’ should be repeated at approximately 400 m intervals. Additional signs may be required at junctions and to suit the carriageway alignment. The supplementary plate may also show a distance.

Working vehicle signing:

- a ‘keep right’ sign to diagram 610 (S13-6-11) to the rear of the working vehicle, or a sign to diagram 7403 (S13-6-10) (see **12.1.6**). An authorised vehicle mounted small light arrow sign may be used in place of signs to diagram 610 (S13-6-11) and 7403 (S13-6-10) as per **12.1.8**.
- optionally, ‘keep left’ sign to diagram 610 (S13-6-11) to the front of the working vehicle.

Plan SVW2 Single vehicle works on a single carriageway road - 'STOP/GO'



NOTES:

1. Alternative 'STOP/GO' operative location dependent upon carriageway alignment and visibility.

2. Sign to diagram 610 (S13-6-11) on the front or rear of the working vehicle should only be used on roads with a maximum speed limit of 30 mph or less (see **12.1.6**). The use of such a sign on the front of the vehicle is optional.

3. The 'road works ahead' sign to diagram 7001 (S13-2-9) with supplementary plate 'Mobile road works' is to be repeated at approximately 400 m intervals. Additional signs may be required at junctions and to suit the carriageway alignment. The supplementary plate to sign diagram 7001 13-2-9 may also show a distance.

4. On roads with a speed limit of 40 mph or more, consideration should be given to fitting a TMA and/ or a sign to diagram 7403, or an authorised light arrow, on the rear of the working vehicle This would be subject to a risk assessment. If neither are provided, an escort vehicle must be employed (see **12.1.5** and **12.1.6**).

Single vehicle works on dual carriageway roads, permanent speed limit of 40 mph or less

12.1.25. The following principles for single vehicle works on dual carriageway roads, with a permanent speed limit of 40 mph or less, are illustrated in **Plan SVW3**.

The following advance signs are required:

- a pair of ‘road works ahead’ signs to diagram 7001 (S13-2-9) with supplementary plate ‘Mobile road works’ repeated at approximately 400 m intervals.
- a pair of ‘lane closed ahead’ signs to diagram 7202.1 (S13-6-13).

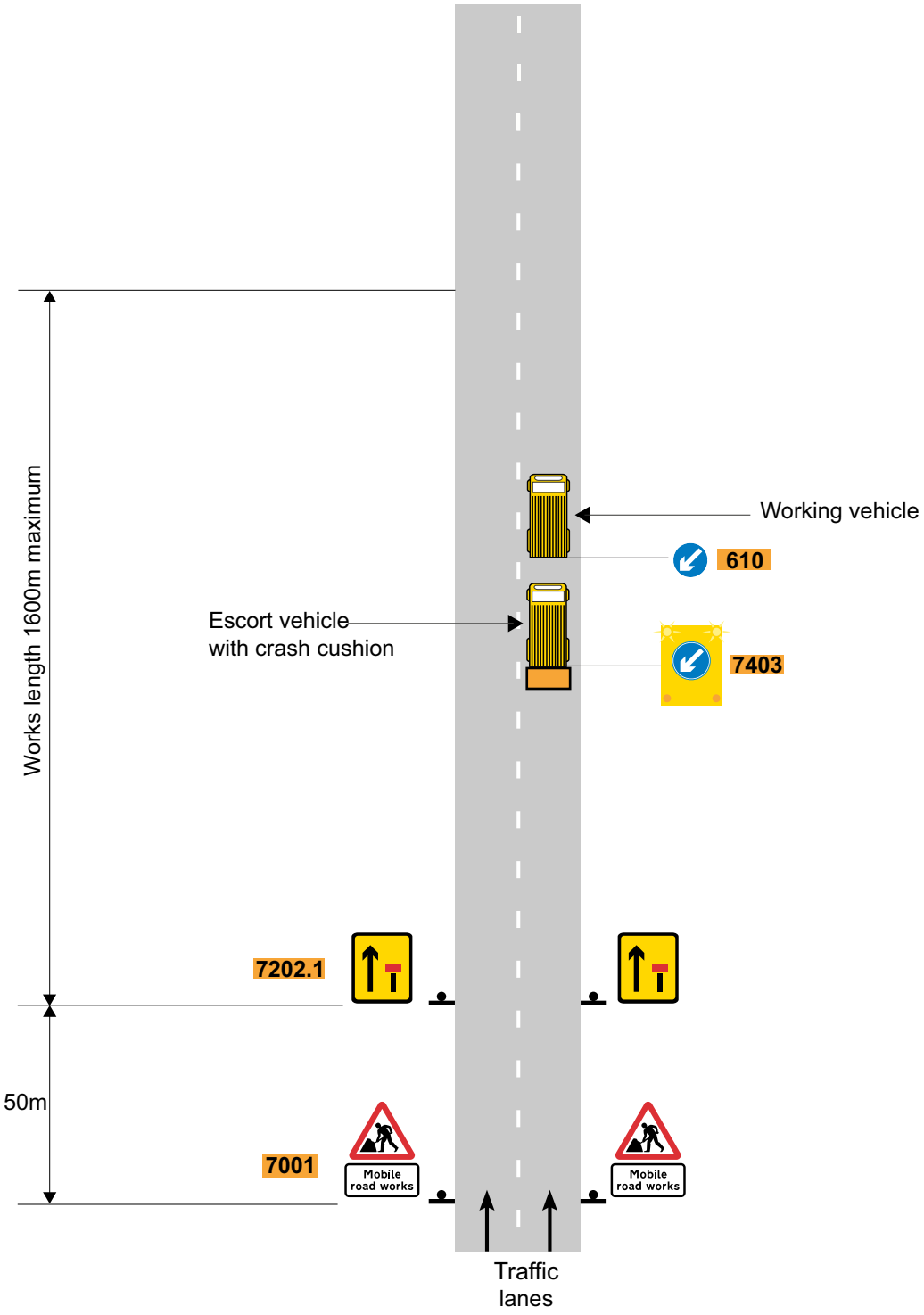
Impact protection vehicle signing:

- a ‘keep right/left’ sign to diagram 610 (S13-6-11) to the rear of the escort vehicle.

12.1.26. Working vehicle signing:

- a ‘keep right/left’ sign to diagram 610 (S13-6-11) to the rear of the working vehicle, or a sign to diagram 7403 (S13-6-10) (see **12.1.6**). An authorised vehicle mounted small light arrow sign may be used in place of signs to diagram 610 (S13-6-11) and 7403 (S13-6-10) as per **12.1.8**.

Plan SVW3 Single vehicle works on a dual carriageway road, permanent speed limit 40 mph or less



NOTES:

1. The pairs of signs to diagram 7001 (S13-2-9) with supplementary plate to be repeated at approximately 400 m intervals. Additional signs may be required at junctions and to suit the carriageway alignment. The supplementary plate to sign diagram 7001 may also show a distance.

12.2 Works undertaken at or near normal road speed

12.2.1. Works undertaken at a controlled speed nearing that of the normal road speed (e.g. gritting, salting, damping down of dust) require appropriate specialist vehicles. These types of works should not require any additional special precautions. Care should be taken to avoid these types of works in peak times or when it might disrupt traffic.

12.2.2. Where the scale of these operations is unusual, a ‘road works ahead’ sign to diagram 7001 (S13-2-9), with appropriate supplementary plate ‘Gritting’ or ‘Salting’ should be used to give advance warning. The VMS message ‘GRITTING IN PROGRESS’ may be used to support gritting operations.

12.3 Traffic signal maintenance

12.3.1. Maintenance of traffic signals and street furniture at junctions on single carriageway roads should be carried out in good visibility, ideally in daylight. At traffic signal sites where disruption to permanent signals is likely to be prolonged, the traffic authority may need to install portable or temporary signals.

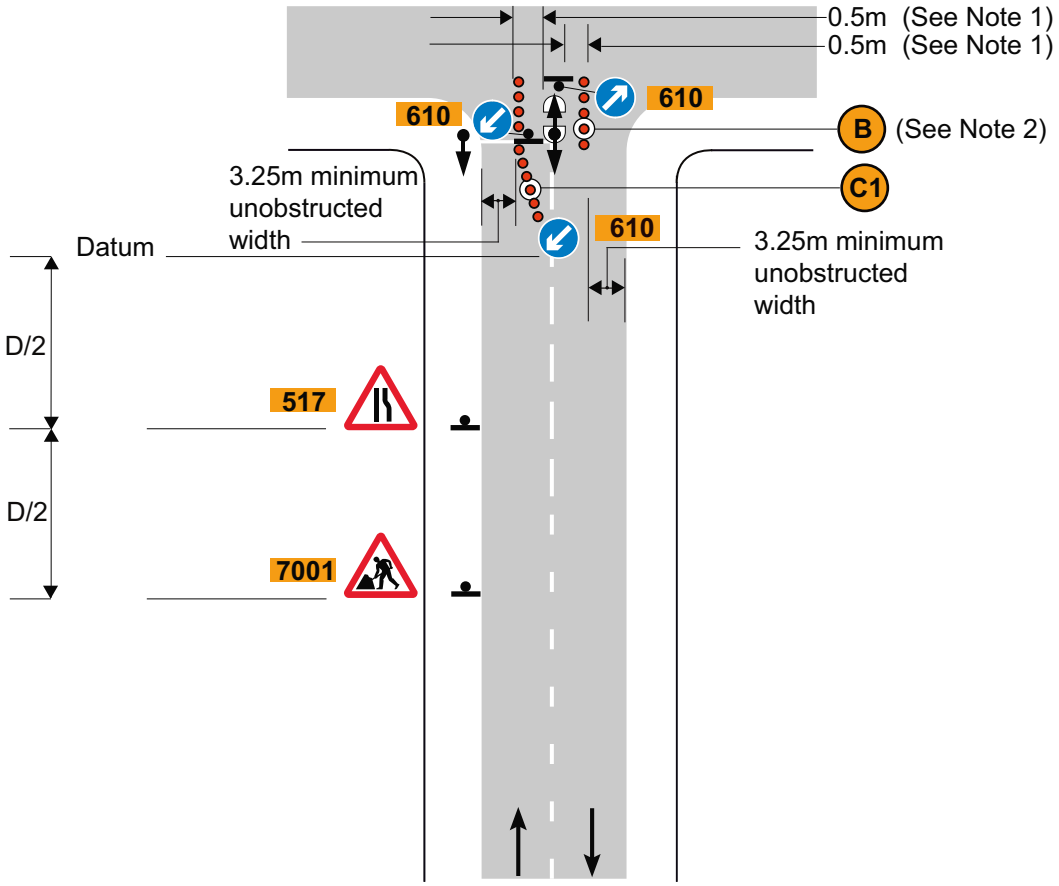
12.3.2. When maintenance work is being carried out on traffic signals, a ‘TRAFFIC SIGNAL MAINTENANCE’ sign to working drawing 7010.1 (S13-9) should be displayed. This sign must be reflectorised if it is not directly illuminated. The needs of pedestrians and other non-motorised roads users must be considered when traffic signals are removed from use (see **Sections 4.31** to **4.32**).

12.3.3. The principles for signing of works at a signal island and a kerbside signal at junction are illustrated in **Plans SM1** to **SM3**. The principles shown on these plans are also applicable for the maintenance of street furniture.

12.3.4. For signal crossing sites along a single carriageway road, the approach coning and signing principles given in **Plans SM1** to **SM3** should apply.

12.3.5. The principles for works in the centre of a single carriageway road are outlined within **Section 6.**

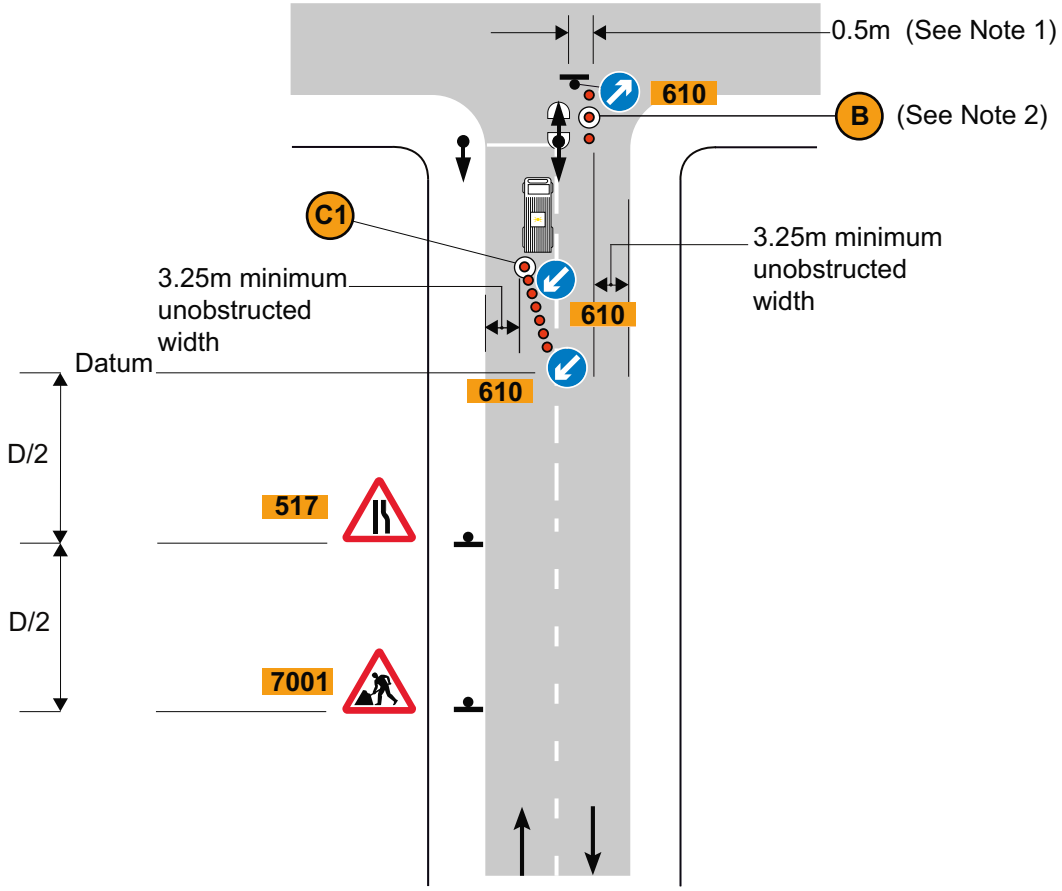
Plan SM1 Junction in a single carriageway road with a permanent speed limit of 30 mph or less, work on a signal island



NOTES:

1. The minimum lateral clearance is increased from 0.5 m to 1.2 m if the speed restriction on the crossing road is 50 mph or more. The position of any change in speed limit with the crossing road is not normally a factor as long as the speed of turning traffic is identified as not being a risk.
2. Detail B – the size of cones is dependent on the speed limit on the crossing road.
3. Appropriate advance warning signs should be placed on the cross arms of the junction.

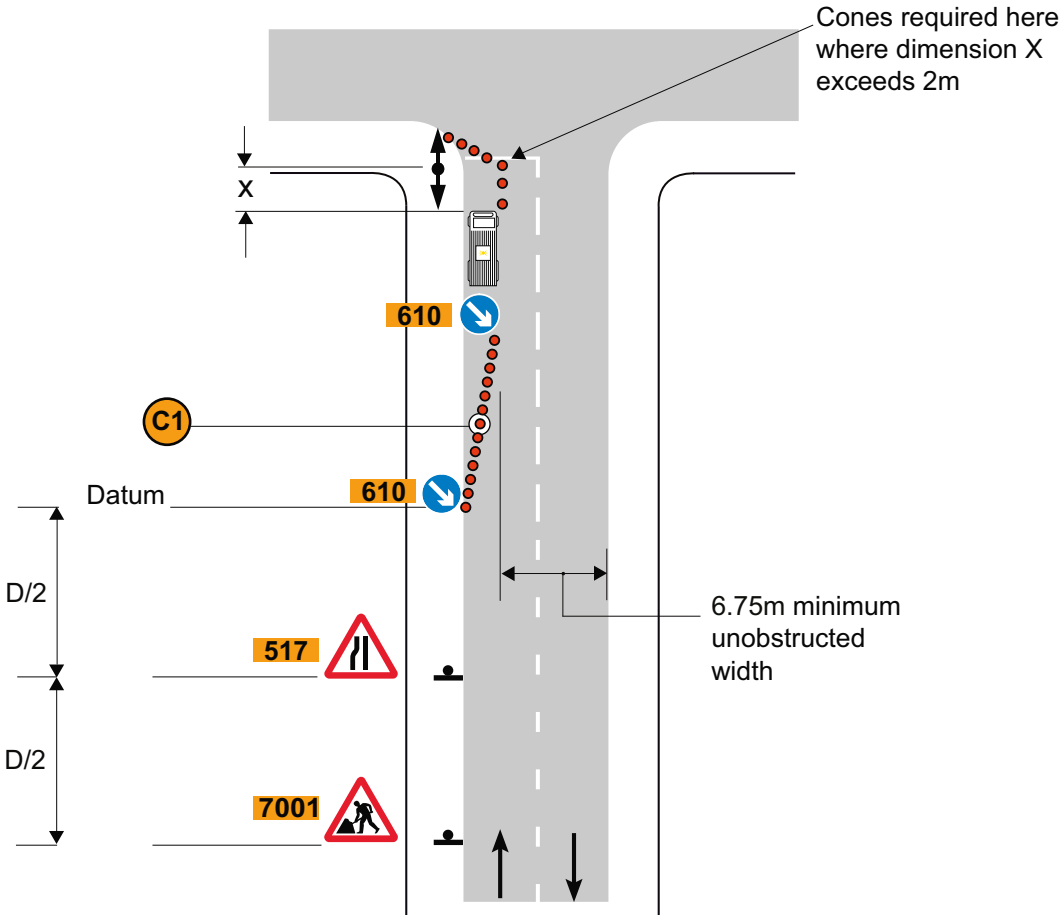
Plan SM2 Junction on a single carriageway road with a permanent speed limit of 30 mph or less, work on a signal island with a conspicuous vehicle with beacon



NOTES:

1. The minimum lateral clearance is increased from 0.5 m to 1.2 m if the speed restriction on the crossing road is 50 mph or more.
2. Detail B – the size of cones is dependent on the speed limit on the crossing road.
3. Appropriate advance warning signs should be placed on the cross arms of the junction.

Plan SM3 Junction on a single carriageway road with a permanent speed limit of 30 mph or less, work at a kerbside with a conspicuous vehicle with beacon



NOTE: Appropriate advance warning signs should be placed on the cross arms of the junction.

12.4 Road user surveys and interviews

12.4.1. Where it is not practicable to apply the principles outlined within **Sections 6** and **7** to the signing for interview sites, the following minimum requirements and guidance should be adopted. Some local discretion in their application may be necessary for optimum safety and operational efficiency. This will depend on the traffic flow, speeds, type of road and information required on the nature of the survey.

12.4.2. Where TTM arrangements use the principles outlined within **Section 12.4**, the attendance of a police officer is assumed.

12.4.3. Surveys may need to be carried out in conditions where it is not possible or appropriate for traffic to be funnelled into a single lane of slow-moving traffic, or stationary traffic at signals. All survey sites must be subject to a site-specific risk assessment.

12.4.4. Where available space is limited the spacing of signs and minimum length of lead tapers for single and dual carriageway roads should be used as outlined in **Table 12.1**.

Table 12.1 Survey sites – spacing of signs and taper length

Permanent speed limit (mph)	Siting distance apart of signs (m)	Length of lead taper (m)	Minimum clear visibility of sign to diagram 562 (S13-2-7) (m)
30 or less	20	45	60
40	30	70	60
50	80	95	75
60	90	115	90
70	110	140	105

12.4.5. Additional signs should be used in consultation with the police, particularly on roads for which the national speed limit applies. Supplementary distance plates should be used if appropriate (see Section 5.8). Cones should be 750 mm high and placed 9 m apart, or closer as required.

12.4.6. All the signs used at interview sites must as prescribed, conform to Schedule 13 Part 9 (where relevant), or be specifically authorised. Authorisations and approvals need to be procured through the authority.

12.4.7. The speed of vehicles approaching an interview site is to be reduced to about 20 mph in the vicinity of the sampling line by appropriate signing and cones. The implementation of a temporary mandatory speed limit should be considered where the nature of the TTM is not always going to be clear and traffic speeds are likely to be excess of 30 mph (see **Section 4.8**).

12.4.8. Sign illumination at interview sites must be in accordance with the Regulations. Warning lights should be used to indicate the limits of the obstruction and the path vehicles should take. The lights should be sited on cones, as indicated in **Table A1.3** (**Appendix A1**).

12.4.9. Warning of a traffic census or roadside survey is provided by the use of the ‘other danger ahead’ sign to diagram 562 (S13-2-7; **Figure 12.6**) and ‘Census’ plate variation.



Figure 12.6 Diagram 562 (S13-2-7) ‘Other danger ahead’ with supplementary ‘Census’ plate

12.4.10. Where a driver may be stopped for interview in connection with a traffic survey, the ‘CENSUS STOP if directed’ sign to diagram 830.1 (S13-6-46; **Figure 12.7**), and its permitted variants can be used. Approval by the national authority, the authority, and the police must be sought for the use of these signs. Only a police officer or Traffic Officer may legally stop or direct traffic at a survey site.



Figure 12.7 Diagram 830.1 (S13-6-46) ‘Census stop if directed’

12.4.11. On a heavily-trafficked road or where equipment is located on the carriageway, it will be necessary to close a lane using the principles set out in **Sections 6** and **7**. Alternatively, it may be necessary to close one carriageway completely. This should be done by means of the appropriate TTM.

12.4.12. For surveys at lay-by sites an additional guide island is required to separate the vehicles to be surveyed from the through vehicles.

12.4.13. For surveys on single carriageway roads with a permanent speed limit of 40 mph an additional 'road narrows ahead' sign to diagram 517 (S2-2-14) with sub-plate 'Single file traffic' is required.

12.4.14. On dual carriageway roads, the reduction of traffic speed may present difficulty. In such cases it is essential that:

- signing is adequate and sufficient advance warning of the site is given.
- vehicles are restricted to a single lane prior to the sampling line to reduce traffic speed to about 20 mph.

12.4.15. For interview sites at signal-controlled junctions. the 'road narrows ahead' sign to diagram 517 (S2-2-14) is not used. Additional 'STAY IN LANE' signs to diagram 830.3 (S13-6-48; **Figure 12.8**) are required on the arm of the signals on which the traffic survey is being carried out. On the other arms of the signals, an 'other danger ahead' sign to diagram 562 (S13-2-7) with supplementary plate 'Census' is required. These sites should be used only in built-up areas where approach speeds are low.



Figure 12.8 Diagram 830.3 (S13-6-48) 'STAY IN LANE'

The principles for traffic management at a survey site

12.4.16. The principles are:

- the length of the survey area is given by the formula (4 + 8 x the number of interviewers) (m), except when the survey site is at a traffic signal controlled junction. In this case the length is given by the formula (4 + 4 x the number of interviewers) (m).
- coning to Detail C1 is used to mark a guide island through the survey site.
- 'keep left/right' signs to diagram 610 (S3-2-3) are used on the offside behind the coning of the guide island to indicate the route traffic should take past the guide island, and to indicate the line of the traffic.
- a police officer or a Traffic Officer is required to be in attendance.

The following signing is required in the primary direction on the nearside, upstream of the sampling point:

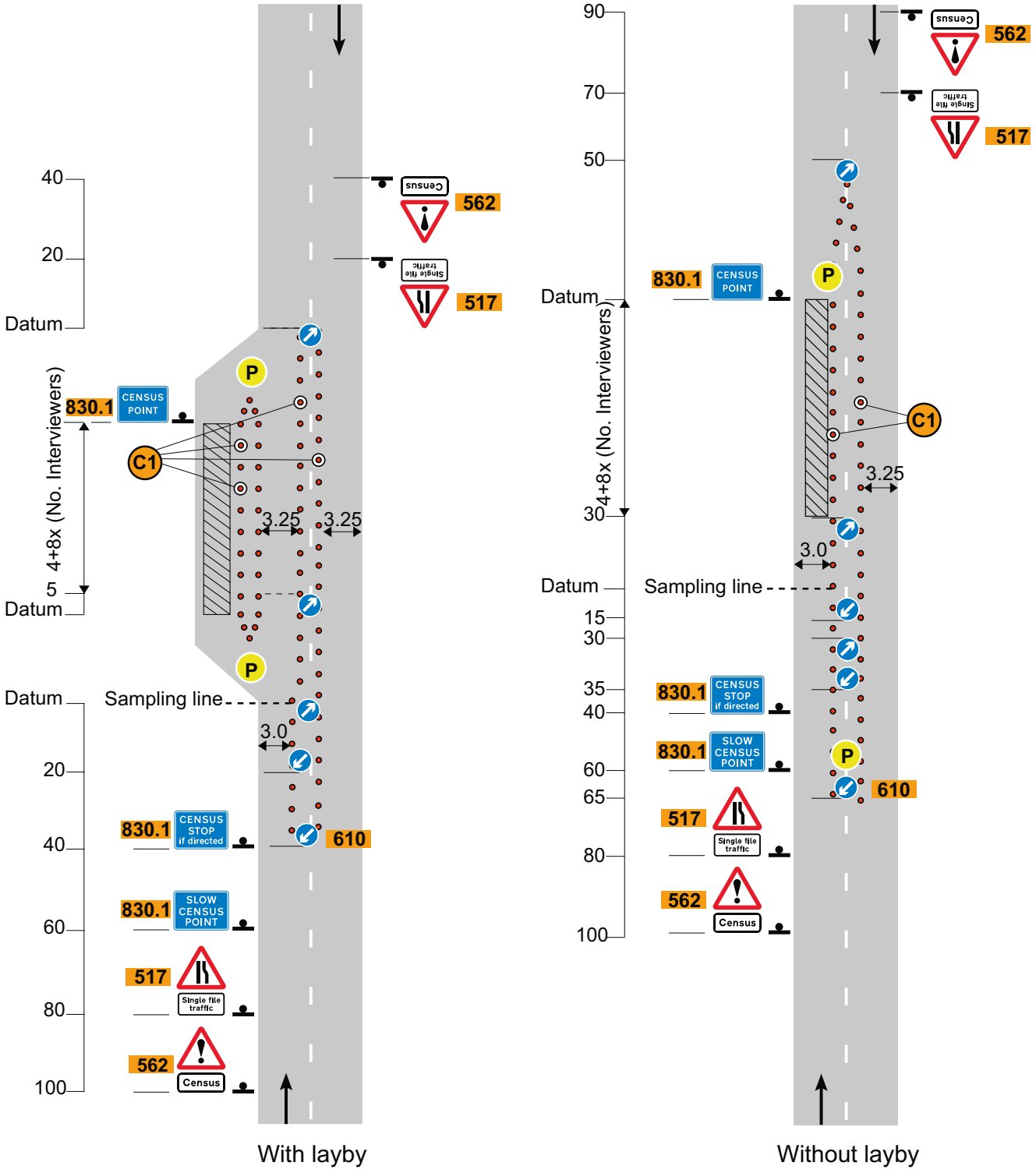
- an 'other danger ahead' sign to diagram 562 (S13-2-7) with supplementary plate 'Census'.
- at least one 'road narrows ahead' sign to diagram 517 (S2-2-14) with supplementary plate 'Single file traffic'.
- a 'SLOW CENSUS POINT' sign variant to diagram 830.1 (S13-6-46).

- a ‘CENSUS STOP if directed’ sign 830.1 variant.
- a ‘CENSUS POINT’ sign 830.1 variant located at the far end of the census point.

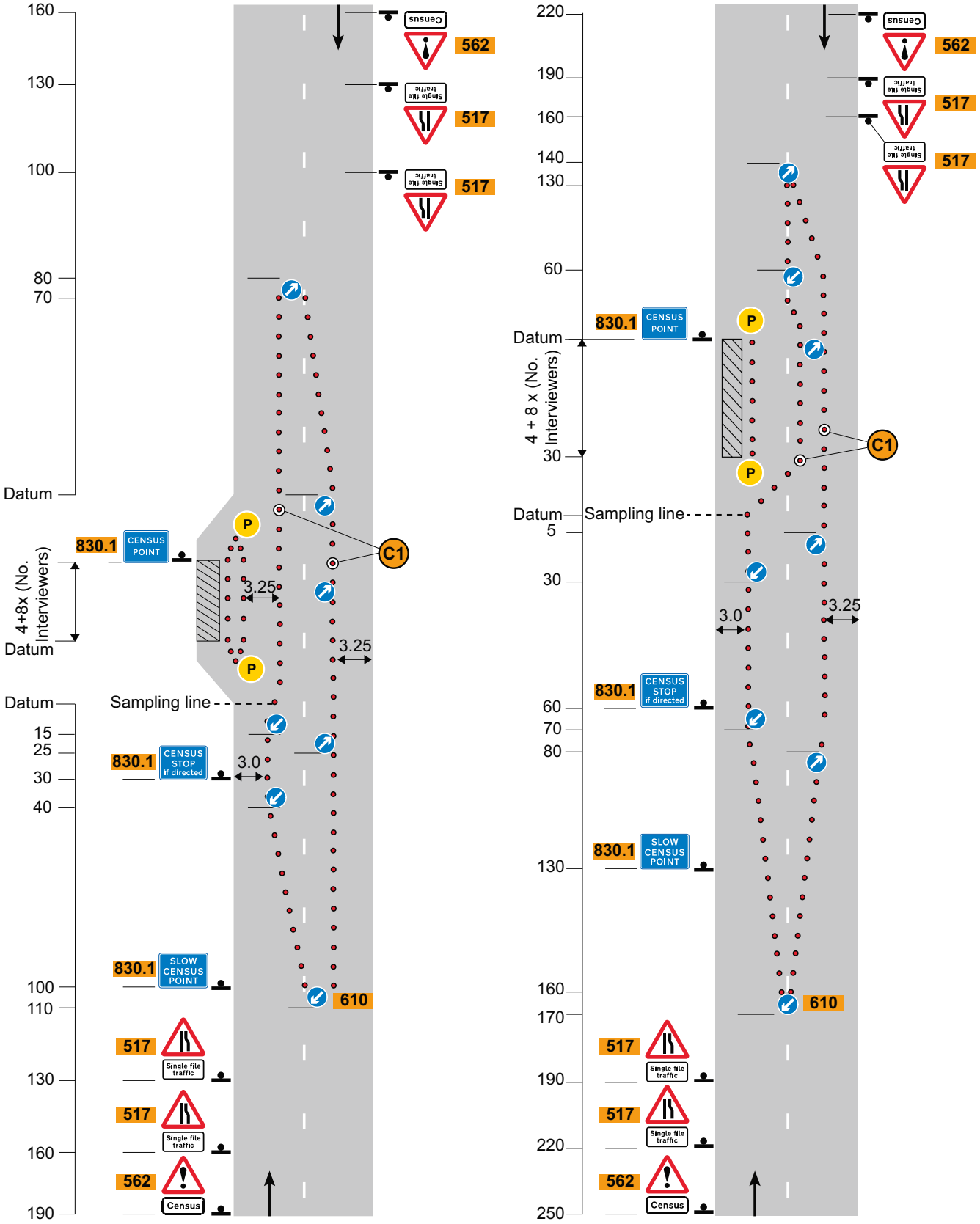
The following signing is then required for the secondary direction on the nearside, upstream of the first cone of the survey area:

- an ‘other danger ahead’ sign to diagram 562 (S13-2-7) with supplementary variation plate ‘Census’.
- at least one ‘road narrows ahead’ sign to diagram 517 (S2-2-14) with supplementary variation plate ‘Single file traffic’.

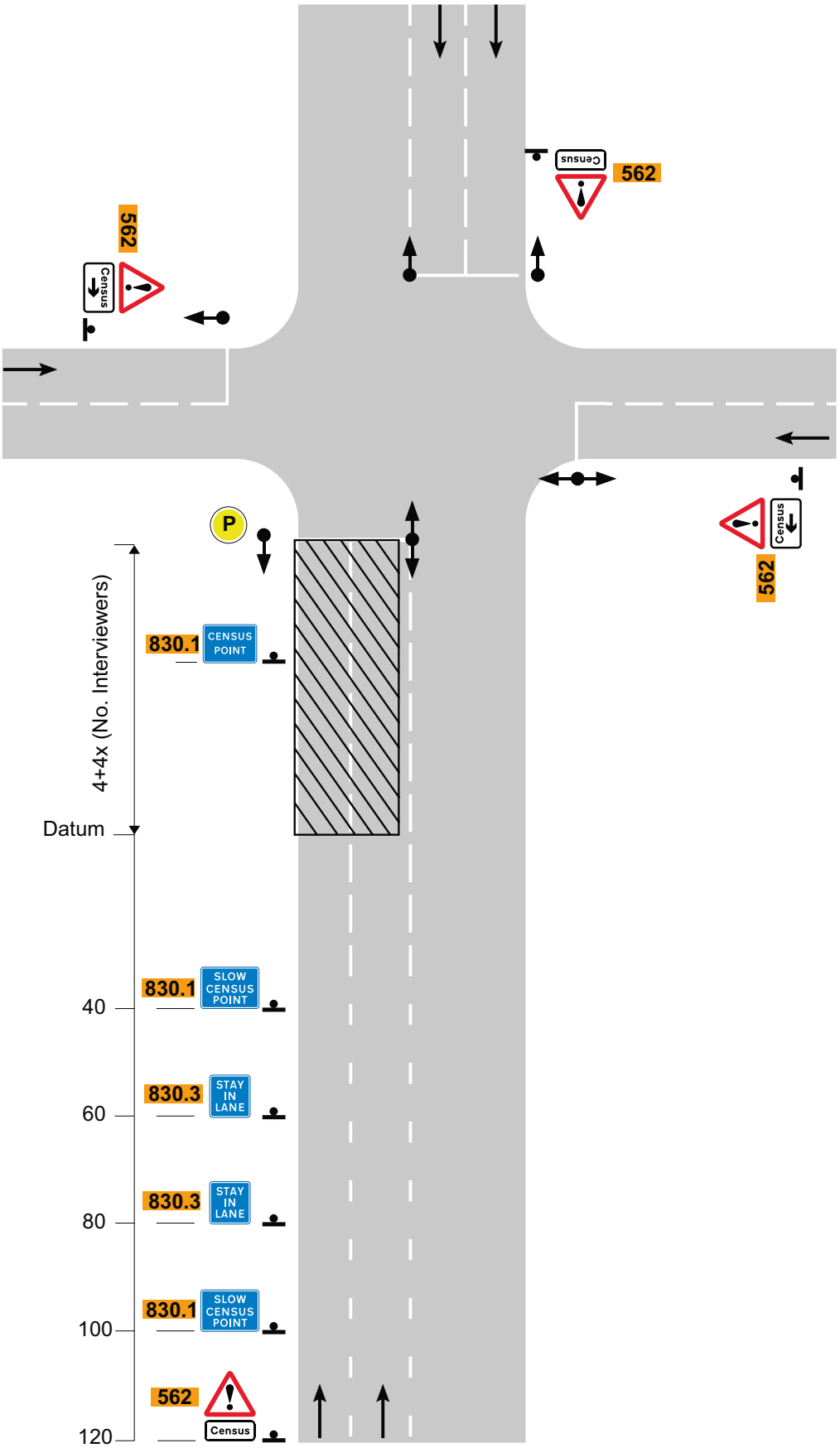
Plan SV1 Traffic survey on a single carriageway road with a permanent speed limit of 30 mph or less (less than 10 m wide)



Plan SV2 Traffic survey on a single carriageway road with a permanent speed limit of 40 mph (less than 10 m wide)



Plan SV3 Traffic survey on a traffic signal controlled junction with a permanent speed limit of 30 mph or less



12.5 Vehicle weight and condition checks

12.5.1. The principles for the TTM arrangements at sites where checks are carried out on vehicle conditions and weight are generally the same as those given for road user surveys (see **Section 12.4**).

12.5.2. When vehicle checks are being conducted, the following signs to may be used:

- GOODS VEHICLES STOP if directed' sign to diagram 830.2 (S13-6-47; **Figure 12.9**).
- 'VEHICLE EXCISE LICENCE CHECK' sign to diagram 831.2 (S13-6-49; **Figure 12.10**).
- 'CHECK POINT AHEAD' signs to diagram 832.1B (S13-6-50; **Figure 12.11**) and its variants.



Figure 12.9 Diagram 830.2 (S13-6-47) Goods vehicles stop if directed



Figure 12.10 Diagram 831.2 (S13-6-49) Vehicle excise check



Figure 12.11 Diagram 832.1B (S13-6-50) DVSA check point ahead

12.5.3. Signs to diagrams 832.4 (S13-6-51; **Figure 12.12**) and its variants, along with signs to diagram 832.7 (S13-6-27) may also be used to sign for permanently sited vehicle check points.



Figure 12.12 Diagram 832.4 (S13-6-51) Instructions to goods vehicles for a check point ahead

12.5.4. Refer to the Driver and Vehicle Standards Agency (DVSA) for details of the TTM arrangements at vehicle check sites and for the procedures used to stop vehicles.

12.6 Road condition surveys

12.6.1. Road condition surveys and surveying (e.g. skidding resistance, deflection testing, surface texture, profile measurements, road marking retroreflectivity) are often executed by means of short-duration works and lane closures. These surveys are undertaken on all types of roads, including those both with and without hard shoulders. Vehicle-mounted signs are used with one or more vehicles travelling at slow speed. In short-duration lane closures, the surveys may move continuously or proceed slowly along the road with frequent stops.

12.6.2. The police and/or authority (or their maintaining agent for maintenance) should be notified of any proposal to carry out an inspection on a motorway. Any road occupancy management processes for the road will need to be met.

12.6.3. Where survey teams are working on or near an unobstructed carriageway, and where there is not more relevant option e.g. the 'Mobile works' plate the 'Surveying' plate variant to supplement diagram 7001 (S13-2-9; **Figure 12.13**) may be used.



Figure 12.13 Diagram 7001 (S13-2-9) with Surveying supplementary plate variant

12.6.4. Some road condition surveys can also be undertaken from moving vehicles without workers being on foot. For vehicles mounted surveys undertaking at slow speeds, including occasional stops appropriate TTM and operations can be identified from **Section 10**, **11**, **12.1**, **12.9** and **12.10**. For vehicle mounted surveys undertaken, at, or near the normal speed of traffic see **Section 12.2**.

12.7 Surfacing (surface dressing)

12.7.1. The 'loose chippings on road ahead' sign to diagram 7009 (S13-2-10) should be placed at 400 m intervals on newly surface-dressed roads. The sign must be retained in position until the danger from flying chippings has passed. The 'no overtaking' sign to diagram 632 (S3-2-5) may be used as per **5.11.21** and Chapter 3.

12.7.2. Traffic cones should be placed 9 m apart on the centre line of single carriageway roads wider than 7.3 m.

12.7.3. On urban streets and minor rural roads, the following signs should be placed at the start of the work and then at regular intervals (between 50 and 100 m spacings):

- the 'road works ahead' sign to diagram 7001 (S13-2-9).
- 'TRAFFIC CONTROL AHEAD' sign to working drawing 7010.1 (S13-9).

- ‘loose chippings on road ahead’ sign to diagram 7009 (S13-2-10) with advisory 20 mph maximum speed plate to diagram 513.2 (S13-4-2), see **Figure 12.14**, or plate to diagram 7009.1 (S13-4-3) if the ‘Skid risk’ advisory plate is added, see **Figure 12.15**.



Figure 12.14 Diagram 7009 (S13-2-10) Loose chippings on the road ahead combined with plates to diagram 513.2 (S13-4-2) maximum advised speed limit



Figure 12.15 Diagram 7009 (S13-2-10) Loose chippings on the road ahead combined with plates to diagram 7009.1 (S13-4-3) Skid risk and maximum advised speed limit

12.8 Road markings

12.8.1. There are generally two methods for applying road markings:

- most lane markings and some hatching and symbols can be applied by a machine, either mounted on a powered cart or vehicle, or.
- other makings and particularly in areas where carriageways are narrow, disrupted, subject to parked cars or with many variations, markings may need to applied manually by a pedestrian operated applicator or hand screed.

12.8.2. The use of advance warning signs and the warning indications on vehicles may be sufficient for longitudinal markings and some symbols, providing that there is adequate width for the passage of traffic and newly laid lines or studs do not to be kept clear of traffic.

12.8.3. Where further measures are required, the following may be used:

- cones and the use of ‘keep left/right’ signs to diagram 610 (S3-2-3), or.
- lane closures, with or without traffic control.

12.8.4. For markings applied by a pedestrian-operated applicator or hand screed, the TTM provisions set out in **12.8.2** and **12.8.3** may be sufficient. For static marking operations, appropriate TTM must be defined by the designer. Necessary consideration should be given to whether such works require a carriageway closure, positive traffic control, or other measures.

12.8.5. Carriageway marking and road stud works pose different problems to those of other types of road works. Personnel, vehicles, and plant engaged in the works are continually on the move along the carriageway. Traffic may not be seriously interrupted, but circumstances may require the narrowing of a lane or lanes for this operation.

12.8.6. Where road marking material is applied to the carriageway using a vehicle mounted marking machine, the following signing approaches are required as the use of static road signs in not practical:

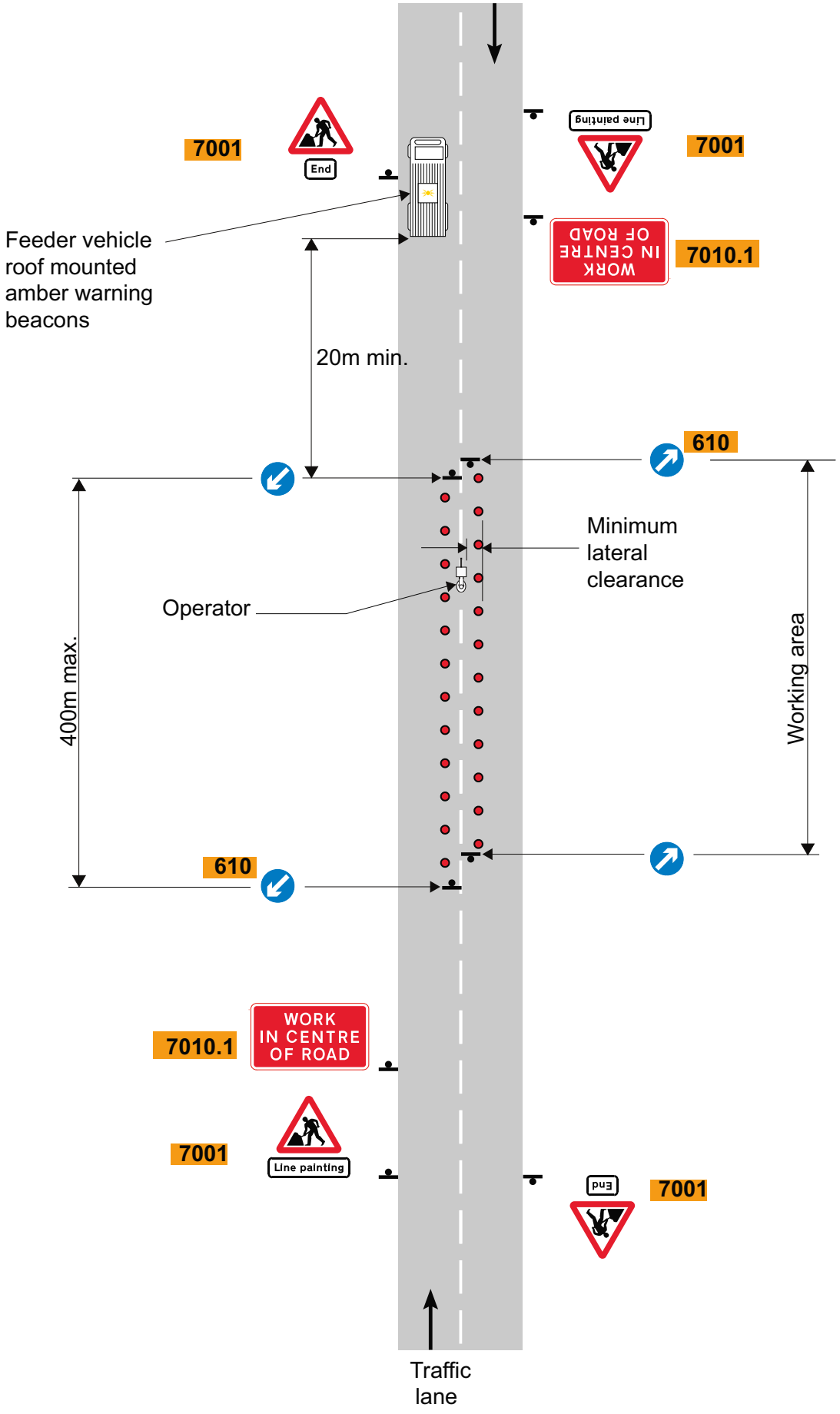
- Signs to diagram 610 (S13-6-11) should be mounted on the rear of the working vehicle and/or other vehicles which travel in convoy with the marking machine.
- On dual carriageways, a MLC (see **Section 10**) may be used to support the application of road markings using a vehicle mounted marking machine, or.
- Short duration road closures, following the principles outlined within **Sections 6** and **7**.

12.8.7. TTM layouts suitable for different road marking operations are illustrated in the following:

- **RM1** (see below).
- **SC2** and **SC3** (see **Section 6**).
- **SVW1** and **SVW2** (see **Section 10**).

12.8.8. Operational aspects of road marking operations are covered in **Section 12.10**.

Plan RM1 Single carriageway road line painting



NOTE: See S13-12-6 for details of road works signs that may be attached to works vehicles.

12.9 Inspection stops

12.9.1. There is always an element of danger in activities undertaken on an operational road. There is a duty under the 'Health and Safety at Work, etc. Act' 1974 and 'Health and Safety at Work (NI) Order' 1978 on every employer and every operative to take particular care to ensure the safety of themselves and those affected by their actions. Some ways of meeting this requirement are:

- carry out a risk assessment (see **Section 3.6**).
- plan to do the inspection in periods of light traffic flow.
- ensure that all staff are adequately trained, informed and supervised.
- plan the inspection before going on to the road and try to keep to the plan.
- do not embark on any activity if visibility is poor or during adverse weather conditions, except in an emergency. Whenever visibility is significantly reduced, the inspection should not proceed unless there are at least two persons present at the site. One of whom should act as a lookout to warn others of approaching traffic.
- always remain alert and whenever possible face oncoming traffic.
- complete the inspection as quickly as possible.

12.9.2. Any proposal to carry out an inspection (using static TTM) on a highway should be notified to the police and/or the authority (or their maintaining agent for maintenance) in accordance with arrangements previously established. Any road occupancy management processes for the road will need to be met.

12.9.3. Inspections of structures or road features should be conducted well away from traffic lanes (e.g. using verges or overbridges). Ideally locations should be accessed away from a high speed road, e.g. vehicles parked off network with a dedicated walking route. Some inspections will still require people to be on the hard shoulder or in traffic lanes. Guidance on the TTM required, and suitable methods of operation, are given in in GG117 Appendix B 'Requirements for works on the hard shoulder and roadside verges on high speed dual carriageways'. The application of this guidance may be limited by the nature of the highway and the expected traffic flows; the authority (or maintaining agent) will need to be consulted to confirm if the guidance in GG117 can be considered and for any relevant information on relaxations or departures in road geometry and the relevant traffic flow data.

12.9.4. Any carriageway inspections or measurements which may last longer than 90 minutes should be carried out as static works, with the corresponding signing.

12.9.5. On some roads, the geometry of the road and adjacent features such as junctions, changes in speed limit or high traffic flows mean that particular care is needed when carrying out inspection stops. In these cases, these features along with additional mitigations should be captured in the site-specific risk assessment prior to the inspection.

12.9.6. For all classes and speeds of road, any vehicle stopping on a highway for inspection or works purposes should be:

- of a conspicuous colour and marking (see **Section 14.7**).
- identifiable to police and / or authority by the sign 'HIGHWAY MAINTENANCE' to diagram 7404 (S13-6-12; **Figure 12.16**) on the vehicle and facing the rear.
- fitted with a roof-mounted flashing amber beacon (see **Section 14.8**).



Figure 12.16 Diagram 7404 (S13-6-12) HIGHWAY MAINTENANCE

12.9.7. When arriving at the site, the following procedures for stopping on the highway should be observed:

- manoeuvre to the left-hand traffic lane and switch on roof-mounted flashing amber beacon before starting to slow down. For the general use of roof-mounted beacons, see **Section 14.8**.
- on motorways with hard shoulders, stop on the hard shoulder as far to the left as possible, approximately 50 m in advance of the site. For motorways without hard shoulders the authority (or maintaining agent) will have defined places of relative safety, maintenance hard standings etc which can be used for inspection stops.
- on all-purpose roads stop in any convenient lay-by, field gate entrance or side road. If stopping on a grass verge, leave enough space for pedestrians. If there is no alternative to stopping on the carriageway, park the vehicle as close to the edge as possible.
- consider adopting a 'fend' position (see **8.10.7**).
- if the vehicle is to remain parked on the hard shoulder of a motorway or in the carriageway of an all-purpose road, the flashing beacon should remain on for the duration of the stop unless within the confines of a fully installed TTM layout.
- ensure that there is a minimum safety clearance between live traffic and all personnel and vehicles (see **Section 4.2**).
- put on a high-visibility garment (see **Section 15.2**) before leaving the vehicle.
- leave the vehicle via a door on the side away from the traffic if possible. Otherwise look out for approaching traffic before opening the door and alighting.

12.9.8. While on the road, the following points should be observed:

- do not run.
- take particular care in climbing up and down side slopes.
- if it is essential to cross the carriageway, wait for a gap in the traffic which is long enough to allow walking across briskly keeping a look out for oncoming vehicles. Be prepared to wait some time to do this in safety. On very heavily trafficked roads, it may be possible to cross the carriageway only during off-peak periods. See **Section 13.2** and the HSE publication entitled 'Reducing risk in temporary traffic management operations' (see **Appendix B**).

12.9.9. On completion of the work, the following should be observed:

- take special care when re-joining the traffic stream.
- ensure that the appropriate direction indicator is switched on before moving off.
- on a motorway, build up speed on the hard shoulder to match the speed of traffic in the left-hand lane before re-joining it. Watch out for debris on the hard shoulder which may hinder its use.
- the flashing amber beacon should remain in operation until the vehicle has re-joined the main flow of traffic.

12.9.10. The ‘Surveying’ supplementary plate variant to diagram 7001 (S13-2-9) is used for the protection of survey teams working on or near the carriageway where the carriageway is not obstructed.

12.9.11. On a heavily-trafficked road or where equipment is located on the carriageway, it will be necessary to close a lane using the principles set out in **Sections 6** and **7**. It may be necessary to close one carriageway completely. This should be done by means of the appropriate TTM.

12.10 Road (highway) maintenance and safety assessments

12.10.1. The requirements are:

- the work should be carried out at off-peak times if practicable.
- where relevant operatives should wait for a sufficient gap in the traffic prior to marking any defects on the carriageway (see **13.2.2**).
- operatives should face oncoming traffic or use a lookout while marking defects etc.
- where gaps in the traffic are insufficient (taking into account the speed limit, speed of any traffic and nature of the road e.g. SSD, clear viability), operatives should not attempt to enter the road. They should instead estimate the size and scope of any relevant defect or issue.

12.10.2. Work on three-lane single carriageway roads should be carried out from the nearside lane. If activities are done while driving at speeds less than 30 mph or on lanes other than the nearside lane, mobile or static lane closure techniques are required.

12.10.3. In order to determine the appropriate method of working, single and dual carriageway roads are split into categories depending on the daily vehicle flow per carriageway:

- Category 1: >80,000 veh/day.
- Category 2: 20,000-80,000 veh/day.
- Category 3: <20,000 veh/day.

12.10.4. For each road category, the choice of vehicle used should be determined based on a site-specific risk assessment. **Section 14** deals with vehicle issues and the specification of TTM vehicles is given in **Section 14.6**.

12.10.5. For Category 1 and 2 roads, the following method should be followed by the operative:

- drive at a minimum of 30 mph on the nearside lane of the carriageway.
- pull up on the hard shoulder or at a safe location to record or assess defects.
- On a dual carriageway with a hard shoulder, the inspection should be undertaken from the hard shoulder, if this is practicable and safe to do so.

12.10.6. For Category 3 roads, the following method should be followed by the operative:

- when travelling slowly, allow traffic to pass at a suitable safe location.
- use a roof-mounted beacon during the inspection and hazard warning lights when stationary.
- place a sign to diagram 7404 (S13-6-12; Figure 12.16) ‘HIGHWAY MAINTENANCE’ to the rear of the vehicle during the inspection.
- park at a safe location and walk back to mark the defect, facing oncoming traffic.

12.10.7. Walk and inspect method:

- for Category 1 and 2 roads, use a static lane closure (see **Sections 6** and **7**). On dual carriageway roads only use a MLC (see **Section 10**, **Plan MLC4**) or the Mobile Carriageway Closure technique (see **Section 11**), or GG117 Appendix A eMCC technique may be considered.
- See **Appendix A6** for details of inspection stops in Northern Ireland.

12.11 Events

12.11.1. Events may range from local street closures, sporting events to ceremonial processions. Temporary traffic management may be used to facilitate events on or near a road, in all cases the same legal duties to maintain safety applies as it does to works.

12.11.2. Event organisers must consult and obtain approval to place traffic signs and other equipment onto a road from the relevant road or highway authority. All signs and equipment used must be lawful and should be in accordance with any relevant guidance in this document.

12.11.3. Organisers of events should note that a Temporary Traffic Regulation Order (TTRO) is required for the lawful closure of roads and apply other restrictions of traffic to enable the event to proceed in safety. Many authorities make a charge for making a TTRO. A TTRO can take weeks - and occasionally months - to be made, especially if there are any objections to it. Thus organisers are strongly advised to consult with the authority at the earliest opportunity to ensure that the lack of a TTRO doesn’t mean their event has to be delayed or cancelled.

12.11.4. Event organisers share liability for TTM for their events (including civil claims and Health and Safety legislation) with the TTM designer and authority, therefore they should give the TTM contractor and authority a clear indication of the objectives and requirements for signing. However, the detailed TTM design and plan is to be completed by a competent designer. Liability for other aspects, such as the timely removal of TTM, may also be shared between the organisers, TTM contractor and potentially the authority if an order is in place.

12.11.5. Unless there is an order, TTM for events is a temporary situation and not works for roads purposes and therefore the Safety at Street Works and Road Works: A Code of Practice (the Red Book) is not directly applicable. The design of the TTM layout, and the associated signs, need to be the same as TTM for equivalent works; e.g. a road closure for a running race must be signed in the same way as any other closure and not primarily signed as a running event (although secondary signing may give details of the event). While the guidance in this document can be used for all situations, specific layouts from the Red Book may be suitable, but these will require an additional risk assessment to confirm they are the most appropriate option.

12.11.6. Anybody installing, maintaining and removing signs and equipment related to events must be competent to do. It is the responsibility of the event organiser to ensure any operatives, particularly those in a live lane or safety zone, have sufficient training and competency to do so safely and lawfully. The training recommended in this document for works and other temporary situations may be suitable, or provide a relevant benchmark for event specific training where the organiser is not using a general TTM contractor. The relevant road or highways authority should normally be consulted about training requirements. Event organisers must be aware that those installing, maintaining or removing signs and equipment (as well as those monitoring road or carriageway closures) have no inherent powers of direction to road users. Only lawfully placed traffic signs can impose a restriction or requirement. There is no flexibility to use signs of a different nature to those prescribed to control traffic e.g. double sided STOP board.

12.11.7. Events will need to be arranged to minimise the impact on the road network. As with works this includes minimising disruption to parking, particularly for domestic properties. Residential properties should be given prior notice of any closures or suspension of parking along with an indication of where alternative parking, with sufficient spaces, will be available. Given some groups with protected characteristics are less likely to have sufficient information on parking restrictions through signs, or the internet, residents will need to be provided with a hard copy of this information

12.11.8. Where residents affected by event TTM have a relevant disability (not just those with blue badges) and declare that they are not able to walk to or from an alternative parking location the event organiser is required to provide assistance. If not provided by the event organiser the duty to provide assistance will be with the authority.

12.11.9. Pedestrian access must be maintained to properties at all times (and by extension as vehicle access for all disabled users (not just Blue Badge holders) unless alternative access arrangement mentioned above are proved by the event organiser or authority). Events should ensure that all roads not closed as part of the event retain access to the wider road network. This is not just for emergency services, in residential areas for example those with relevant protected characteristics may depend on access for carers and deliveries. This may require alternative access options to be adopted, such as changing the route of an event so only closing roads where their side roads have an alternative exit, or only closing roads in one direction and having a one-way 2.0 m or 2.5 m wide lane for left in/ left out access to cul-de-sacs. If access to the wider network cannot reasonably be retained, then the road will be required to be formally closed with an order and alternative provision of residential parking with access to the wider networks provided (and if requested, assistance provided to and from that location).

12.11.10. Further guidance on events is given in the DfT Traffic Advisory Leaflet TAL04/11 ‘Using temporary traffic signs for special events’

https://www.gov.uk/government/publications/temporary-traffic-signs-for-special-events

12.11.11. Guidance on the use of portable variable message signs, which are sometimes used at events, is given in the DfT Traffic Advisory Leaflet TAL01/15 Variable Message Signs

https://assets.publishing.service.gov.uk/media/5a7e1e2a40f0b62305b80eac/150123_TAL_Variable_Message_Signs__for_web_publication_.pdf

12.11.12. Whilst some of the references in both TALs have been superseded, much of the information in them remains relevant

12.11.13. Cycle events have specific signs prescribed where they are undertaken on an otherwise open road (only on roads with a permanent limit of 60 mph or lower). Where cycle events are undertaken on a road formally closed to other users (and other road users will not encounter cycles in the event) then this would need to be signed as a generic event.

13 OPERATIONAL CONSIDERATIONS FOR STATIC TTM

13.1 General

13.1.1. Low traffic capacity can be expected at some sites during the first few days of operation. It is important not to make inappropriate changes to the TTM until drivers become accustomed to the situation. Changes during this period may increase the risk to the workforce and road users.

13.1.2. The following should be kept to a minimum:

- the extent of all excavations and temporary obstructions.
- the time taken to complete the works in a safe and practicable manner.
- the number of vehicles entering and leaving a site.

13.1.3. On motorways and dual carriageway roads workers (in vehicles) making their way into and out of TTM arrangements need to use vehicles fully compliant with the relevant requirements outlined within **Section 14**.

13.1.4. The provision for the parking of personal vehicles, and those not involved in the works, should be made off site.

13.2 Crossing the carriageway on foot

13.2.1. Crossing any carriageway on foot can be a hazardous activity. It should only be done by suitably trained operatives. Whenever practicable such crossings should be eliminated or minimised. However, in some situations it is both a safe, and safest, method of installing TTM; therefore operatives should always be trained in how to cross both high and low speed carriageways.

13.2.2. If required, crossing on foot should be carefully planned with location specific risk assessments to ensure:

- crossings are not undertaken whilst working alone.
- there is a place of safety at both sides of the carriageway (both single and dual carriageways).
- the central reservation provides a sufficient place of safety if used.
- the location chosen for the crossing has adequate sight lines, in both directions if appropriate.
- the person crossing should not run, to reduce the risk of tripping and falling.
- there are sufficient gaps in the traffic, at least three seconds (or 150 m) per lane to be crossed, to allow the operative to walk across briskly.
- crossing of carriageways with more than four lanes should be avoided.

13.2.3. All site personnel on dual carriageways subject to a permanent speed limit above 60mph should be transported to worksites by suitable vehicles once the full traffic management is in place. Individuals should not make their own way into and out of the site across live traffic lanes.

13.2.4. For further guidance on crossing high-speed roads see the HSE publication entitled ‘Reducing risk in temporary traffic management operations’

https://www.hse.gov.uk/pubns/cis53.pdf.

13.3 Installation of static temporary traffic management

13.3.1. The organisation responsible for the TTM operation should address the following points prior to commencing operations:

- operatives should be aware of the proposals and familiar with their role in particular.
- checks should be made to ensure that the required resources are available as outlined within the method statement.
- operatives should be made aware of any site-specific hazards, such as overhead cables. This may be achieved by holding a safety induction.
- all persons involved in the operation must wear high-visibility garments; see **Section 15.2**.
- to minimise direct risk and reduce duration of exposure to risks, TTM should be implemented during periods of low traffic flows. As such the commencement of TTM operations should relate to the traffic flow rather than a specific time.
- weather forecasts should be consulted to confirm the required levels of visibility are likely to be maintained throughout the operation. Forecasts should also inform the viability of putting down temporary markings and adhesive studs.
- equipment should be in acceptable condition and assessed prior to delivery to site. Guidance on the acceptable condition of traffic management equipment is given in **Section 5.4**.
- assumptions made in the method statement (refer to **Section 3.7**) should be checked and confirmed. Any changes required to the method statement of TTM design as a result should be noted.

13.3.2. During the installation of TTM, as far as practicable, operatives should work facing oncoming traffic with traffic management delineators between themselves and approaching traffic.

13.3.3. Any available footway or verge should be used when collecting or transporting equipment on foot, see **Section 4.2**.

13.3.4. TTM signs and other equipment erected needs to:

- be secure and upright.
- not hidden from view by other temporary signs, existing features, or vegetation.
- not interfere with the visibility of permanent signs (see **Section 5**).
- not obstruct sightlines at junctions and accesses.
- maintain adequate access, and not present a hazard, to pedestrians, cyclists and other non-motorised users.

13.3.5. Large signs may be hinged to ease and facilitate their handling. Any hinge arrangement should not compromise the appearance of the sign.

13.3.6. Methods to avoid directing traffic into lanes temporarily occupied by traffic management vehicles should be implemented. Where there are advance signs for lane closures in place, avoid having traffic management vehicles stop in the remaining open lanes.

13.3.7. Whilst setting out advance warning signs and establishing the taper, a sign to working drawing 7001.3 with the legend ‘WORKFORCE IN ROAD SLOW’ (S13-9; **Figure 13.1**) should be positioned on the nearside of the carriageway, in advance of the first crossing point. The variant ‘SETTING OUT ROADWORKS AHEAD’ may also be used. These signs should be enhanced by the addition of a high intensity flashing warning light, see **Section 4.21**. Alternatively, if VMS are available then these should be used to display the message

'WORKFORCE IN ROAD SLOW', see **Section 8.8**. The temporary sign or VMS message should be removed immediately following completion of the setting out work.



Figure 13.1 Sign to working drawing 7001.3 (S13-9) WORKFORCE IN ROAD SLOW

13.3.8. Signs and cones should be set out in sequence moving towards the site of the works. This starts with the 'road works ahead' sign to diagram 7001 (S13-2-9; **Figure 13.2**) at the recommended distance from the start of the taper.



Figure 13.2 Diagram 7001 (S13-2-9) Road works ahead

13.3.9. There are particular hazards associated with the installation of these initial signs and cones. It may be useful to use a suitable variant of the MCC technique, this may facilitate cones being placed up an exit slip road. By exception, the police or traffic officers may have powers to undertake a rolling road block.

13.3.10. Consideration must be given to the state of the TTM at all times during installation. Where TTM needs to be installed over several nights, the design should take account of and remove or control the risks associated with the intermediate traffic management.

13.3.11. Whenever TTM operations involve regular repetition of layouts (e.g. use of overnight near side lane closures), consideration should be given to changing legends or uncovering and re-covering signs using remote-control methods.

13.3.12. Following the installation or modification of any TTM arrangements, an inspection needs to be carried out to ensure that all signs and delineators are correct or have been removed or covered as appropriate. The nominated person responsible for undertaking the inspection must be adequately trained and competent (see **Section 15.1**). This person would normally be the Traffic Safety Supervisor (TSS) and referred to as Traffic Safety and Control Officer (TSCO) or:

- Nominated deputy.
- Foreman/lead operative responsible for activities in the working area.
- Works supervisor.
- Ganger.
- Resident engineer, or.
- Highways inspector or superintendent.

This list is not exhaustive.

13.3.13. The inspection needs to include a review from the road users perspective helping to ensure that signs are not obscured, legends are readable, and manoeuvres are safe. It is recommended the inspection is formally recorded as evidence of the adequacy of the TTM.

13.4 Maintaining static temporary traffic management

13.4.1. For the duration of the TTM regime, the following must be maintained to a safe condition:

- signs, cones and barriers.
- warning lights and any temporary area illumination.
- temporary road markings.
- existing road markings that form part of the TTM layout.
- For guidance on the assessment of the condition of TTM equipment see **Section 5.4**.

13.4.2. Sufficient resources need to be made available at all times by the contractor to carry out the required checks and maintenance of the TTM at the intervals recommended by the TTM designer (see **Section 3.4**). Suitable risk assessments and method statements should be produced by the TTM contractor for these maintenance operations. It is recommended that the checks and remedial actions should be recorded formally. This will provide evidence as to the adequacy and also allows recurrent problems to be identified.

13.4.3. The maintenance of any particular layout may vary throughout the duration of the scheme. This may be due to things like varying volumes of traffic or changes in weather. The designer must consider the methods and requirements of maintenance of the designed TTM.

13.4.4. During the maintenance of TTM the use of a sign to working drawing 7001.3 with the legend ‘WORKFORCE IN ROAD SLOW’ (S13-9) should be considered.

13.4.5. The frequency of inspections should be defined by the traffic management designer. For heavily trafficked sites this may be at a frequency of two-hourly intervals, twenty-four hours a day. On large schemes, it may well take two hours for the maintenance crew to travel around the site, effectively making the maintenance a continuous operation.

13.4.6. Sites which are unoccupied overnight or at the weekend still require the TTM to be inspected and maintained. This also includes temporary layouts which are not part works (the frequency of inspections for temporary layouts will need to be determined on a site by site basis).

13.4.7. The TTM designer may increase the minimum required frequency of inspections if:

- the site is prone to vandalism, or.
- the site is in the vicinity of a highly populated areas with vulnerable persons, school, or play area, etc.
- it is in an exposed or other location where weather conditions affect the TTM.

13.4.8. Remedial actions should be undertaken in accordance with the method statements produced for the maintenance of the site. If this is not possible, the actions should be in accordance with the principles outlined with **Section 3.7**.

13.4.9. Remedial actions, such as replacing damaged or displaced signs, carriageway markings or cones needs to be done as soon as it is safe and practicable to do so and should be within 12 hours of being reported.

13.4.10. If adopted in association with physical measures as part of the safe system of work, temporary speed limit signs must always be in place. Intermittent placement of speed limit signs, or the presence of contradictory permanent signs will mean enforcement is not possible.

13.4.11. Inspections of speed limits, regulatory aspects or element should be formally logged. These records may need to be used in enforcement cases to show signing complied with the requirements of this document and relevant Regulations.

13.4.12. Where recurrent problems are identified, such as repeated damage to TTM, then the TTM designer should be consulted. The designer should consider improvements to the layout and where appropriate, the designer should consult with the police and other parties.

13.5 Removal of static temporary traffic management

13.5.1. The removal of TTM arrangements should be undertaken with the same level of planning as those taken for its installation.

13.5.2. During the removal of TTM the use of a sign to working drawing 7001.3 with the legend 'WORKFORCE IN ROAD SLOW' (S13-9) should be considered.

13.5.3. Checks to confirm the completion of all construction works, safety inspections and audits on the carriageway and/or footway should be undertaken before the TTM arrangement is removed. The carriageway and/or footway should also be unobstructed and safe for traffic and pedestrians.

13.5.4. In general, the TTM should be removed in a reverse order from its installation, working from the 'end of road works' sign towards the advance road works signs sequentially. The 'road works ahead' sign to diagram 7001 (S13-2-9) should be the last piece of equipment to be removed or covered to afford operatives the maximum potential protection.

13.5.5. During the removal of TTM, as far as practicable, operatives should work facing oncoming traffic with traffic management delineators between themselves and approaching traffic.

13.5.6. Following the completion of the works or removal of the TTM arrangements, an inspection should be carried out to ensure that all signs and delineators have been removed or covered as appropriate. Any remaining TTM should be checked for correctness as appropriate.

13.5.7. The inspection should include a review from the drivers' perspective helping to ensure that all temporary signs and equipment have been removed and any permanent road signs that were covered or removed have been reinstated correctly. It is recommended the inspection is formally recorded as evidence of the adequacy of the removal.

13.5.8. During the time works are in place, temporary signs and equipment relating to the works activities may be placed on a road. These signs must be removed when the works are complete. The only exception to this removal is sign to diagram 7007.1 (S13-6-2; **Figure 13.3**) which may be kept in place for three months after the works have been completed.



Figure 13.3 Diagram 7007.1 (S13-6-2)

13.5.9. Signs to diagram 7014 (S13-6-37; **Figure 13.4**) must have a date on the back by which the person placing the sign reasonably believe the sign will be removed. This date must be no later than 3 months after the sign is placed on, or near, a road. These signs provide warning for users after the completion of works and must not be used to indicate a temporary change in the road layout ahead during road works or temporary situations.



Figure 13.4 Diagram 7014 (S13-6-37) Changed priorities ahead - variant

13.5.10. Removal dates should also be placed on relevant signs prescribed by Schedule 13-9 when not part of TTM associated with works. The date must be no later than the last date permitted by Schedule 13-12-16.

13.5.11. Regular audits to identify signs which are no longer required or are approaching their removal dates should be undertaken.

Temporary removal

13.5.12. TTM signs and equipment that is only in use during off peak periods should be removed from site or stored where it poses no risk to road users, as a potential distraction or hazard.

13.5.13. Where works are expected to stop for a number of days, such as over a weekend, the contractor must assess the practicability of removing the TTM equipment. If removal is not reasonably practicable, the contractor should seek to continue working through the period in question, subject to local restrictions.

13.5.14. Where the length of the works is reduced, rather than being fully removed, during off peak periods the following signs may need to be changed:

- approach signings.
- speed limit signs.
- signs with distances.

Signs should be changed or removed without the need to retain redundant, misleading, or incorrect signs.

13.6 Working in the hours of darkness

13.6.1. Traffic flows and other factors require some TTM activities to be undertaken during the hours of darkness. As such these operations require additional planning, resources, and procedures to those operations undertaken during daylight hours.

13.6.2. Where it is necessary for works being conducted in the hours of darkness, the following checks should be conducted during daylight:

- stopping points for vehicles should be identified.
- proposed locations for signs, tapers and longitudinal coning should be identified.
- verges and central reservations should be inspected for hazards and adequate width for safe placement of temporary signs.

- sight lines at carriageway crossing points should be checked.
- locations of overhead electric lines likely to impinge on the TTM activities should be identified.

13.6.3. Consideration should be given to pre-placing covered signs in the central reservation or verge during daylight hours. Signs can then be secured upright during the hours of darkness.

13.6.4. The risks posed to operatives from high traffic flows may be reduced during the hours of darkness. Other factors associated with working during the hours of darkness however will increase the risks posed to operatives, including;

- an increase in poor driver behaviour.
- higher vehicle speeds.
- limited vision.
- difficulty judging distance.
- fatigue.

13.6.5. During the hours of darkness, warning lights and high intensity flashing warning lights, where relevant, must supplement signing and cones as appropriate (see **Section 5.5**).

13.7 Adverse weather conditions

13.7.1. TTM operatives and contractors should be aware of the following adverse effects caused by weather:

- decreased visibility caused by fog, falling snow or heavy rain.
- increased stopping distances of vehicles in wet and icy conditions.
- the impact of reflective glare from sunlight on a wet road surface.

13.7.2. Risk assessments should identify the hazards associated with adverse weather, along with the required controls to be implemented. The TTM operator should seek agreement with the client, or authority control room if relevant, regarding acceptable limits of adverse weather prior to work taking place.

13.7.3. When the onset of adverse weather affects the visibility of TTM arrangements, additional high intensity flashing warning lights may be placed on the approach to the site, as prescribed in S13-10.

13.7.4. If adverse weather conditions persist, in the interest of safety, it may be advisable to cease work and clear the site of all personnel. In some exceptional cases, the carriageway may be cleared of all obstructions caused by the works, if this can be done safely. Those supervising the works and maintaining the TTM should make these initial decisions. Where there is a wider network impact of adverse weather, e.g. flooding of diversion, or alternative, routes, the final decision on the implementation, maintenance, and removal of TTM is for the police and/or client and will depend on all the prevailing circumstances.

13.8 Surface dressing

13.8.1. Requirements for TTM arrangements relating to surface dressing operations are included in the RSTA/ADEPT documents ‘Guidance for Temporary Traffic Management at Surface Dressing Sites’ and ‘Guidance on Temporary Traffic Management on Slurry Surfacing and Microsurfacing Sites’; see References (**Appendix B**). For further guidance, see **Section 4.46**.

13.8.2. Signs to diagram 7009 (S13-2-10) 'loose chippings' are used to warn drivers during surface dressing operations (see Chapter 4). The sign must be reflectorised if not directly lit and must be retained in position until the danger from flying chippings has passed. The sign should be accompanied by an advisory plate to diagram 7009.1 (S13-4-3), advising a risk of skidding and maximum speed of 20 mph whilst the chippings are being embedded by traffic, see **Figure 13.5**.



Figure 13.5 Diagram 7009 (S13-2-10) Loose chippings on the road ahead combined with plates to diagram 7009.1 (S13-4-3) Skid risk and maximum advised speed limit

13.8.3. It is not appropriate to allow traffic to drive over unchipped binder.

13.8.4. During heating and planning operations, adequate space must be allowed to ensure that pedestrians and vehicles, especially those with inflammable loads, are not endangered.

13.9 Portable traffic signals

13.9.1. Throughout this document the use of portable traffic signals is discussed. The DfT booklet document 'An introduction to the use of portable vehicular signals' (TSO, 2016) has been withdrawn. The Association for Road Traffic Safety and Management (ARTSM) have produced advice titled the 'Guidance on the use of portable traffic signals' which is available as a PDF download from their website and as hard copy. This constitutes best practice in Great Britain.

13.9.2. Where signals are used to control traffic they should not introduce new hazards and ensure traffic flows as smoothly as possible for the circumstances. Queuing traffic should not extend past the previous controlled junction. The visibility of signals should not be affected by adjacent lighting such as floodlights etc.

13.9.3. All portable traffic signals must be to diagram 3000.1 (S14-2-2; **Figure 13.6**) and be capable of operating under the following modes:

- vehicle actuated, this is the normal mode of operation and should be used in all cases except where the authority directs otherwise in writing.
- fixed time.
- manual, when the operation of the signal is under the control of a competent operator at all times to deal with short term problems such as blockages. Short term manual operation may be done without reference to the authority where an issue has arisen.

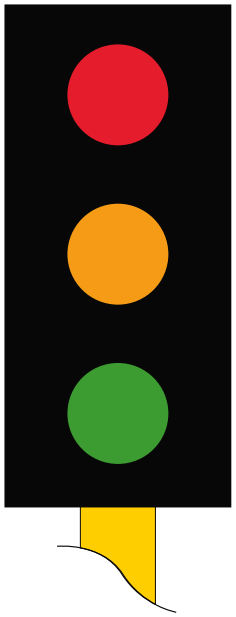


Figure 13.6 Diagram 3000.1 (S14-2-2) Portable light signal

13.9.4. The settings for signals must be undertaken or supervised by competent persons, to ensure that minimum delays are obtained. Contractors should ensure that such persons are available throughout the period during which traffic control is necessary.

13.9.5. Maximum green times should be altered to cater for appreciable changes in tidal flow (e.g. morning, evening, or off-peak conditions).

13.9.6. During the hours of darkness on unlit roads, in case of signal lamp failure, the base of the signal support should be marked by a separate non-flashing warning light.

13.9.7. Signals should be gradually moved on sites where the work moves progressively.

13.9.8. For distances greater than 300 m, alternate one-way working should not be used without prior consultation with the authority.

13.9.9. The detectors used within the signals for vehicle-actuated operation are most effective when the signal is positioned on the nearside of approaching traffic. For further information, see **Section 6.10**.

13.9.10. Where cable crossing protectors are used they need to be secured against movement, be considered safe and fit for purpose by the authority and not present a risk to road users passing over them.

13.9.11. When used, cable crossing protectors will need to be accompanied by ‘RAMP AHEAD’ and ‘RAMP’ signs (see **4.46.8**).

13.9.12. Positioning the signals on or near the centre line of the road removes the need for cables to cross running lanes, making them easier to move if required. This arrangement also reduces the chance of obscuration of the signals caused by stationary vehicles. However, the effective range of the detectors is reduced, resulting in issues due to the necessary gap between the signal head and the ‘WHEN RED LIGHT SHOWS WAIT HERE’ sign to diagram 7011 (S14-2-58; **Figure 13.7**) or ‘stop’ line to diagram 1001 (S14-2-46).



Figure 13.7 Diagram 7011 (S14-2-58) Point beyond which traffic must not proceed when required to stop

13.9.13. Appropriate risk assessments and contingency planning should be in place in case of signal failure. Where signals fail, or stop cycling through the relevant sequence the sign 'Traffic light signals not in use' to diagram 7019 (S14-2-61; **Figure 13.8**) may be used. This sign must be reflectorised. To avoid confusion traffic signals should normally be switched off whilst sign to diagram 7019 remains in place. The maintenance of traffic signals is dealt with in **Section 6.10**.



Figure 13.8 Diagram 7019 (S14-2-61) Traffic light signals not in use

13.9.14. In the event of signal failure, the equivalent number of 'STOP/GO' boards to diagram 7023 (S14-2-64) and 7024 (S14-2-65), see **Figure 13.9**, must be available. To facilitate rapid deployment by sufficiently trained operators, the 'STOP/GO' boards should be stored under or next to the signal controller. For further details of the operation of 'STOP/GO' boards, see **Section 6.7**. When used in event of a signal failure the use of 'STOP/GO' boards would prohibit the use of 'all red' operations (see **Section 6.13**).



Figure 13.9 Diagrams 7023 (S14-2-64) STOP and 7024 (S14-2-65) GO

13.9.15. It may also be appropriate to keep sufficient 'TRAFFIC CONTROL AHEAD', 'WHEN STOP SIGN SHOWS WAIT HERE' signs in reserve to enable 'STOP/GO' traffic control. See **Section 6.7** for further guidance.

13.9.16. When not in operation, for any significant period of time, the signal head should be bagged over and the 'traffic signals ahead' signs to diagram 543 (14-2-28) must also be removed. For periods of less than one-week signs to diagram 7019 (S14-2-61) may be erected, either on the signal post or in advance, instead of bagging over the signal head. Signs to diagram 7019 should never be used if other signals are in use at the site.

13.9.17. Other than in short-term situations, Traffic Signal Maintenance signs to working drawing 7010.1 (S13-9) should be used in advance of the signals when personnel are working on the portable traffic signals in close proximity to traffic.

13.9.18. Where the use of a ‘stop’ line to diagram 1001 (S14-2-46) is inappropriate or impracticable, the ‘WHEN RED LIGHT SHOWS WAIT HERE’ sign to diagram 7011 (S14-2-58) can instead be placed 3 m in advance of the portable traffic signal. The sign indicates the position the first vehicle should wait. Sufficient room should be provided to ensure that vehicle from the opposite direction is able to clear waiting vehicles and to return to their own side of the road, if necessary.

13.9.19. Where designers have decided junctions normally controlled by ‘GIVE WAY’ signs, require control by multiphase portable traffic signals the ‘GIVE WAY’ sign and lines should be temporarily masked or removed.

13.9.20. The most appropriate choice of signals for junctions normally controlled by permanent signals is dependent on the position of the works. A temporary change in the position of the stop line and/or one signal head may suffice. If use of the detectors as part of permanent signals is not appropriate, traffic signal control should be switched to provide a permanent demand on that phase. If delays are likely to result from the fixed time operation, alternative detection arrangements should be considered for works of more than a few days.

13.9.21. Other situations may require temporary signals to control traffic rather than the permanent signals. With the permanent signals switched off, the following options may be implemented:

- a reconfigured permanent signal controller and signals to diagram 3000 (S14-2-1).
- a multiphase portable signal set, or.
- a manual method of traffic control.

13.9.22. Any unused permanent signal heads must be covered, for example during a temporary one-way system on a two-way road.

13.9.23. Where the road works do not actually include a junction, but one is so close that difficulties may be encountered, multiphase control of the junction and shuttle lane may be inevitable, even though either the junction or shuttle lane taken in isolation would not require signal control (see Chapter 6).

13.9.24. Relatively minor junctions within a controlled area may not require separate signalling and the provision of warning signs. Clear visibility from the side road to both ends of the works is required, ensuring emerging vehicles are not confronted by oncoming traffic. For further information, see **Sections 6.10** and **6.14**.

13.10 Specification for an automatic braking system

13.10.1. This is a generic specification for systems intended to apply the brakes of a HGV in the event of a collision from the rear.

13.10.2. This specification only applies when the said system is fitted to a vehicle being employed for the purpose of acting as an IPV or block vehicle for an MLC.

13.10.3. The fitment of all such devices requires a ‘Notifiable Alteration’ to be recorded with the DVSA.

13.10.4. The purpose of this specification is to ensure that automatic impact braking systems meet certain minimum performance standards and have no deleterious effect on the operation of the standard service, secondary and parking brake systems. It is not intended to be a comprehensive design specification. Manufacturers should design their system and its components within the constraints contained in this specification.

13.10.5. The impact braking system should be energised by a driver-operated control, but it should only be capable of functioning when the control is in the on position and the truck mounted attenuator (TMA) has been lowered.

13.10.6. If the driver-operated control is in the on position, the impact braking system should be automatically enabled when the TMA is lowered. Conversely, raising the TMA should automatically disable the impact braking system.

13.10.7. The system should incorporate one of the two following facilities:

- a diagnostic self-test function capable of detecting system defects and warning the driver, or.
- a manual test facility allowing an operator to check for the correct function of the system. This test should be sufficiently simple to be incorporated into routine daily maintenance schedules.

13.10.8. If a collision is detected the brakes should be applied to all wheels of the vehicle.

13.10.9. If the system has been activated, it should continue to apply the vehicle brakes until such time as it is reset by switching it off at a control specifically designed and marked for the purpose. It should not be possible to reset the impact braking system unless the parking brake has been applied.

13.10.10. The system should be designed and installed in such a way that it has no effect on the normal operation of the service, secondary and parking brake systems.

13.10.11. The system should be designed and installed in such a way that any malfunction within it has no influence whatsoever on the operation of any aspect of the standard vehicle braking systems. The only result would be the illumination of a warning light in the vehicle cab.

13.10.12. The design and installation of the impact braking system should not have any influence on the effects of a fault within the standard vehicle braking systems.

13.10.13. The impact braking system should never take an air supply from the input side of the four-circuit protection valve.

13.10.14. If the impact braking system takes an air supply from the service brake system, then it should be isolated from the service brake by means of a dual circuit protection valve.

13.10.15. Electrical or magnetic fields should not adversely affect the operation of the impact braking system. It also should not emit electrical or magnetic fields that could adversely affect other vehicle systems. This should be demonstrated in accordance with EMC Type Approval Assessment to ECE Regulation 10 (Revision 5, 9.10.2014) and 72/245/EEC as amended

13.10.16. The impact braking system should be insensitive to power line transient signals. This should be tested in accordance with ISO 7637.

13.10.17. The impact brake system should be equipped with a control to enable the system to be released and reset manually after an accident. This control should be clearly marked and positioned in an easily accessible place. It should not be possible to reset the impact braking system unless the parking brake has been applied.

13.10.18. The impact braking system should be fitted or modified only by qualified personnel approved by the manufacturer of the system.

13.10.19. All wiring and components should conform to the requirements of BS EN 60068 with regard to protection from environmental factors such as vibration and humidity.

13.10.20. All components and subsystems should be insensitive to temperature within the range –20º C to +50º C. This is of particular importance to the impact sensor if it is of the rubber air-filled tube type.

13.10.21. The system should be insensitive to accelerations of less than ±1 g horizontally and ±4 g vertically.

13.10.22. The impact sensor will be exposed to a harsh working environment. It should be extremely rugged, durable, and resistant to physical damage.

13.10.23. The mechanical integrity of components, wiring and piping in the impact braking system should be at least as good as that of the standard vehicle braking system. Pipes should be resistant to rupture and both pipes and wiring should be routed carefully to avoid fretting.

13.10.24. Components should either be designed for the life of the system or should have a service or replacement interval marked on them or published as part of a comprehensive aftercare manual.

14 OPERATIONAL VEHICLES

14.1 General

14.1.1. Production vehicles are rarely suited to site work in their standard form and are likely to require modification. Before purchasing a vehicle to adapt for site use, the following factors should be considered:

- the model's suitability for modifications.
- the model's ability to carry the necessary equipment.
- the ease with which an operator can move from the offside seat to the nearside door.

14.1.2. The choice of vehicle should reflect the acceleration and manoeuvrability required of the vehicle during normal working conditions.

14.1.3. All vehicles and equipment must be checked for correct operation before work commences. Basic vehicle checks should always include fuel, lights, electrics, and tyres. All checks should be documented, and all faults reported prior to work commencing. If necessary, the vehicle or equipment should be taken out of service until faults are rectified.

14.1.4. All site vehicles should, where practicable, have good all-round visibility. This may be achieved by substituting vehicle models; for example, estate cars should be used in preference to vans. Where substitution is not practicable, additional mirrors should be fitted to eliminate blind spots.

14.2 Parked vehicles

14.2.1. In some circumstances, vehicles may need to be parked on the carriageway in order to undertake the works off the carriageway.

14.2.2. Sign, cone, and barrier layouts for works on minor roads without parked public vehicles are provided in **6.2.5**. The presence of an occasional parked private vehicle does not require different treatment from what is specified in **Section 6.2**.

14.2.3. In the interest of safety, vehicles in attendance at works on the carriageway should be conspicuous (see **Section 14.7**). Where a vehicle that meets these conspicuity requirements is parked within the coned-off area, the 'lane closed' barrier to diagram 7105 (S13-6-8) does not need to be used.

14.2.4. Works vehicles and plant should not be parked in a position where they are likely to obstruct junctions, accesses, driveways, or cause visibility issues to other road users.

14.2.5. For works on the carriageway with a works vehicle in attendance, either the 'road works ahead' signs to diagram 7001 (S13-2-9) or the 'road narrows' sign to diagram 517 (S2-2-14) may not need to be provided in advance of the works if all the following conditions are met:

- the permanent speed limit is 30 mph or less.
- there is a total two-way traffic flow of less than 400 vehicles per hour.
- less than 20 heavy goods vehicles and buses pass the works site per hour.
- a roof-mounted flashing amber beacon is continuously operating.
- the beacon is always clearly visible from a distance of at least 50 m on each approach.

14.2.6. The parking of public vehicles is usual on some minor roads and works may need to take place in the space between parked public vehicles. In such cases, advance warning of the works should be provided, if practicable, by a 'road works ahead' sign to diagram 7001 (S13-2-9). Advance warning should be provided if the delineated area (including working space and safety zones) extends into the carriageway beyond the line of vehicles.

14.2.7. For works on carriageways with parked vehicles, a line of cones should be placed in the carriageway along the length of the works in line with the parked vehicles. The works should have a continuous barrier on the footpath side to safeguard pedestrians (see **Sections 4.17** and **4.20**). If the delineated area, which includes a safety zone, extends into the carriageway beyond the line of vehicles a 'keep left/right' sign to diagram 610 (S3-2-3; **Figure 14.1**) will be required. Provisions should be made for the installation of any necessary additional barriers and coning to safeguard the perimeter of the works as parked cars are moved from the vicinity of the works.



Figure 14.1 Diagram 610 (S3-2-3)

14.2.8. If a works vehicle is present at this type of work, it may occupy one of the parking spaces next to the site. Space for an additional works vehicle can be reserved by extending the coned area.

14.2.9. If most of the parked vehicles are removed so that the site of the works becomes exposed to traffic, it will then be necessary to revert to the arrangements described in **6.2.5**.

14.3 Use of vehicles in lanes closed by red 'X'

14.3.1. Works vehicles or IPVs may enter a lane closed, indicated by the use of a red 'X' to diagram 6031.1 (S15-2-14; **Figure 14.2**), for the purposes of establishing or enhancing ETM (see **Section 8.2**). The prohibition indicated by the red 'X' is only cancelled by the display of 'END' or diagrams 670 (S10-2-1) or 671 (S10-2-2) on a signal. As such, contractors must not place any IPV or TTM in a live lane which would result in road users entering a closed lane.

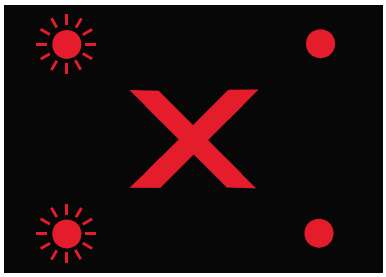


Figure 14.2 Diagram 6031.1 (S15-2-14) Gantry mounted light signal displaying the prohibition of a lane closed ahead

14.3.2. Diagram 6031.2 (S15-2-15; **Figure 14.3**) is a signal aspect which is displayed on a verge mounted sign or on a sign placed partly over the verge and the carriageway. This, along with diagrams 6002.1 (S15-2-3) and 6008.2 (S15-2-6) as seen in **Figure 14.4** and **Figure 14.5**, can be combined to display a variety of lane control aspects. The provision for works vehicles and IPVs entering a lane closed by diagram 6031.2 (S15-2-15) is the same as for diagram 6031.1 (S15-2-14).

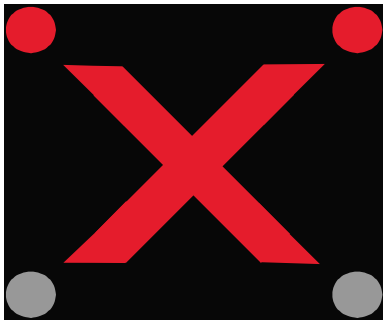


Figure 14.3 Diagram 6031.2 (S15-2-15) Verge mounted light signal displaying the prohibition of a lane closed ahead

14.3.3. For planned works, the display of a red 'X' to diagram 6031.2 (S15-2-15) and a cranked arrow to 6002.1 (S15-2-3) should only be used during the setting up and removal of TTM. During the works, lane closure information should be on separate signing under the control of the TTM provider. Permanent VMS may display diagram 6008.2 (S15-2-6) as part of the approach signing (see **Section 5.2**).



Figure 14.4 Diagram 6002.1 (S15-2-3) Cranked arrow – traffic must move to the next lane

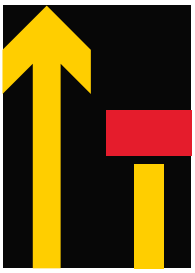


Figure 14.5 Diagram 6008.2 (S15-2-6) Closure of one lane of a two-lane carriageway ahead

14.4 Use of vehicles at road works

14.4.1. Roof-mounted flashing amber beacons and vehicle markings may constitute sufficient warning to other road users of the obstruction caused by a works vehicle if:

- used in urban situations, or where traffic speeds are low.
- used for very short duration stops (less than 15 minutes).

14.4.2. However, when approach visibility is poor, traffic flows are heavy and/or traffic speeds are high, additional warning needs to be given by the use of a tapered length of cones on the approach side (see **Table A1.3**, **Appendix A1**) and advance road works signs. For further guidance on short duration stops, see **Section 12.9**.

14.4.3. On all-purpose roads, where a works vehicle is parked in advance of the works with the intention of providing some physical protection, a minimum clearance between the works

vehicle and the working area should be provided. **Figure 14.6** shows the minimum clearances for all-purpose roads for different speed limit ranges.

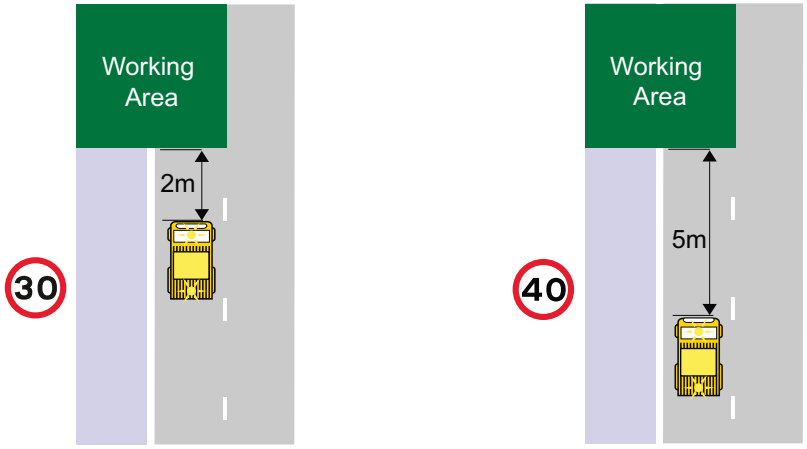


Figure 14.6 Longitudinal clearance provided by works vehicle for all-purpose roads with (a) a 30 mph speed limit or less and (b) a 40 mph speed limit or more

14.4.4. Most traffic regulation orders dealing with waiting restrictions on minor roads make exemptions for vehicles belonging to statutory undertakers, local authorities and contractors carrying out road works. These vehicles may wait despite the presence of waiting restrictions in the area. In these circumstances, provided that the presence of parked vehicles is uncommon, and the road works are wholly within the footway, no advance signs are required. As a minimum, a roof-mounted flashing amber beacon and barriers protecting the works are required in these situations. If the road works are in the carriageway, extra precautions will be needed.

14.4.5. During routine maintenance of street lighting equipment, overhead telecommunications and electricity works by undertakers, it is often necessary for a vehicle to stand on the carriageway. The vehicle will have a hoist system to raise operators and replacement equipment to the required height. Nets should be provided around and under the bucket to catch any articles dropped by the operators.

14.5 Use of vehicles to install and remove temporary traffic management

14.5.1. The presence of stationary or slow-moving vehicles in live traffic lanes on high-speed roads should be minimised. Where TTM operations involve the encroachment of stationary or slow-moving vehicles into live traffic lanes on a dual carriageway, these vehicles should:

- be afforded impact protection.
- be fitted with a light arrow sign.
- be protected by advance signing (see also **Section 13.3**).
- take up a position in the centre of the lane to be blocked.

14.5.2. Where a vehicle does not comply with the above, it should be protected by another vehicle that does. This does not apply to vehicles entering or leaving the works area, hard shoulder, or verge.

14.5.3. On high-speed dual carriageway roads without hard shoulders, operations should be planned to identify safe taper positions which facilitate the provision of advance signing without the need for stationary or slow-moving works vehicles to encroach into live lanes when pre-placing, erecting, or removing traffic management equipment.

14.5.4. Where the procedure detailed in **14.5.3** is not practicable, one of the following options should be used:

- the works vehicle should be afforded impact protection and be fitted with a light arrow sign.
- the police or traffic officers implement an approved closure using either the police or, traffic officers, or.
- apply the Mobile Carriageway Closure technique (see **Section 11**).
- apply the Enhanced Mobile Carriageway Closure technique (see GG117 Appendix A) on roads which the vehicle mounted signs have been authorised for use.

14.5.5. For activities involving vehicles, the area within the taper and longitudinal safety zones should be treated as a live lane.

14.5.6. Vehicles which are located outside of the works area and are engaged in the installation and removal of traffic management equipment adjacent to live lanes should always face in the same direction as the traffic.

14.5.7. Trailers are not to be used for TTM operations which involve reversing.

14.6 Vehicle specifications

14.6.1. Vehicles used for the installation, maintenance, and removal of static TTM on high-speed roads needs to comply with the following specifications:

- the vehicle should be of a conspicuous colour (e.g. yellow or white – a non-reflective yellow colour, No. 355 (lemon) to Table 1 of BS 381C: 1996 ‘Specification for colours for identification, coding and special purposes’ is recommended) and / or.
- the vehicle may have company or client livery on the side of the vehicle.

Further specifications for individual vehicle types are listed in **14.6.2** to **14.6.5**. Compliance with all specifications listed in this section is also recommended for use on all types of road irrespective of speed limit.

14.6.2. Inspection/supervisor vehicles need to have:

- a 70 mm (desirable minimum) capital letter height ‘HIGHWAY MAINTENANCE’ sign to diagram 7404 (S13-6-12; **Figure 14.7**) externally mounted on the rear of the vehicle), preferably on a retroreflective background (see also **14.7.10**).
- a roof-mounted amber light bar (visible 360°) with a minimum of two independent light sources.
- reflective and retroreflective markings on the rear of the vehicle in accordance with **Section 14.7**.



Figure 14.7 Diagram 7404 (S13-6-12) HIGHWAY MAINTENANCE - Nature of work being done by vehicle working on a highway

14.6.3. Traffic management/maintenance vehicles (personnel/equipment carrier) need to have:

- a 140 mm (desirable minimum) capital letter height ‘HIGHWAY MAINTENANCE’ sign to diagram 7404 (S13-6-12; **Figure 14.7**), placed externally on the rear of the vehicle (see also **14.7.10**), preferably on a retroreflective background.

- reflective and retroreflective markings on the rear of the vehicle in accordance with **Section 14.7**.
- all seats fitted with head restraints and 3-point inertia reel belts.
- working lights.
- an audible reversing device.
- a front roof-mounted amber light bar (visible 360°) with a minimum of two independent light sources, and rear-mounted flashing amber beacons (visible 360°).
- a high visibility fluorescent yellow retroreflective strip along side of vehicle.
- HD CCTV for rearward vision (360° vision recommended).

14.6.4. Equipment installation/removal vehicles should have:

- a 140 mm (desirable minimum) capital letter height 'HIGHWAY MAINTENANCE' sign to diagram 7404 (S13-6-12; **Figure 14.7**) externally mounted on the rear of the vehicle, preferably on a retroreflective background (see also **14.7.10**).
- reflective and retroreflective markings on the rear of the vehicle in accordance with **Section 14.7**.
- all seats fitted with head restraints and 3-point inertia reel belts.
- working lights.
- an audible reversing device.
- a front roof-mounted amber light bar (visible 360°) with two independent light sources, and rear-mounted flashing amber beacons (visible 360°).
- a high visibility fluorescent yellow retroreflective strip along side of vehicle.
- a special adaptation to provide a low-level working platform with a guard rail arrangement within the normal width of the vehicle (e.g. tail lift or well).
- a driver/operative intercom system.
- HD CCTV for rearward vision (360° vision recommended).

14.6.5. Impact protection vehicles should have:

- a 10-tonne minimum on the road weight.
- a TMA – see **Section 14.9**. For details of the latest specification for TMA, see CD 378 'Impact and assessment criteria for truck mounted attenuators'.
- an automatic brake activation system.
- signing equipment in accordance with **Section 10.7**.
- a light arrow sign in accordance with **Section 10.8**.
- an audible reversing device.
- a 140 mm (desirable minimum) capital letter height 'HIGHWAY MAINTENANCE' sign to diagram 7404 (S13-6-12; **Figure 14.7**) externally mounted on rear of vehicle when TMA is in the stowed position. This will need to be on a retroreflective background, either as specified a relevant authorisation for a light arrow, or as identified in **Section 14.7**).
- a front-mounted amber light bar with two independent light sources and rear-mounted flashing amber beacons visible when the truck mounted attenuator (TMA) and the light arrow are in the stowed position.
- all seats fitted with head restraints and seatbelts with a minimum of three points of anchorage to the vehicle.
- HD CCTV for rearward vision (360° vision recommended).

NOTES:

a) A vehicle complying with this specification can also be used for the installation and removal of longitudinal coning as long as it is fitted with a special adaptation to provide a low-level working platform with a guard rail arrangement within the normal width of the vehicle (i.e. a ‘coning well’).

b) Unless at the scene of an incident, the light arrow sign should not display any form of arrow when the vehicle is on a two-way single carriageway road or when on a hard shoulder of a dual carriageway.

14.7 Vehicle conspicuity

14.7.1. Any vehicle engaged in works on the highway that is not in an established works zone should be of a conspicuous colour.

14.7.2. Any works vehicles that are used to protect the workforce or that form part of the signing of the works should be of conspicuous colour and have appropriate markings. This applies to the whole vehicle but is especially important for the parts of the vehicle that would be visible to drivers or the parts that make up the prescribed sign mounted on the vehicle.

14.7.3. On high-speed roads, all vehicles stopping on the highway for works purposes or inspections also need to be equipped with high visibility rear markings. High visibility rear markings should comprise of one or more of:

- signing to diagram 7403 (S13-6-10; **Figure 14.8**).
- the alternative light arrow sign in accordance with **Section 10.8**.
- chevron markings according to **Figure 14.9**, or.
- a solid block of red retroreflective material.

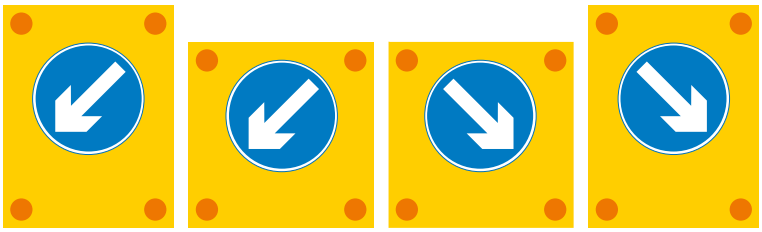


Figure 14.8 Diagram 7403 (S13-6-10) Other traffic keep to the left or right of vehicles carrying out mobile road works

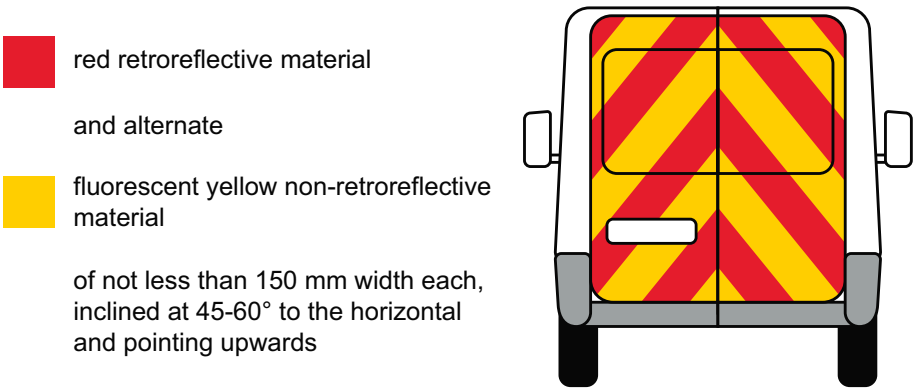


Figure 14.9 High visibility chevron rear marking with fluorescent yellow chevrons

14.7.4. Where the mounting angle is suitable Class R3B-UK, as defined in the National Annex to BS EN 12899-1 ‘Fixed, vertical road traffic signs’, retroreflective material should be used for vehicles stopping on high-speed roads. Class RA2/R2 materials may be used for roads with speed limits below 40 mph. Class RA1/R1 material is not recommended for works vehicles.

14.7.5. The chevron markings described in **14.7.3** should cover as much of the rear-facing portion of the vehicle as possible without obscuring windows, vehicle lighting or registration

plates. A solid block of red retroreflective material may be considered (particularly if space is limited) but chevrons normally maintain a higher level of conspicuity over different levels of diffuse and direct illumination likely to be encountered. Where the main body of the vehicle being used is not a recognised conspicuous colour (yellow or white) then, as a minimum, a high visibility fluorescent yellow retroreflective strip, of not less than 50 mm wide, along the side of vehicle should also be provided.

14.7.6. Red retroreflective tape needs to be applied to all rear facing edges of open doors, guardrails, and equipment lockers.

14.7.7. Where rear facing high visibility markings may be obscured by devices mounted on the rear of the vehicle (e.g. a TMA or cone laying adaptation), additional chevron markings complying with **14.7.3** needs to be applied to any rear facing portions of any such device. These markings should be displayed to the rear and to other road users any time that the vehicle is stopped on a high-speed road.

14.7.8. Works vehicles should be kept clean to maintain their conspicuity.

14.7.9. Motor vehicles with a maximum gross weight exceeding 7.5 tonnes and trailers with a maximum gross weight exceeding 3.5 tonnes must be fitted with rear markings in accordance with ‘The Road Vehicles Lighting Regulations 1989’.

14.7.10. Vehicles used for works purposes must be identified by displaying to the rear the sign to diagram 7404 (S13-6-12; **Figure 14.7**) ‘HIGHWAY MAINTENANCE’. The sign to diagram 7404 variant ‘MOTORWAY MAINTENANCE’ may be used instead when working on motorways only. A bilingual version of diagram 7404 may be mandated in some locations (either by legislation or authorisation). However, it would be an offence to drive such vehicle on roads outside the area covered by the legislation or authorisation.

14.8 Roof mounted beacons

14.8.1. Without prejudice to the specific requirements of the following sections, any vehicle stopping on the highway for works purposes or inspections must be equipped with either a roof-mounted flashing amber warning light bar (comprising at least two independent light sources) or two independent roof-mounted flashing amber warning beacons, visible through 360°.

14.8.2. Roof-mounted flashing amber warning beacons must comply with the requirements of the Road Vehicles Lighting Regulations 1989 and should, where relevant, also comply with the UN Regulation No. 65 on Special Warning Lamps.

14.8.3. Additional beacons should be fitted towards the rear of the vehicle if the main roof-mounted beacons are likely to be obscured by the vehicle or equipment it carries. Where a vehicle is displaying a prescribed or authorised light arrow, beacons to the rear of the vehicle will normally need to be switched off when the arrow is in use. For some authorised light arrows this is a mandatory requirement, contractors should check the relevant authorisation or with the vehicle/product supplier.

14.8.4. When a vehicle is stationary within the confines of a fully installed TM arrangement, the roof-mounted beacons should be switched off, unless they form part of the guarding of the works (e.g. works on minor roads) or are required for mobile works (see **Sections 10** and **11**).

14.8.5. Vehicles engaged in snow clearing, gritting operations, or similar work should always display a flashing amber warning beacon when operating.

14.8.6. Each warning beacon must display a light where the interval between each light is constant. When viewed from approaching traffic, or by other road users, the frequency of all visible beacons should be considered. This is essential to minimise the potential for inducing Photo Sensitive Epilepsy (PSE) where flashing / blinking lights of 2hz or higher may cause a reaction. The use of multiple beacons or lamps, particularly uncoordinated lamps to UNCE 65, which have an effective flash rate of above 4hz is unacceptable.

14.8.7. Beacons are intended to ensure vehicles are conspicuous without reducing the conspicuity of workers in the immediate area of the vehicle. Variable light outputs settings and/ or selective operation of beacons may be justified for maximising road worker conspicuity. The use of multiple beacons and lamps can, by over emphasising the vehicle, increase the likelihood of road users driving into the vehicle rather than avoiding it (known as the moth effect). This can be a particular problem outside works situations e.g. breakdown vehicles, wide load escorts, etc.

14.8.8. Beacons must not be fitted, or operated, in a way which could give the appearance of information, or an instruction, to road users e.g. a static or active arrow or strobe. Only prescribed or authorised signs may provide such information or instruction.

14.9 Impact protection vehicles

14.9.1. The purpose of impact protection vehicles (IPVs) is to:

- alert road users to the presence of road works vehicles on the hard shoulder or on the carriageway and, by association, road workers.
- provide appropriate information and instruction to road users via prescribed or authorised traffic signs.
- reduce the severity of injury to road users should a collision with a works vehicle occur.
- reduce risks to road workers on foot on the carriageway and working on the rear of works vehicles.
- reduce risks to road workers in and around TTM vehicles and other works vehicles.

14.9.2. The installation, maintenance, and removal of TTM may be carried out using one of the following options:

- Dual vehicle working – This is where two vehicles are used; the first (upstream) vehicle is fitted with a TMA and offers protection to the downstream works vehicle. Where practicable, the works vehicle may also be fitted with a TMA, or.
- Single vehicle working – This is where one vehicle acts as both the IPV and works vehicle.

14.9.3. The use of dual or single vehicle working is likely to result in different risks for road workers. As such, the decision to use either dual or single vehicle working (and the selection of the separation distance for dual vehicle working) should be based on ensuring that the risk to both road workers and road users is managed to a level that is ‘As Low As Reasonably Practicable’.

14.9.4. In some circumstances, it may be appropriate to use more than two vehicles with more than one upstream IPV. The principles of dual vehicle working still apply.

14.9.5. Research indicates that dual vehicle working may achieve the lowest level of risk posed to road workers when working in a live lane compared to other working methods (e.g. single vehicle working).

14.9.6. When working on a motorway or dual carriageway, dual vehicle working should normally be used when installing, maintaining and removing TTM, in accordance with the TMCA guidance document 'Temporary Traffic Management Vehicle Selection and Operation On High Speed Dual Carriageways Including Motorways'. Following the guidance in this document should substantially reduce road worker exposure to risks from traffic.

14.9.7. When using dual vehicle working, a separation distance of 75m (+/-25m), as shown in **Plans MLC1** to **MLC7** in **Section 10**, should always be used and maintained. Selection of an appropriate distance between the vehicles should consider that:

- shorter distances decrease the risk of road users re-entering the closed lane between the two vehicles but may increase the risk that, if the upstream vehicle is hit, it may be shunted into the rear of the downstream vehicle.
- longer distances decrease the risk of the upstream vehicle being shunted into the rear of the downstream vehicle, but present a greater likelihood of road users cutting back into the gap between the two vehicles and colliding with the rear of the downstream vehicle.

14.9.8. If the downstream vehicle is not fitted with a TMA, the severity of such a collision is likely to be greater.

14.9.9. Vehicles used for single vehicle working may or may not be equipped with a TMA.

- If it is fitted with a TMA, signing on the vehicle should comply with the recommendations in **14.6.1** and **14.6.5**.
- If it is not fitted with a TMA, it should not operate as a single vehicle in a live lane of a dual carriageway open to vehicular traffic. Signing on the vehicle should comply with **14.6.1**.

14.9.10. Single vehicle working may be considered for installation, maintenance, and removal of TTM so long as road workers do not need to operate on the rear of a vehicle in a live lane. If used, then single vehicle working should be conducted in accordance with the TMCA guidance (see **Appendix B**).

14.9.11. Impact Protection Vehicles (IPV) used as MLC vehicles and Mobile Carriageway Closure (MCC) vehicles need to deploy their TMA. The requirements for TMA are given in CD 378 'Impact test and assessment criteria for truck mounted attenuators'. As higher specification TMA become available their use should be adopted if appropriate.

14.9.12. Vehicles fitted with a TMA currently contravene the Road Vehicles (Construction and Use) Regulations 1986, as amended, with regard to the permissible overhang (Regulation 11) when the TMA is in operational mode. To enable the vehicle to be operated legally, a special dispensation known as a Vehicle Special Order (VSO) must be obtained from the Department for Transport before the vehicle is put into service. Further details about applying for a VSO can be found on the DfT website (www.gov.uk/dft) under the heading 'Vehicle special orders section 44 requirement'.

14.9.13. In addition to the overhang requirements of Regulation 11, the vehicle must comply with all the other applicable requirements of the Construction and Use Regulations as well as those of the Road Vehicles Lighting Regulations 1989, also as amended.

14.9.14. An IPV needs to be fitted with a system that automatically applies the vehicle's brakes when any contact is made with the rear of the TMA. When fitted with such a device, the vehicle will be subject to a notifiable alteration with the Driver and Vehicle Standards Agency (DVSA). For notifiable alteration requirements in Northern Ireland, refer to the Driver and Vehicle Agency.

14.9.15. Seat belts with a minimum of three points of anchorage to the vehicle need to be fitted for all occupants of IPV's and block vehicles (e.g. MLC, and MCC vehicles), and they should always be worn whilst operations are being carried out.

14.9.16. Head restraints need to be fitted and correctly adjusted (centre of restraint at eye level) for all the occupants of block vehicles and advance sign vehicles.

14.9.17. It is recommended that a safety survey of the block vehicle cab be undertaken whenever additional, potentially protruding, items (e.g. two-way radios) are fitted.

14.9.18. Signing on IPVs should comply with **14.6.5** and **Section 10.6** for the working vehicle. Vehicle mounted approach signs identified in **Plans MLC1** to **MLC5** may be replaced where suitable signals or remote-control fixed taper point signs are available.

15.1 Workforce training

15.1.1. All TM operatives must be trained and assessed to be competent in all activities that they are required to carry out, including:

- installing, removing, and maintaining all relevant TM equipment;
- having a full understanding of all relevant signs and their requirements.
- correct operation of all equipment to be used.

15.1.2. In the case of undertaking street works, members of the workforce must hold a current Street Works Qualification. This may be as an operative, supervisor or both - in accordance with the New Roads and Street Works Act (NRSWA) 1991 and associated regulations.

15.1.3. Workers for authority road works should have completed recognised training and assessment against national standards for TTM before conducting any road works activities.

15.1.4. Operatives should be given refresher training periodically to ensure they remain competent and are up to date with latest practices. Supervisors and operatives on sector schemes must be reassessed every 5 years. All operatives and supervisors undertaking street works should be retrained according to the requirements for:

- England, in Statutory Instruments No 1147 The Street Works (Qualifications of Supervisors and Operatives) (England) Regulations 2016.
- Wales, in Statutory Instruments No. 1687 The Street Works (Qualifications of Supervisors and Operatives) Regulations 1992.
- Scotland, in Statutory Instruments No. 1675 (S.162) The Road Works (Qualifications of Supervisors and Operatives) (Scotland) Regulations 1992.
- Northern Ireland, in Statutory Instruments No. 20 Street Works (Qualifications of Supervisors and Operatives) Regulations (Northern Ireland) 1998.

15.1.5. The overseeing organisation (for England, Scotland or Wales) requires that organisations engaged in TTM operations ensure that operatives have relevant competency-based training certification. For high-speed roads this will need to be training to the requirements of the relevant section of Sector Scheme 12 (NHSS 12A to 12D). For other road authorities organisations involved in TTM operations should comply with these requirements if required.

15.1.6. The contractor needs to ensure that all personnel (including any sub-contracted personnel) are appropriately qualified and can provide evidence of this.

15.1.7. Training and competency regimes in NHSS 12A, 12B, 12C, and 12D are likely to be appropriate and applicable for authority road works TTM design and operation activities. NHSS 12D addresses requirements training, assessment and accreditation of the New Roads and Street Works Act (NRSWA) 1991 and the Traffic Management Act 2004 as well as other requirements for positive TTM.

15.1.8. Other sector schemes, such as NHSS 13A, also include training and assessment requirements for TTM activities based on NHSS 12A-12D. Details of all sector schemes are available from LANTRA (LANTRA; https://www.lantra.co.uk/national-highway-sector-schemes-nhss).

15.1.9. All Traffic Safety Supervisors (TSS), also known as Traffic Safety and Control Officers (TSCO) operating in England, Scotland or Wales should hold a valid competency based registration (covered by NHSS 12A and B). The criteria for registration requirements are given in GC/GP 106 Working on the highway. TSS / TSCOs should also possess:

- a broad experience in the highways construction industry.
- the ability to interpret contract requirements.
- detailed knowledge of the TTM industry.
- detailed knowledge of the requirements for motorways and trunk roads.

15.1.10. All designers, supervisors and operatives associated with TTM involving portable traffic signals should have a full understanding of the correct operation of signals and the consequences of improperly set signals. Designers of TTM for street works involving portable traffic signals will need to have attained the appropriate qualification. Similarly, Designers of TTM for authority road works should attend a suitable course on the use of portable traffic signal equipment and correct signing of works.

15.2 Personal protective equipment

15.2.1. Sources of hazards must be eliminated, reduced, or isolated where possible. If they cannot be eliminated, hazards should be minimised at source using appropriate plant, materials, and methods of working to reduce or isolate risk. Only when the above steps are taken should Personal Protective Equipment (PPE; e.g. head, eye, ear, and foot protection) be utilised to control the residual risk. Contractors should avoid blanket requirements for PPE as this has been shown to reduce operative's ability to identify and manage risk. It also may imply that the risk assessment is not sufficiently detailed, nor comprehensive. While requiring foot and head protection is likely to be common, the use of eye and ear protection, which may disproportionally affect some workers hearing and eyesight, needs to be limited to area where there is an identified risk which cannot be eliminated, reduced or isolated. When identifying PPE requirements for each site the nature of the risk should be identified to the workforce along with the type of PPE required.

15.2.2. High-visibility clothing is normally considered to be PPE; this not strictly correct as it provides no physical protection (other than in respect of the weather). However it is an essential part of maintaining the conspicuity of road workers, making them more visible to road users and helping to isolate workers from traffic. Workers installing, maintaining, and removing TTM will need to wear high-visibility clothing which complies with the following aspects of BS EN ISO 20471:2013+A1:2016: High visibility clothing. Test methods and requirements.

- for high speed roads ('High risk' BS EN ISO 20471 Class 3, Annex A Table A.1):
  - Class 3 from BS EN ISO 20471 Table 1.
  - fluorescent yellow or fluorescent orange-red to BS EN ISO 20471 Table 2.
  - garments complying with BS EN IS 1 paragraph 4.2.2 (see **15.2.4**).
  - minimum retroreflective material requirements to BS EN ISO 20471 Table 4 and/or 5 if combined performance material is used.
- For motorways and high speed roads, high visibility jackets or coveralls with full length sleeves are recommended. This requirement may be varied to three-quarter length sleeves where a risk assessment shows full length sleeves would present increased risk due to the activity being undertaken.
- for other roads ('High risk' BS EN ISO 20471 Classes 3 and 2, Annex A Table A.1):
  - Class 2 or 3 from BS EN ISO 20471 Table 1.

- fluorescent yellow or fluorescent orange-red to BS EN ISO 20471 Table 2.
- garments complying with BS EN ISO 20471 paragraphs 4.2.1 or 4.2.2 (see **15.2.3** and **15.2.4**).
- minimum retroreflective material requirements to Table 5.

15.2.3. Garments to BS EN ISO 20471 paragraph 4.2.1 should have two horizonal retroreflective bands as well as bands over both shoulders.

15.2.4. For garments to BS EN ISO 20471 paragraph 4.2.2, preference should be to have two retroreflective bands on the sleeves or over both shoulders.

15.2.5. Due to the higher coefficient of luminance factor, yellow high visibility garments should always be used when a worker is in either a live carriageway or safety zone, in preference to orange or orange-red - except where this would be a hazard (e.g. on or near level crossings and other sections of live/operational railways, plus some tramways and light rail systems). Other garments, not intended to make workers conspicuous, may be of other colours as long as it does not reduce the effectiveness of the clothing specified in this section.

15.2.6. High visibility trousers should be used for activities where high visibility jackets or vests may be obscured, including when carrying equipment or bending over to install TTM. This may be separate trousers to BS EN ISO 20471 paragraph 4.2.3, or combined top and bottom garments to BS EN ISO 20471 paragraph 4.2.4 (low speed roads only) or BS EN ISO 20471 paragraph 4.2.5 (all roads). Separate trousers should be Class 1 garments from BS EN ISO 20471 Table 1. High visibility trousers are unlikely to be needed if not undertaking the activities mentioned above in a live carriageway or safety zone. In all other situations high visibility jackets should be chosen to provide sufficient conspicuity without relying on high visibility trousers.

15.2.7. Where activities, including inspections and surveys, are undertaken where the public continue to have normal access or use (e.g. footways, footpaths, pedestrian crossings), then the need for high visibility garments would need to be justified by risk assessment.

15.2.8. High visibility weatherproof clothing, of a similar performance standard to that outlined above, should be provided and used when required, without it restricting the field of vision (such as use of hoods) or a reduction in audible awareness.

15.2.9. High visibility clothing needs to fit the person and be adapted for the wearer’s characteristics and/or task as required. It must be maintained, including being kept clean, to ensure visibility and function.

15.2.10. Damaged or degraded PPE must be replaced.

15.2.11. The conspicuity of road workers depends on the fluorescent and retroreflective elements in garments being effective. This efficiency is reduced by glare from nearby active light sources (e.g. amber beacons, see **14.8.4**) in the work zone and working space. When designing and planning construction activities, the impact on the conspicuity of workers in the safety zone or live carriageway will need to be considered.

15.3 Fitness for task

15.3.1. While taking into account any reasonable adjustments, TTM operatives should be assessed to ensure that they:

- have sufficient use of their neck, trunk, arms and legs.

- have at least 6/12 distance vision or greater when wearing glasses or contact lenses.
- have adequate hearing.

15.3.2. TTM operatives should also be assessed to ensure that their ability to work is not compromised by specific medical conditions. This may include:

- vertigo (other balance disorders).
- severe mental disorders.
- diabetes.
- cardiovascular and gastrointestinal conditions, or.
- sleeping disorders.

15.3.3. Organisations undertaking TTM operations should establish an appropriate medication, drugs, and alcohol policy.

15.4 Workforce working hours

15.4.1. In order to avoid workforce fatigue in the safety critical environment of road works, employers should ensure working hours do not exceed the requirements of the Working Time Directive. Fatigue reduces awareness and can increase the likelihood of accidents, therefore excessive hours need to be avoided.

16 SOURCES OF FURTHER ADVICE

16.1 General

16.1.1. The Government website www.gov.uk contains traffic signs working drawings, Traffic Advisory Leaflets, Local Transport Notes, Circulars and other advice.

16.2 Design Manual for Roads and Bridges / Specifications for Highway Works (DMRB/SHW)

16.2.1. The DMRB and SHW provide a comprehensive manual system which accommodates current Standards, Specifications and other published documents. While most relate to Trunk Road works, some advice is applicable to local traffic authorities.

The SHW is in the process of being updated at the time of publication and designers should check the latest status of these documents before use.

www.standardsforhighways.co.uk/ha/standards

16.3 Manual for Streets

16.3.1. Manual for Streets contain useful guidance on the principles of sign design and placement.

www.gov.uk/government/publications/manual-for-streets

16.4 Institute of Highway Engineers guidance

16.4.1. The Institute of Highway Engineers Sign Structures Guide: Support Design for Permanent UK Traffic Signs contains useful guidance on sign structures.

https://www.theihe.org/wp-content/uploads/2023/12/IHE-Sign-Structures-Guide-2021.pdf

16.5 Traffic Management Contractors Association

16.5.1. The Traffic Management Contractors Association Advice Note 1 provides detailed guidance on the selection of the type and number of vehicles for use in various methods of working on high speed dual carriageway roads.

https://tmca.org.uk/resources/

16.6 Association for Road Traffic Safety and Management

16.6.1. Following the withdrawal of the DfT document ‘An introduction to the use of portable vehicular signals’ (the Pink Book, TSO 2016) the ‘Guidance on use of Portable Signals’ published by the Association for Road Traffic Safety and Management (ARTSM) provides best practice for Great Britain on the use of Portable Signals.

https://artsm.org.uk/downloads/

APPENDIX A

A1 Sign and delineator tables

This appendix contains the following tables:

Table A1.1 Location and number of approach signs

Table A1.2 Sizes of signs

Table A1.3 Recommended spacing and sizes of traffic cones

Table A1.4 Key to areas and symbols shown in plans

Table A1.5 Details A to K used in plans

A2 Glossary

A3 Colours

Table A3.1 Key to areas and symbols shown in plans

A4 Signs prescribed by Schedule 13 Part 9

This appendix contains the following tables:

Table A4.1 'x' heights for Schedule 13-9 signs

Table A4.2 Number of words comprising Unit of Information for VMS legends

Table A4.3 Sizes of characters on verge mounted VMS

A5 Signs to diagram 7243, Schedule 13 Part 6 Item 14

This appendix contains the following table:

Table A5.1 Minimum horizontal spaces between central panel elements (mm)

A6 Inspection stops in Northern Ireland

A7 Approach 'wicket' signing for relaxation schemes

This appendix contains the following tables:

Table A7.1 Diagram 7202.1 'Wicket' sign sizes and clear visibility distances for relaxation schemes on dual carriageways (signs provided on both side of the carriageway).

Table A7.2 Diagram 7202.1 'Wicket' sign sizes and clear visibility distances for relaxation schemes on dual carriageways (nearside only signs)

Table A7.3 Diagram 7202.1 'Wicket' sign sizes and clear visibility distances for relaxation schemes on dual carriageways (offside closures)

A8 Sign Lighting

This appendix contains the following table:

Table A8.1 Specific requirements related to lighting signs and retroflection

A9 Temporary Direction Signing

APPENDIX A1 SIGN AND DELINEATOR TABLES

Table A1.1 Location and number of approach signs

Type of road (permanent speed limit)	Minimum siting distance of first sign in advance of the works metres and miles	Minimum clear visibility distance to first sign metres	Minimum size of warning or regulatory sign (Note 1) mm	Distance from works to 'End of road works' signs metres
Single carriageway road (30 mph or less)	20 m – 45 m	60	600	10 – 30
Single carriageway road (40 mph)	45 m –110 m	60	750	30 – 45
Single carriageway road (50 mph or more)	275 m – 450 m	75 at 50 mph 90 at 60 mph	900	30 – 45
Dual carriageway road (40 mph or less)	300 m	60	750	45
Dual carriageway road (50 mph)	Standard: 800 m (1 mile where congestion is likely) Relaxation: 800 m	75	1200	90
Dual carriageway road (60 mph)	Standard:1 mile (2 miles where congestion is likely) Relaxation 1 mile	90	1500	90
Dual carriageway road (national speed limit)	Standard: 2 miles (3 miles where congestion is likely) Relaxation 1 mile	120	1500	90
Dual carriageway road (national speed limit) hard shoulder only closure	800 m	120	1500	90

NOTES:

1. Recommended sizes of all repeater warning or regulatory signs beyond the start of the entry taper in relation to the initial sign are as follows:

Initial sign (mm)	600	750	900	1200	1500
Repeater sign (mm)	450	600	750	900	900

Chapter 3 provides further advice on size and spacing of speed limit signs for side roads, but the size and spacing of speed limit signs specified in this document may be more onerous.

2. The minimum number of warning signs in advance of a road works is dependent on the particular temporary traffic management requirement. Generally, for single carriageways there will be a minimum of two signs, but four or more signs may be required for more complex traffic arrangements. Similarly, for dual carriageways there will be generally a minimum of two signs in pairs, but seven or more may be required for complex traffic management arrangements.

3. On roads with a permanent speed limit of 40 mph or less, for relaxation situations no advance signing is required in certain circumstances for off-carriageway works (see **Section 4.44**).

4. On dual carriageway roads with a permanent speed limit of 40 mph or less, the 'end of road works' sign to diagram 7001 (S13-2-9) with an 'END' plate need only be placed on the nearside of the carriageway. However, where traffic is diverted around an off-side lane closure island it is recommended that one is also placed in the central reservation.

5. All signs up to the start of the taper should be of the size shown.

The siting distance of the first sign is given in metres or miles. However, to comply with the Regulations the distances on supplementary plates must be shown in imperial dimensions. Tables and plans show the placing of road works signs in equivalent metric dimensions; this utilises part of the permitted 10% tolerance on the placing of signs (see **5.3.13**; e.g. signs showing 400 yards being placed at 400 m).

Table A1.2 Sizes of signs

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P504.1	Crossroads ahead Triangle (height)	600	750	900	750	1200	1500
P506.1	Side road ahead Triangle (height)	600	750	900	750	1200	1500
P511	Reduce speed x-height	62.5	75	100	75	125 / 150	200
P513.2	Maximum speed in mph advised x-height	50	62.5	75	100	125	125
P516	Road narrows both sides ahead Triangle (height)	600	750	900	750	1200	1500
P517	Road narrows on right ahead Triangle (height)	600	750	900	750	1200	1500
P518	Single file traffic x-height	62.5	75	100	75	125 / 150	150
P521	Two-way traffic Triangle (height)	600	750	900	750	1200	1500
P522	Two-way traffic on route crossing ahead Triangle (height)	600	750	900	750	1200	1200
P530	Maximum headroom Triangle (height)	600	750	900	750	1200	1500
P543	Traffic signals ahead Triangle (height)	600	750	900	750	1200	1500
P543.1	Part time traffic signals x-height	62.5	75	100	75	125	150
P554	Worded warning sign Triangle (height)	600	750	900	750	1200	1200
P554.1	Try your brakes Triangle (height)	600	750	900	750	1200	1500
P554.2	Risk of ice ahead Triangle (height)	600	750	900	750	1200	1500
P554.3	Ice ahead x-height	62.5	75	100	75	50mph 125 / 60mph 150	200
P556	Uneven road ahead Triangle (height)	600	750	900	750	1200	1500
P557	Slippery road ahead Triangle (height)	600	750	900	750	1200	1500

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P560	Carriageway edge or obstruction near that edge Circle diameter (Alternative Rectangle)	75-150 diameter 240 height (max)					
P562	Other danger ahead Triangle (height)	600	750	900	750	1200	1500
P563	Nature of other danger ahead x-height	62.5	75	100	75	125 / 150	200
P570	Distance over which hazard extends x-height	62.5	75	100	75	125 / 150	200
P572	Distance ahead to hazard x-height	62.5	75	100	75	125 / 150	200
P573	Distance and direction to hazard x-height	62.5	75	100	75	125 / 150	200
P574	Area infected by animal disease ahead x-height	40	62.5	100	75	125 / 150	200
P601.1	STOP sign Octagon (height)	750	750	900	750	1200	1200
P602	Give way Triangle (height)	600	750	900	750	1200	1500
P606	Traffic must proceed in direction of arrow Circle (diameter)	600	750	900	750	1200	1500
P609	Traffic must turn ahead in direction of arrow Circle (diameter)	600	750	900	750	1200	1200
P610	Keep left or right Circle (diameter)	600	750	900	750	1200	1500

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P610	Keep left or right attached to a road maintenance vehicle Circle (diameter)	Single size 1500 diameter (Size may be reduced to 1200 or 900 where it is not practicable to mount the 1500 diameter sign on the vehicle)					
P611	Traffic may proceed either side of sign Circle (diameter)	600	750	900	750	1200	1200
P612	No right-turn for traffic Circle (diameter)	600	750	900	750	1200	1200
P613	No left-turn for traffic Circle (diameter)	600	750	900	750	1200	1200
P614	No U-turns for traffic Circle (diameter)	600	750	900	750	1200	1200
P615	Priority must be given to vehicles for the opposite direction Circle (diameter)	600	750	900	–	–	–
P615.1	Give way to oncoming vehicles x-height	62.5	75	100	–	–	–
P616	No entry for traffic Circle (diameter)	750	750	900	750	1200	1200
P622.1A	Entry prohibited to goods vehicles exceeding weight specified Circle (diameter)	600	750	900	750	1200	1500
P626.2A	Weak road structure, vehicles exceeding weight specified prohibited Circle (diameter) & x-height	450 / 60	600 / 80	900 / 100	600 / 80	900 / 100/120	900 / 120
P627.1	Exemption for vehicles conveyed in sign 626.2A x-height	37.5	50	62.5	50	62.5 / 75	75
P632	No overtaking Circle (diameter)	600	750	900	–	–	–

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P633	STOP police Circle (diameter)	450 (540 size can be used at the discretion of the police)					
P633.1	STOP cycling Circle (diameter)	Sign used in accordance with the British Cycling protocol					
P636	No waiting Circle (diameter)	200 to 275					
P636.1	No loading x-height	20 to 40					
P636.2	No stopping x-height	Single size – 20/40					
P640.1	Temporary suspension of a parking place x-height	80 (100 can be used depending on prevailing conditions)					
P645	End of restriction or prohibition x-height	62.5	75	100	75	125 / 150	200
P670	Maximum speed limit in mph Circle (diameter)	See table 4.4.					
P671	National speed limit applies Circle (diameter)	See table 4.4.					
P670 / P671	Speed limit repeaters Circle (diameter)	See table 4.4.					
P790	New method of controlling traffic at a railway or tramway level crossing ahead Rectangle (height)	Single size 1050 x 750					
P811	Traffic has priority over vehicles from the opposite direction Rectangle (height)	800	1000	1200	–	–	–
P811.1	Traffic priority descriptive sign x-height	50	62.5	100	–	–	–
P829.1	Potential danger ahead proceed with caution Rectangle (height)	550 x 375	550 x 375	900 x 600	550 x 375	900 x 600	900 x 600
P829.2	Accident ahead proceed with caution Rectangle (height)	550 x 375	550 x 375	900 x 600	550 x 375	900 x 600	900 x 600

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P829.3	Traffic should use hard shoulder Rectangle (height)	550 x 375	550 x 375	900 x 600	550 x 375	900 x 600	900 x 600
P829.4	Traffic should re-join carriageway Rectangle (height)	550 x 375	550 x 375	900 x 600	550 x 375	900 x 600	900 x 600
P829.5	Speed check area x-height	50	62.5	75	75	50mph 150 / 60mph 150	200
P830	Vehicles required to stop at census point Rectangle (height)	Single size 750					
P830.1	Vehicles to stop at census point if directed Rectangle (height)	Single size 750					
P830.2	Goods vehicles to stop if directed x-height	75	100	150	125	150	200
P830.3	Vehicles should stay in lane Rectangle (height)	Single size 750					
P831	Slow on approach to census point Rectangle (height)	Single size 750					
P831.2	Vehicle excise licence check point ahead and variants x-height	75	100	150	125	150	200
P832	Location of traffic survey and variants Rectangle (height)	Single size 750					
P832.1B	DVSA check point ahead x-height	37.5 / 75	50 / 75	75 / 100	50 / 75	75 / 100 / 150	100 / 200
P832.2B	Vehicle condition inspection point ahead x-height	37.5 / 75	50 / 75	75 / 100	50 / 75	75 / 100 / 150	100 / 200
P832.3	Goods vehicles should leave motorway if directed x-height	N/A	N/A	N/A	200	250	250
P832.4	Goods vehicles should enter check point if directed x-height	100	125	150	125	150 / 175	250

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P832.5	Goods vehicles should keep to left-hand lane x-height	100	125	150	125	150 / 175	250
P832.6	Lane segregation of goods vehicles and other traffic x-height	150 / 100 / 125	150 / 100 / 125	180 / 120 / 150	150 / 100 / 125	210 / 150 / 175	240 / 160 / 200
P832.7	Goods vehicles should get into the left-hand lane on approach to a check point ahead x-height	150 / 100 / 125	150 / 100 / 125	180 / 120 / 150	150 / 100 / 125	210 / 150 / 175	240 / 160 / 200
P832.8	Goods vehicles should leave the main carriageway x-height	100	125	150	125	150 / 175	250
P832.9	Direction to vehicle check point x-height	75	75	100	75	100 / 150	200
P832.10A	End of vehicle check point area x-height	75	75	100	75	100 / 150	200
P878	Cameras used to enforce regulations x-height	50	75	100 / 150	75	100 / 150	250
P879	Cameras used to enforce regulations (reminder) Rectangle (height)	600	750	900	750	1200	1500
P2701	Direction to new housing development x-height	50	75	100	75	125	150
P2701.1	Advance direction to new housing development x-height	50	75	100	75	125	150
P2702	Start of temporary diversion route Rectangle (height)	Single size 750					
P2703	Direction of temporary diversion route x-height	60	75	100	75	100 / 150	200
P2703.1	Direction of temporary diversion route x-height	60	75	100	75	100 / 150	200
P2706	Roundabout ahead leading to diversion route x-height	60	75	100	75	100 / 150	200

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P2707	Direction of temporary diversion route to destination x-height	60	75	100	75	100 / 150	200
P2708	Direction of route for emergency vehicles x-height	Single size 40					
P2716	Junction ahead leading to diversion route x-height	75	150	250	150	250	2 lanes: 250 3 lanes: 300 4 lanes or more:400
P7001	Road works or temporary obstruction ahead Triangle	600	750	900	750	1200	1500
P7001.1	Nature of road works x-height	62.5	75	100	75	125	150
P7001.2	Location of road works x-height	62.5	75	100	75	125	150
P7001.3	Workforce in road proceed slowly x-height	100 140	100 140	125 180	100 140	125 / 150 180 / 200	150 210
P7002A	Major road works ahead x-height	75	75	100	75	100 / 150	200
P7002B	Time and date when route is to be closed to traffic x-height	75	75	100	75	100 / 150	200
P7002.1	Date when road works are to take place and variants x-height	75	75	100	75	100 / 150	200
P7003.1	Starting date and duration of road works x-height	100	100	125	100	125 / 150	200
P7005	Information for drivers in respect of road works x-height	100	100	125	100	125/150	200
P7006	End of road works x-height	100	100	125	100	125 / 150	200
P7006.1	Telephone number for enquiries about road works x-height	150	150	200	150	200 / 250	200 / 250

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P7007.1	Description of major construction or improvement scheme ahead x-height	100	100	125	100	125 / 150	200
P7008	Nature of street works x-height	Single size – 200/50/200 (Panel height and x-height)					
P7009	Loose chippings on road ahead Triangle (height)	600	750	900	750	1200	1500
P7009.1	Risk of skidding, max speed of 20mph x-height	62.5	75	100	75	100	125
P7010.1	Traffic should proceed slowly owing to temporary hazard described x-height	60	75	100	75	100 / 150	200
P7011	Point where vehicles should wait when red light shows Rectangle (height)	Single size 750					
P7011.1	Point at a road junction beyond which vehicular traffic must not proceed when required to stop Rectangle (height)	Single size 750					
P7011.2	Instruction to traffic at signal-controlled pedestrian facility Rectangle (height)	Single size 750					
P7013	Ramp ahead Rectangle (height)	Single size 450					
P7014	Permanent change in road layout ahead x-height	60	75	100	75	100 / 150	200
P7014.1	Reduction in bridge headroom ahead x-height	50	75	100	75	100 / 150	200
P7015	Temporary absence of hard shoulder for specified distance x-height	100	100	125	100	125 / 150	200
P7016	Crossing not in use Rectangle (height)	Single size 375					

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P7017	Direction pedestrians should look for approaching traffic Rectangle (height)	Single size 450					
P7018	Direction of temporary route for pedestrians Rectangle (height)	Single size 450					
P7018.1	Cyclists to dismount and use footway x-height	40/50					
P7019	Light signals not in use Rectangle (height)	700	875	875	875	1050	1050
P7020	Sign not in use x-height	100	100	150	125	150	200
P7021	Traffic on road ahead controlled by portable light signals Rectangle (height)	Single size 750					
P7022	Traffic joining is not controlled by signals Rectangle (height)	Single size 750					
P7023	Manually operated STOP sign Octagon (height)	600	900	900	900	900	900
P7024	Manually operated GO sign Circle (diameter)	600	900	900	900	900	900
P7025	Convoy system in operation ahead x-height	75	100	125	100	125	150
P7026	Convoy system to protect workforce x-height	Single size 50					
P7029	Vehicular traffic must not overtake the convoy vehicle x-height	50 / 62.5	N/A	N/A	N/A	N/A	N/A
P7031	Vehicular traffic must STOP at sign Circle (diameter)	450 / 540	450 / 540	450 / 540	N/A	N/A	N/A
P7032	Commencement point of a new contiguous 30mph speed limit x-height	50 / 75	–	–	–	–	–
P7101.1	Traffic cone	See Table A1.3					

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P7102	Flat traffic delineator	See Table A1.3					
P7103	Traffic cylinder	See Table A1.3					
P7104	Sharp deviation of route Rectangle (height)	200	200	400	200	800	800
P7105	Barrier to mark length of road closure or to guide traffic past an obstruction Rectangle (height)	150	150	300	150	300	300
P7202.1	Temporary lane availability x-height	100	125	150	125	150	175
P7243	Temporary lane usage, alignment and destination x-height	100 / 65 / 265	100 / 65 / 265	125 / 85 / 335	100 / 65 / 265	125 / 85 / 335	150 / 100 / 400
P7244	Temporary lane usage x-height	100	100	125	100	125	150
P7245	Temporary lane alignment and destinations x-height	100	125	150	125	150	175
P7291	Free recovery, await rescue x-height	75	100	150	125	150	200
P7292	Instructions to drivers of wide loads x-height	75	100	150	125	150	200
P7293	Drivers of wide loads should telephone for assistance x-height	75	100	150	125	150	200
P7294	Temporary maximum speed advised x-height	62.5 250	62.5 250	100 400	62.5 250	75 / 100 / 300 / 400	125 500
P7301	Works site access Rectangle (height)	Single size 750					
P7302	Works site exit Rectangle (height)	Single size 750					
P7303	Direction works traffic should take at junction ahead Rectangle (height)	Single size 1050					

Sign Working Drawing No.	Description/Type	Sizes of signs					
		Single carriageway road (permanent speed limit as shown below or less)			Dual carriageway road (permanent speed limit as shown below or less)		
		30 mph	40 mph	50 mph or more	40 mph	50 or 60 mph	National speed limit
P7304	Direction works traffic should take at junction or works entrance ahead x-height	75	75	100	75	100 / 150	200
P7305	Direction works traffic should take at junction or works access x-height	75	75	100	75	100 / 150	200
P7306	Direction works traffic should take at a works access ahead x-height	100	100	125	100	125 / 150	200
P7307	Exit from a works site ahead x-height	100	100	125	100	125 / 150	200
P7402	Lanes closed to traffic ahead by vehicles carrying out mobile road works Rectangle (height)	2500 x 2500 or 2300 x 3000					
P7403	Other traffic to keep to the right of vehicles carrying out mobile road works Rectangle (height)	2500 x 2500 or 2300 x 3000					
P7404	Nature of work being carried out x-height	Size of x-height varies 37.5 to 150 depending on type of vehicle and nature of operation.					
NP430	STOP for convoy if directed x-height	62.5	62.5	62.5	62.5	62.5	62.5
NP431	Wait here for convoy x-height	62.5 / 75	62.5 / 75	62.5 / 75	62.5 / 75	62.5 / 75	62.5 / 75

Table A1.3 Recommend spacing and sizes of traffic cones

Road Type		**Single carriage-way road (permanent speed limit of 30 mph or less)**	**Single carriage-way road (permanent speed limit of 40 mph)**	**Single carriageway road (permanent speed limit of 50 mph or more)**		**Dual carriage-way road (permanent speed limit of 40 mph or less)**	**Dual carriageway road (permanent speed limit of 50 mph or 60 mph)**		**Dual carriageway road (national speed limit)**	
					Relaxation			Relaxation		Relaxation
Rate of taper (see Note 3)		1 in 3	1 in 20	1 in 25		1 in 25	1 in 40		1 in 55	1 in 40
Taper length (m) for hazard of standard carriageway width between 3.6 m and 4 m		50	80	100	100	100	150	150	200 (see note 7)	150
Minimum number of cones		18	28	68	35	35	101	51	135	51
Taper (see Note 8 for spacing of cones in 45° tapers)	Minimum cone size (mm)	450	450	750	750	450	750	750	1000 (see Note 5)	1000 (see Note 5)
	Maximum cone spacing (m)	3	3	1.5	3	3	1.5	3	1.5	3
	Maximum warning light spacing (m)	9	9	9	9	9	9	9	9	9
Longitudinal	Minimum cone size (mm)	450	450	750	750	450	750	750	750 (see Notes 5)	750 (see Note 5)
	Maximum cone spacing (m)	9	9 (see Note 1)	9	9 (see Note 1)	9 (see Note 1)	9	9 (see Note 1)	9	18
	Maximum warning light spacing (m)	9 (see Note 2)	9 (see Note 2)	18 (see Note 6)	18 (see Note 6)	18 (see Note 6)	18 (see Note 6)	18 (see Note 6)	18 (see Note 6)	18 (see Note 6)

NOTES:

1. The 9 m traffic cone spacing may be increased to 18 m for longitudinal coning for work sites over 180 m for which relaxations apply. This applies only to cones placed in straight lengths parallel to the line of traffic.
2. The 9 m warning light spacing may be increased to 18 m for longitudinal coning for work sites of over 180 m in length for which relaxations apply. This applies only to cones placed in straight lengths parallel to the line of traffic.
3. Taper length equals rate of taper multiplied by the width of hazard (generally rounded up to the next whole 10 m length). Where appropriate the next larger size of cone should be used in the entry tapers.
4. The number of cones in a taper equals the taper length divided by the spacing rounded up to the next whole number plus 1.

   On motorways and all-purpose dual carriageway roads with hard shoulders for which the national speed limit applies, 1 m cones will be required:

   - for both standard works and works for which relaxations apply, for both entry/lead tapers and the facing wall, even if 750 mm cones are used elsewhere.
   - where traffic cones are to be installed by machine.
   - where there could be confusion, especially at night, between the 1 m and 750 mm cones.
   - on all motorways and dual carriageway roads with hard shoulders in Northern Ireland.

   During the hours of darkness, an amber warning light should be placed at regular spacing as indicated in **Table A1.3**. Warning lights should be spaced at 9 m intervals on tapers. Flashing lights may only be used where there is a system of street lighting on a road having a speed limit of 40 mph or less.
5. Warning lights may be mounted on the top of existing traffic cones provided they do not mask any of the retroreflective material, obscure the cone or affect its stability. Where there is any doubt the lights should be mounted on additional cones placed at regular spacing in the line of existing cones, in accordance with the above table.

   Warning lights may be mounted on the top of existing traffic cones provided.

   - they do not mask any of the retroreflective material.
   - obscure the cone, or.
   - affect its stability.

   Where there is any doubt, warning lights should be mounted on additional cones placed at regular spacing in the line of existing cones. This should be accordance with the above table.

   If rotating reflector delineators are used, they may be mounted on the top of existing traffic cones provided;

   - they do not mask any of the retroreflective material.
   - obscure the cone, or.
   - affect its stability.

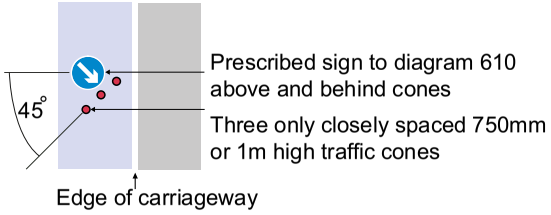
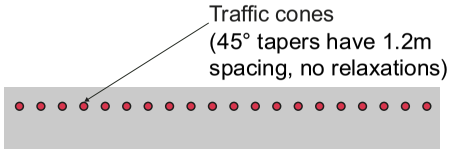
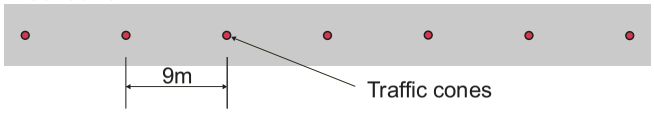
   Where rotating reflectors with amber (retroreflective) reflectors are used on cones on the nearside of traffic, the spacing of the warning lights may be increased by up to 100% with rotating reflectors at the midpoint between consecutive warning lights. In other situations, the maximum longitudinal spacing of the warning lights shown in **Table A1.3** (9 m and 18 m) may be increased by up to 50% (13.5 m and 27 m respectively), with rotating reflectors placed at the third points or midpoint between consecutive warning lights.
6. Where cones to Class R2/R2B are used the spacing of the warning lights may be increased by up to 100% for cones on the nearside. When cones are on the offside of dual carriageways and one way streets the maximum longitudinal spacing of the warning lights may be increased by up to 50%. This applies only to cones placed in straight lengths parallel to the line of traffic where the relevant desirable minimum stopping sight distance for the permanent speed limit is achieved.
7. Where full SSD is provided in closed lanes this taper length may be reduced to 150 m per lane for standard works, subject to an individual risk assessment.

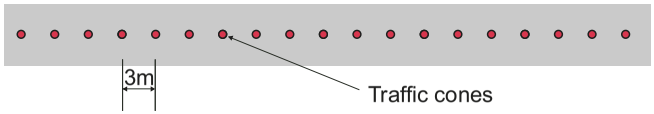
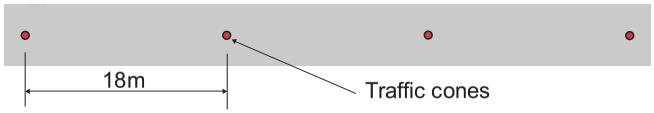
   The spacing and size of traffic cones used with Emergency Traffic Management (ETM) is dealt with in **Section 8**.

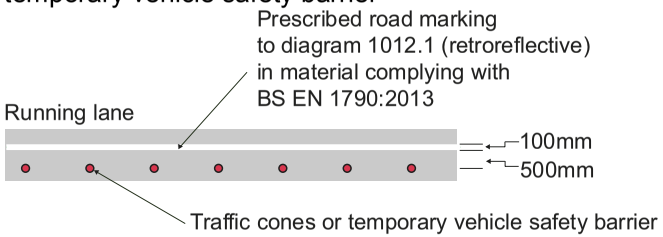
Table A1.4 Key to areas and symbols shown in plans

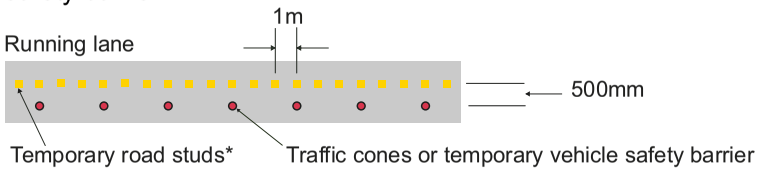
	Footway
	Traffic lane
	Hard shoulder
	Central reservation
	Safety zone
	Works zone
	Traffic signal
	“STOP/GO” sign
P	Police officer or traffic officer
	Sign
7001	TSRGD diagram number or DfT working drawing

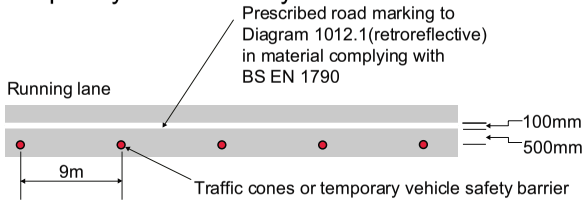
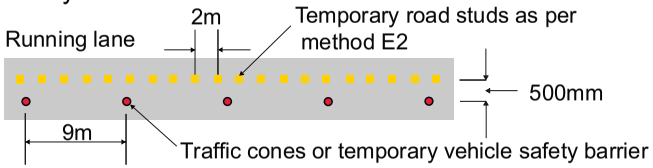
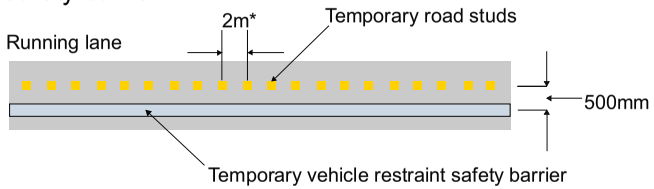
Table A1.5 Details A to K used in plans (minimum sizes given)

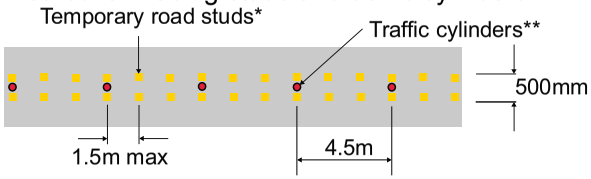
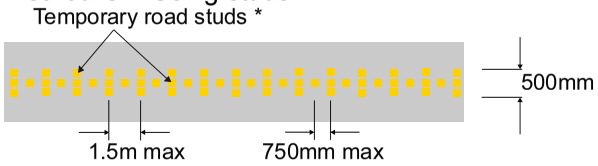
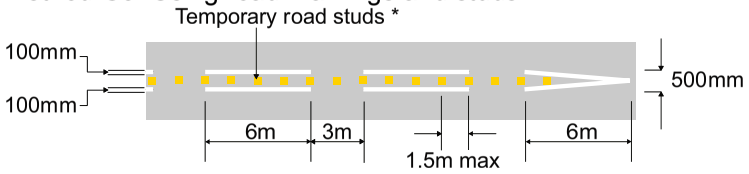
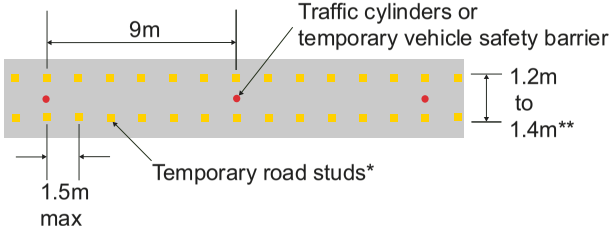
	Single carriageway road (permanent speed limit of 40 mph)	Single carriageway road (permanent speed limit of 50 mph or more)	Dual carriageway road (permanent speed limit of 40 mph or less)	Dual carriageway road (permanent speed limit of 50 mph or 60 mph)	Dual carriageway road (national speed limit)
Detail A  NOTES: 1. During darkness, a single warning light to BS EN 12352:2006 should be provided. 2. Traffic cones should conform to diagram 7101.1 (TSRGD 2016 S13-6-4) and to BS EN 13422:2019.	-	-	-	Cones 750 mm	Cones 750 mm
Detail B  NOTES: 1. During darkness, warning lights to BS EN 12352:2006 need to be provided in accordance with **Table A1.3** (**Appendix A1**). 2. 45° tapers have 1.2 m cone spacing, no relaxations. 3. On motorways and all-purpose dual carriageway roads with hard shoulders on which the national speed limit applies, 1 m cones will be required for both standard works and works for which relaxations may be applied, for both lead tapers and the facing wall of a lane change.	Cones 450 mm Cone spacing 1.5 m	Cones 750 mm Cone spacing 1.5 m	Cones 450 mm Cone spacing 1.5 m	Cones 750 mm Cone spacing 1.5 m	Cones 750 mm Cone spacing 1.5 m Relaxation 3 m
Detail C Method C1  	Cones 450 mm	Cones 750 mm	Cones 450 mm	Cones 750 mm	Cones 750 mm

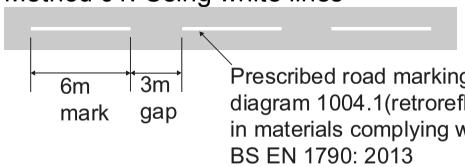
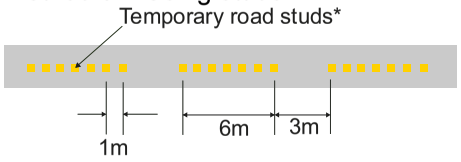
Method C2  NOTES: 1. During darkness, warning lights to BS EN 12352:2006 need to be provided in accordance with **Table A1.3** (**Appendix A1**). 2. For relaxation to Detail C1 see **Table A1.3** (**Appendix A1**).	Cones 450 mm	Cones 750 mm	Cones 450 mm	Cones 450 mm	Cones 750 mm
Detail D  NOTES: 1. During darkness, warning lights to BS EN 12352:2006 need to be provided in accordance with **Table A1.3** (**Appendix A1**). 2. Detail D only applies to relaxation cases, see **Table A1.3** (**Appendix A1**).	Cones 450 mm	Cones 750 mm	Cones 450 mm	Cones 750 mm	Cones 750 mm

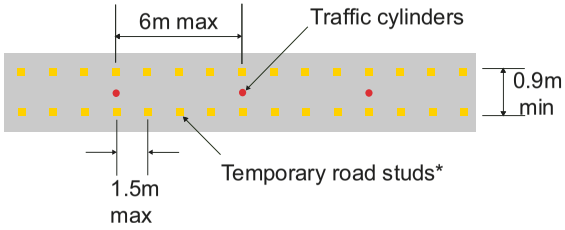
Detail E Method E1: Using road markings and traffic cones or temporary vehicle safety barrier  	-	Cones 750 mm	-	Cones 750 mm	Cones 750 mm (min)

Method E2: Using studs and traffic cones or temporary vehicle safety barrier  NOTES: *With fluorescent Saturn yellow (yellow/green) bodies and uni-directional reflectors coloured amber when on the right and red on the left. Studs must conform to TSRGD 2016 general direction 7. 1. During darkness, warning lights to BS EN 12352:2006 will need to be provided in accordance with **Table A1.3** (**Appendix A1**). 2. On motorways and all-purpose dual carriageway roads with hard shoulders on which the national speed limit applies, 1 m cones will be required for both standard works and works for which relaxations may be applied, for both lead tapers and the facing wall of a lane change. 3. Method E2 is only suitable for schemes up to 6km in length. For longer schemes method E2 may be used for short lengths at changeovers and crossovers.	-	Cone spacing 3 m Relaxation 9 m	-	Cone spacing 1.5 m Relaxation 3 m	Cone spacing 1.5 m Relaxation 3 m

Detail F Method F1: Using road markings and traffic cones or temporary vehicle safety barrier  Method F2: Using studs and traffic cones or temporary vehicle safety barrier  Method F3: Using marking and studs with temporary vehicle safety barrier  *Detail E (single line of temporary road studs): 1m *Detail H (two rows of temporary road studs): 1.5m max. NOTE: 1. During darkness, warning lights to BS EN 12352:2006 need to be provided in accordance with **Table A1.3** (**Appendix A1**). 2. Method F2 is only suitable for schemes up to 6km in length. For longer schemes method F2 may be used for short lengths at changeovers and crossovers.	-	Cones 750 mm	-	Cones 750 mm	Cones 750 mm

Detail G Method G1: Using studs and traffic cylinders 	-	-	Cylinders 750 mm	Cylinders 750 mm	Cylinders 750 mm
Method G2: Using studs 	-	-	Applicable	Applicable	Applicable
Method G3: Using road markings and studs  * With fluorescent Saturn yellow (yellow/green) bodies and uni-directional red reflectors. **Traffic cylinders must conform to diagram 7103 (TSRGD 2016 S13-6-6) and BS EN 13422:2019.			Applicable	Applicable	Applicable
Detail H  * With fluorescent saturn yellow (yellow/green) bodies and uni-directional amber reflectors. See also Detail G1. ** This dimension may be reduced to a minimum of 0.7 m on two-lane dual carriageway roads only except when a temporary vehicle safety barrier is used. NOTE: For narrow lane contraflow buffer zones cylinder case, see Detail K below.	-	-	Cylinders 750 mm	Cylinders 750 mm	Cylinders 750 mm

Detail J Method J1: Using white lines  	-	Line 100 / 150 mm	-	Line 100 mm	Line 100 mm
Method J2: Using studs**  * With fluorescent saturn yellow (yellow/green) bodies and uni-directional white reflectors. * Not to be used for situations where continual over-running by traffic is expected. NOTE: 1. Method J2 is only suitable for schemes up to 6km in length. For longer schemes method F2 may be used for short lengths at changeovers and crossovers. 2. Method J2 requires authorisation. 3. For roads with a permanent speed limit of 40 mph or less then the marking is to diagram 1004 (TSRGD 2016 S11-4-2), i.e. 4 m mark, 2 m gap)	-	Applicable	-	Applicable	Applicable

Detail K  * With fluorescent Saturn yellow (yellow/green) bodies and reflectors which are: i. Bi-directional when delineating a tidal lane, and ii. Uni-directional in all other cases	-	-	Cylinders 750 mm	Cylinders 750 mm	Cylinders 750 mm

APPENDIX A2 GLOSSARY

‘Access road’ means a road which in rural areas serves a small settlement and provides access to individual properties and land; it is often only single lane width and unsuitable for HGVs. In urban areas an access road is often a residential loop road or a cul de sac.

‘All-red period’ means the time during which the signals display a red signal to all traffic streams simultaneously. It allows one stream of traffic to clear the controlled area before the opposing stream is signalled to proceed.

‘ALARP / SFAIRP’ This document uses as low as is reasonably practicable to indicate the legal requirement for both road user and road works safety at works. The term so far as is reasonably practicable is also used by some organisations and can be taken as being equivalent to ALARP.

‘Amenity lighting’ means one or more lamps placed on or near a road which is not intended to illuminate the road surface e.g. lighting for pedestrian footpaths. Lighting intended only for works area and working spaces would come under this definition.

‘Authorised traffic sign’ means a non-prescribed sign authorised by the Secretary of State in accordance with Sections 64 and 65 of the Road Traffic Regulation Act 1984. In Northern Ireland an ‘authorised traffic sign’ means a sign authorised by the Department under Article 28 of the Road Traffic Regulation (NI) Order 1997.

‘Authority’ is defined by the New Roads and Street Works Act 1991 as having the meaning given in Highways Act 1980 or in Scotland the meaning of ‘roads authority’ as given in the Roads (Scotland) Act 1984.

‘Beacon’ means a roof-mounted flashing amber beacon.

‘Buffer lane’ means an existing traffic lane kept unoccupied to provide a temporary separation between lanes carrying opposing flows of traffic.

‘Buffer zone’ means a longitudinal strip of carriageway which provides a temporary physical separation between lanes carrying opposing flows of traffic.

‘Builders’ Skips (Markings) Regulations’ means the Builders’ Skips (Markings) Regulations 1984 (SI 1984 No 1933) or the Roads (Control of Builders Skips) Regulations (NI) 1981 (SR1981 No 22) or the Builders’ Skips (Markings) (Scotland) Regulations 1986 (SI 1986 No 642).

‘Carriageway’ means that part of the road or highway constructed for use by vehicular traffic.

‘Carriageway lighting’ means a lamp placed on or near a road intended to illuminate the road surface.

‘Changeover’ means a change of lanes introduced to divert traffic within the same carriageway, including the hard shoulder.

‘Chapter X’ means the appropriately numbered chapter of the Traffic Signs Manual.

‘Client’ means the organisation or individual for whom the road works are being carried out.

‘Competent person’ means a person who has sufficient training and experience or knowledge and other qualities to enable him or her to undertake the task referred to.

‘Cone’ means a delineator to diagram 7101.1 (S13-6-4).

‘Controlled area’ means the length of road between the stop lines to diagram 1001 (S14-2-46) or ‘WHEN RED LIGHT SHOWS WAIT HERE’ signs to diagram 7011 (S14-2-58) or diagram 7011.1 (S14-2-59), where priority is indicated by traffic signals.

‘Crossover’ means where one or more lanes on a dual carriageway are diverted onto the opposing carriageway.

‘Department’ means the Department for Transport in England; in Northern Ireland the Department for Infrastructure (Northern Ireland); in Scotland, Transport Scotland; and in Wales, Transport Wales, Welsh Assembly Government.

‘Diagram number’ means the appropriately numbered diagram in a Schedule to the Regulations.

The term ‘direction XX’ means the appropriately numbered direction in the General Directions. (The N.I instrument does not include directions).

‘District distributor road’ means an ‘A’, ‘B’ or ‘classified unnumbered’ class road linking identifiable communities with each other which provides for major traffic movements within a town or district.

‘Dual carriageway road’ means a road which comprises a central reservation or two separate carriageways for travel in opposing directions. This term includes motorways. An ‘all-purpose dual carriageway road’ means a dual carriageway road which is not a motorway.

‘Emergency Traffic Management (ETM)’ means short-term traffic management required to protect both those involved in an incident and any other road users affected by that incident during the period before fully compliant traffic management can be installed.

‘Emergency works’ means works which are required in order to put an end to, or prevent the occurrence of circumstances which are likely to cause danger to persons or property.

‘Facing wall’ means a set of cones that directly faces the flow of traffic and guides the traffic along the required path.

‘Fixed-time operation’ means control of traffic by signals in which the change of signal indications from one traffic stream to another is automatic at times predetermined by the settings of the signal controller.

‘Flat traffic delineator’ means a device complying with the relevant requirements of TSRGD 2016 S13-8 (in Northern Ireland, Regulation 45). A specification for flat traffic delineators is given in BS8442: 2022.

‘Full contraflow’ means a road works traffic management scheme where all traffic on both carriageways travels past the works area on the secondary carriageway.

‘General Directions’ means the Traffic Signs Regulations and General Directions 2016 (SI 2016 No. 362) and subsequent Amendment Regulations and Amendment General Directions. (The N.I instrument does not include directions). In Wales ‘the Directions’ also include the Traffic Signs (Welsh and English Language Provisions) Regulations and General Directions 1985 (SI 1985 No 713).

‘Good visibility’ means visibility extending to the full length of the desirable minimum stopping sight distance. For stopping sight stopping distances see CD 109 ‘Highway Link Design’, Table 2.10.

‘Guide island’ means a temporary island usually of one lane width used to control or marshal traffic (e.g. on the approach to the controlled area).

‘Heavy goods vehicle’ (HGV) is defined as one with a maximum gross laden weight in excess of 7.5 tonnes.

‘High-speed road’ means a single or dual carriageway road which is subject to a permanent speed limit of 50 mph or more.

‘Highway’ means the area between the boundary fences including verges, shoulders, medians, footways, cycle tracks and carriageways.

‘Hours of darkness’ means the time between half an hour after sunset and half an hour before sunrise.

‘Incident’ means an unplanned obstruction in the highway which is likely to place road users at risk. It includes, but is not limited to, road traffic accidents, broken-down or abandoned vehicles, or debris in the carriageway.

‘Intergreen period’ means the period between the ending of a green signal being shown to one traffic stream and the start of the green signal being shown to the other traffic stream. It is the length of the all-red period plus the amber and red/amber periods.

‘Intervisibility’ means the distance at the works site over which drivers have uninterrupted vision of approaching traffic in normal weather conditions.

‘Junction’ means the intersection of one road by another on each of which the public has a vehicular right of way. The term does not include a private driveway or works entrances and exits.

‘Lighting Regulations’ means the Road Vehicles Lighting Regulations 1989 (SI 1989 No 1796) as amended by the Road Vehicles Lighting (Amendment) Regulations 2017 (SI 2017 No. 852), and the Road Traffic Regulation (NI) Order 1997.

‘Local distributor road’ means a road that serves communities of up to 1,000 dwellings or an industrial development. In rural areas these roads link the larger villages and HGV generators to the Primary Distributor Network. In built up areas these roads have 30 mph speed limits and very high levels of pedestrian activity with some crossing facilities including zebra crossings. On street parking is generally unrestricted except for safety reasons.

‘Low traffic flows’ means flows less than the reduced available carriageway capacity when the works are in place. Generally low traffic flow is where the traffic flow is not more than 1200 vehicles per hour per traffic lane left open where the HGV content is less than 10%, or 1000 vehicles per hour per traffic lane left open where the HGV content is between 10% and 30%, or 900 vehicles per hour per lane left open where the HGV content is greater than 30%.

‘Manual control’ means control of traffic by traffic signals in which the change from one signal indication to another or to the all-red period is initiated by an operator, or by the use of ‘STOP/GO’ signs to diagrams 7023 (S14-2-64) and 7024 (S14-2-65).

‘Manually operated’ means manual or remote control by an operative or operatives on site in view of traffic conditions.

‘Manually rotated’ means a sign rotated by an operative who holds the sign.

‘Maximum green period’ means the traffic controller setting which in the vehicle-actuated mode is the maximum period for which a traffic stream will continue to run after receiving a call from another traffic stream.

‘MIDAS’ (Motorway Incident Detection and Automatic Signalling) means a system used on some National Highways roads which monitors traffic and displays warnings to drivers about queues ahead.

‘Motorway Regulations’ means the Motorway Traffic (England and Wales) Regulations 1982 (SI 1982 No 1163) (as amended) or the Motorway Traffic (Scotland) Regulations 1964 (SI 1964 No 1002) as amended by the Motorway Traffic Amendment (Scotland) Regulations 1968 (SI 1968 No 960) or the Motorway Traffic Regulations (NI) 1984 (SR1984 No. 160) and subsequent amendment regulations.

‘Multiphase control’ means control of a junction by traffic signals with or without a shuttle lane, but with more than two separate traffic streams.

‘National speed limit’ in the context of this document means 70 mph for dual carriageway roads and 60 mph for single carriageway roads.

‘Order’ means any order made under an Act of Parliament, regulation, byelaw or notice for the regulation of traffic.

‘Overseeing Organisation’, in the context of this document, means the body responsible for authorising non-prescribed signs for the road.

‘Partial contraflow’ means a road works traffic management scheme where primary traffic flows past the works site on both the primary and secondary carriageways.

‘Pedestrian Crossings Regulations’ means TSRGD 2016 (SI 2016 No. 362), or the Zebra, Pelican and Puffin Pedestrian Crossings Regulations (NI) 2006.

‘Portable traffic signals’ (portable light signals) means traffic signals, as prescribed by paragraph 3 in TSRGD 2016 Schedule 14 Part 1 (Regulation 32 in Northern Ireland) normally mounted on a tripod, which are intended for positive control of traffic in shuttle lanes for relatively short periods of time.

‘Precautionary Area’ means an area specified as such in the Special Designation file added to either the National Street Gazetteer or Scottish Street Works Register.

‘Prescribed traffic sign’ means a sign as defined in the Road Traffic Regulation Act 1984 section 64, prescribed in the Regulations, identified by reference to a diagram number as shown therein. In Wales bilingual prescribed sign diagram numbers are prefixed by WAG. In Northern Ireland a ‘prescribed traffic sign’ means a sign prescribed by regulations made under Article 28 of the Road Traffic Regulation (NI) Order 1997.

‘Primary carriageway’ means the carriageway on which the road works are being carried out.

‘Primary distributor road’ means an ‘A’ or ‘B’ class road providing traffic movements into and out of a town and linking major residential and commercial districts.

‘Priority control’ means a shuttle lane where one stream of traffic has priority over the other stream indicated by traffic signs.

‘Public Transport Co-ordinator’ means the person holding this post generally in a local authority.

‘Raised rib’ means the alternative edge of carriageway road marking incorporating an audible and tactile warning in the form of a raised rib, diagram 1012.2 (S11-4-12) used on motorways and diagram 1012.3 (S11-4-13) used on roads that are not motorways and which have hard strips or hard shoulders.

‘The Regulations’ means the Traffic Signs Regulations and General Directions 2016 (SI 2016 No. 362) and subsequent Amendment Regulations and Amendment General Directions. In Northern Ireland, ‘the Regulations’ means the Traffic Signs Regulations (NI) 1997 (SR1997 No 386) and subsequent amendment regulations. In Wales ‘the Regulations’ also include the Traffic Signs (Welsh and English Language Provisions) Regulations and General Directions 1985 (SI 1985 No 713).

The term ‘regulation XX’ means the appropriately numbered regulation in the Regulations.

‘Restricted road’ means a road with street lighting where the maximum speed limit is 30 mph (20mph in Wales) under Section 81 of the Road Traffic Regulation Act (as amended) or Article 36 of the Traffic Regulation (Northern Ireland) Order 1997.

‘Remotely controlled’ means the change of a sign by an operative remotely by radio or wired connection.

‘Road Works’ is a generic term covering highway improvement schemes, excavations, structural inspections, maintenance works, street works, or any other work executed on or near the highway or road. If there is no active or ongoing construction or other worker activity then the situation may be a ‘Temporary Situation’; in this case there are limitations on permitted timescales. By convention this term is always used as two words, and must be shown on signs as two separate words unless authorised as one word.

‘Safety zone’ means that area between the working space and the traffic lanes occupied by vehicles which is necessary to protect the workers.

A ‘Schedule 13 Part 9 sign’ means a temporary sign complying with the requirements of TSRGD 2016 Schedule 13 Part 9 (in Northern Ireland, regulation 42). Direction 6 and general directions in Schedules 13 and 14 require that certain signs of the kind referred to in the regulation be removed with 6 months (2 years in the case of a sign of the kind referred to in regulation 53(1)(d)), unless the Secretary of State has authorised some longer period.

‘Secondary carriageway’ means the opposite carriageway to the one on which the road works are being carried out.

The ‘Secretary of State’ means the Secretary of State for Transport, the Department for Infrastructure (Northern Ireland), Transport Scotland or the Welsh Assembly Government as appropriate.

‘Short-term situations’ means situations that are expected to last less than 24 hours.

‘Shuttle lane’ means the area of carriageway where, owing to a temporary restriction, traffic has to flow first in one direction then in the other in a controlled manner.

‘Single carriageway road’ means a road that has one carriageway for travel in two directions or one direction in the case of a one-way road.

‘Site approval’ means formal written approval, given by the Authority in accordance with general direction 42 of TSRGD 2016 Schedule 14, for a site which includes a junction to be signal controlled.

‘Site length’ means the distance between the ends of the controlled area.

‘Smart motorway’ means is a section of a motorway that uses traffic management methods, including using the hard shoulder as a running lane, to increase capacity and reduce congestion in particularly busy areas.

‘Statutory undertaker’ means the person by whom the relevant statutory right is exercisable or the licensee under the relevant street works licence. For a full definition see section 48(4) (or in Scotland section 107(4)) of the New Roads and Street Works Act 1991.

‘Stopping sight distance’ is the distance required for a vehicle to come to a stop, taking into account the time taken to perceive, react, brake and stop safely. For full details see Table 2.10 of CD 109 ‘Highway Link Design’.

‘Street Lighting’ means a system of carriageway lighting intended to illuminate the road surface which meets the following specification.

- In England and Wales lamps placed not more than 200 yards apart.
- In Scotland lamps placed not more than 185 metres apart and the road is of a classification or type specified by the Scottish Ministers.
- In Northern Ireland lamps placed not more than 185 metres apart.

‘Street works’ means works such as placing, inspecting, maintaining, adjusting, repairing, altering, or renewing apparatus, changing the position of apparatus or removing it, executed in a street in pursuance of a statutory right or a street works licence. For a full definition see section 48(3) (or in Scotland section 107(3)) of the New Roads and Street Works Act 1991.

‘Taper’ means a single straight row of traffic cones that directly closes or opens a traffic lane. An entry taper is the first taper encountered and lead tapers are subsequent tapers facing the flow of traffic.

‘Terminal’ sign means a sign placed in accordance with directions to relevant Schedules in TSRGD 2016.

‘Temporary Road’ means a specific section of road constructed as part of the works or a temporary situation that is subsequently removed. Where the temporary road is to allow the works to be constructed e.g. online widening, works access or bridge replacement, the design speed and highway geometry shall be consistent with the works on the adjacent sections of road (using the same road geometry requirements as identified for crossovers and changeovers). Design requirements relating to a temporary situation will need to as identified by the road authority.

‘Traffic authority’ is defined by the New Roads and Street Works Act 1991 as having the meaning given in Road Traffic Regulation Act 1984.

‘Traffic cone’ or ‘traffic cylinder’ means a device complying with the relevant requirements of TSRGD 2016 Schedule 13 Part 8 (in Northern Ireland, regulation 45) and manufactured in accordance with BS EN 13422: 2004 ‘Portable road traffic signs – cones and cylinders’.

‘Traffic officer’ should be interpreted as referring to traffic officers as defined by the Traffic Management Act 2004. Traffic officers must be in uniform in order to exercise their powers.

‘Traffic sign’ refers to all traffic signs, road markings, and delineators either prescribed in the Traffic Signs Regulations and General Directions 2016 (SI 2016 No. 362), the Traffic Signs Regulations (NI) 1997 (SR 1997 No 386) and subsequent amendment regulations, or authorised by the Secretary of State in accordance with Sections 64 and 65 of the Road Traffic Regulation Act 1984.

‘Transition section’ means the transition from a single carriageway road to a dual carriageway road and vice versa.

‘Tunnel’ means an enclosed road tunnel of 150 m or more in length. For a full definition see CD 352 ‘Design of road tunnels’

‘Type approval’ means approval in accordance with S14-46.

‘Unrestricted road’ means a road subject to the national maximum speed limit, that is, 70 mph for dual carriageway roads and 60 mph for single carriageway roads.

‘Vehicle-actuated mode’ means that the duration of the red and green signals and the time of the cycle vary in relation to the traffic flow into and through the controlled area.

‘Warning light’ means a lit lamp that conforms to the National Annex to BS EN 12352:2006 at all times during its use.

‘Working drawing’ refers to plans detailing the design requirements and permitted variations of prescribed signs.

‘Working space’ means that space around the works area needed for workers and equipment.

‘Works area’ means that area occupied by the works themselves.

‘Works vehicle’ means any vehicle which is officially involved in the road works and entitled to be there.

‘Yellow’ when describing the colour of a traffic sign means the colour of the retroreflective material described as ‘yellow’ in BS EN 12899-1:2007.

APPENDIX A3 COLOURS

Standard colours for traffic signs

The colours used for sign faces must conform to the chromaticity requirements specified in BS EN 12899 1:2007(a). The National Annex recommends appropriate classes for UK use. However, as an aid to comparison, **Table A3.1** below lists the equivalent colours from BS 381C.

Table A3.1 Key to areas and symbols shown in plans

Colour (from BS EN 12899-1)	Equivalent colour (from BS 381C)
White	N/A
Yellow	No 355 (Lemon)
Orange	No 557 (Light Orange)
Red	No 537 (Signal Red)
Blue	No 109 (Middle Blue)
Green (see Note)	No 225 (Light Brunswick Green)
Dark green (see Note)	No 226 (Middle Brunswick Green)
Brown	No 411 (Middle Brown)
Grey	No 693 (Aircraft Grey)
Black	N/A
NOTE: Primary route direction signs, as well as panels and patches indicating primary routes on other signs, are 'dark green', previously known as 'Worboys green'. A small number of signs (e.g. Quiet Lane signs and direction signs for emergency vehicles) use 'green', which is lighter. A revised specification for 'green', which meets the requirements of the TSRGD has been included in the current National Annex.	

Standard colours for road markings

The colours white, yellow and red are prescribed for road markings.

White and yellow road markings must conform to the chromaticity requirements in BS EN 1436 'Road marking performance'. All yellow markings, permanent or temporary, will need to be within the colour box Y1 in Figure 1 in this standard. There is no current specification for red, 'Primrose' and 'Deep Cream' colours in the standard; however, it is expected that specifications will be included in a future National Annex.

The standard colour for waiting and loading restriction road markings is No. 355 (Lemon). No. 309 (Canary) is also acceptable. However, in environmentally sensitive areas No 310 (Primrose) or No. 353 (Deep Cream) may be used. The numbers referenced are the equivalent colours from BS 381C.

Black material for masking road markings (must conform to BS 7962:2000 with Amendment No 1, dated 2004, or an equivalent EEA Standard. There is currently no European Standard for this material.

APPENDIX A4 SIGNS PRESCRIBED BY SCHEDULE 13 PART 9

Overview and use of signs to S13-9

Schedule 13-9 of TSRGD provides for temporary warning and information signs that are not otherwise covered in the Regulations. It is important to note that contrary to some third party advice this Part does not provide cart-blanche to place any sign not otherwise prescribed in the TSRGD on a road. When designing signs to this Part designers are expected to be fully conversant with Chapter 1, and familiar with requirements in Chapters 4 and 7. The principles of what signs are covered by this Part are:

- If there is a prescribed sign for the intended use it must be used.
- The sign must only contain symbols, arrows and other elements which are included, or permitted, in the TSRGD.
- The signs must follow the relevant design rules identified in the TSRGD such as colour combinations, font, date and time formats, capitalisation and size and shape.
- This Part only covers a subset of uses, designers must confirm if the intended sign is with the identified limits in the regulations.
  - convey a civil emergency warning or information;
  - convey a temporary hazard warning;
  - convey temporary information (this is information about temporary situations and does not include temporary signs related to ongoing or permanent issues), or.
  - indicate the entrance to, or exit from, road works for vehicles involved in the carrying out of those works.
- Signs to this Part must not be used for displaying the start or end of restrictions or requirement. These can only signed and enforced using prescribed signs.
- Signs to this Part may be used to give advance notice of restrictions; however, in most situations diagram 818.4 (S12-28-22), suitably varied, will be appropriate.
- Signs to this Part should not be co-located with regulatory signs; to do so may effect the enforceability of the restriction or requirement.
- Any sign to this Part retained after the date that the TSRGD indicates that it is required to be removed will be an unlawful obstruction. Any sign co-located with the unlawfully retained sign is similarly an unlawful obstruction and any restriction or requirement will not be enforceable.

Where determining the purposes and use of signs to S13-9, the following definitions should be considered:

- ‘Civil emergency warning or information’ – a warning or information about a civil emergency or the prospect of a civil emergency.
- ‘Temporary hazard warning’ – a warning about, or information on how to avoid, any temporary hazard caused by:
  - works being executed on or near a road.
  - adverse weather conditions or other natural causes.
  - the failure of street lights or malfunction of, or damage to, any other apparatus, equipment or facility used in connection with the road or anything situated on or near or under it.
  - damage to the road itself.

  - it does not cover issues related to the lack of routine or timely maintenance of the road, or associated equipment.

- ‘Temporary information’ – information about:
  - the time, date or location of road works.
  - the expected delay that road works may cause.
  - convenient routes to be followed on the occasion of a sporting event, an exhibition or any other public gathering which is likely to affect a large volume of traffic.
  - details of diversions or alternative routes related to road works and temporary situation (this requires suitable route(s) to be identified and does not include non-specific ‘find alternative route’ or similar phrases).
  - check points at which drivers of goods vehicles or public service vehicles may be required to stop.
  - the availability of new routes or destinations.
  - changes in route numbers.

- ‘Temporary information’ – information for:
  - Drivers of wide loads about action to be taken in respect of road works ahead.
  - Requests by the police for information in connection with road traffic accidents.

- ‘Indicate the entrance to, or exit from, road works for vehicles involved in the carrying out of those works’.
  - This is limited to signs at entrances in road works (including street works). It does not cover temporary access to construction sites unless there is relevant TTM on the road.

- ‘Temporary’ unless associated with relevant works or a relevant temporary situation (see below) this is limited to six months.

The design of signs to S13-9

See also **Appendix A9** Temporary Directional Signing.

Where signs convey

- a temporary hazard warning,
- temporary information only for pedestrians, cyclists or equestrians,
- or indicates the entrance or exit from road works for works vehicles

the background must be red.

Any letters, numerals, other characters, chevrons or borders on such signs must be white. Text on signs with red backgrounds is always presented as upper case lettering, unless otherwise shown on a working drawing or includes a distance.

Where signs convey

- temporary information in connection with road works, or
- emergency diversion route information or symbols, or
- signs at event relating to any change in layout TTM, or
- information about check points at which good vehicles or public service vehicle may be required to stop

the background must be yellow

Any letters, numerals, other characters, chevrons or borders on such sign must be black.

Static signs should have no more than 7 units of information. Designers should eliminate any superfluous units to help ensure driver comprehension. An example of text to omit would be the phrase ‘Plan ahead’. Similarly, statements like ‘thank you for your support / cooperation’, particularly for events, should be omitted as along with ‘sorry for any inconvenience’ as they are often taken as being insincere as well as unnecessarily increasing reading times. Where there is active on-line information about closures etc, the phrase ‘search xxx’ may be acceptable, but not if the content is static.

Unless otherwise indicated on a working drawing, only one ‘x’ height should generally be used on a sign. Varying sizes of text may place undesirable emphasis on part of a legend.

For bilingual signs, the maximum number of units of information may be increased beyond 7 to a maximum of 14 (i.e. 7 Welsh and 7 English). It is assumed drivers would read either the Welsh or English elements. Unless otherwise prescribed, all units in each language should be grouped together.

For bilingual signs, larger sign faces should be used to accommodate both languages at the appropriate ‘x’ height for the conditions. The ‘x’ height should not be reduced to fit both languages on standard size temporary sign faces, unless otherwise shown on a working drawing.

Unless otherwise shown on Working Drawings, ‘x’ height sizes for Schedule 13-9 signs are shown in **Table A4.1**.

Table A4.1 ‘x’ heights for Schedule 13-9 signs

85th percentile approach speeds of private cars/ speed limit	Examples of typical roads for which Column 1 may apply	Minimum ‘x’ height (millimetres)
Up to 20 mph	Very narrow and urban roads	60
20 to 30 mph	Urban and rural roads of local character	75
30 to 40 mph	Urban and rural single 2-lane roads (7.3 m wide with 1 m hard strips)	100
40 to 50 mph	High standard rural single roads (7.3 m wide with 1 m hard strips) Urban all-purpose dual carriageway roads	125
50 to 60 mph	Wide single carriageway roads (10 m wide) Urban all-purpose dual carriageway roads	150
60 to 70 mph	High standard all-purpose dual carriageway roads Motorways with a speed limit less than 70mph	200
70 mph	All-purpose grade separated dual carriageway roads and motorways	250

Note: Signs for pedestrians may be at a minimum ‘x’ height of 35 mm.

Standard rules for the capitalisation of proper nouns need to be used, i.e. a proper noun should always begin with a capital letter. Proper nouns include:

- geographic place names (e.g. ‘South East England’).
- company or organisation names (e.g. ‘TfL’).
- holidays (e.g. ‘Easter’).

Terms such as ‘town centre’, ‘the contractor’, or ‘summer’ are not proper nouns and should not begin with a capital letter.

Text on signs with a red background need to be in upper case lettering, unless otherwise shown on a working drawing, or containing a distance e.g. ‘1 mile’. Text on other colour combinations is lower case, except for leading capitals for each message, as mentioned above or otherwise shown on a working drawing. Capitalisation must not be used to emphasis a word in a message e.g. CLOSED.

Distances must be given as ‘yards’, ‘yds’, ‘mile’ or ‘miles’. Where distances of less than ½ mile are expressed in yards, it must be to the nearest 10 yards. For distance greater than 3 miles, the distance must be quoted to the nearest whole mile.

Any distance between ½ mile and 3 miles may be indicated using one of the following: ‘⅔ m’, ‘¾ m’, ‘1 m’, ‘1¼ m’, ‘1⅓ m’, ‘1½ m’, ‘1’⅔ m’, ‘1¾ m’, ‘2 m’, ‘2¼ m’, ‘2⅓ m’, ‘2½ m’, ‘2’⅔ m’ or ‘2¾ m’.

Any time period, or combination of periods, should be expressed as:

- ‘Monday’ or any other day of the week, abbreviated as appropriate.
- ‘Monday – Saturday’ or any other days of the week, abbreviated as appropriate:
- ‘8.30 am – 11.00 am’,’8.30 – 11.00 am’, ‘8.30 am – 3 pm’, ‘2 – 3 pm’, ‘Midnight – 6 am’, ‘Noon – 9 pm’ or any other time periods as appropriate.
- ‘1 May – 30 September’ or any other dates and may include references to bank and public holidays, abbreviated as appropriate.

Noon is neither am nor pm. 12 pm and 12 am are not valid times and must not be used instead of Midnight, Midday or Noon. The 24 hour clock must not be used to define times; the 12 hour clock must be used,

Dates must be in the format ‘1 January 2025’. The month may be abbreviated. The inclusion of a year is normally only needed where the sign is to be retained on the road for more than 6 months, or the last date included on the sign is more than 6 months in the future. The use of the date format ‘1/1/25’ or ‘01/01/2025’ is not lawful.

The inclusion of web addresses, hashtags or other similar references are not permitted on signs. Traffic signs must not encourage drivers to consider accessing the internet while in charge of a vehicle.

Except for Police requests for information or unless solely for viewing by pedestrians, telephone numbers should not be included on signs to S13-9 if the ‘x’ height of the text is less than 100 mm, or less than 150 mm where the 85th percentile approach speed is over 40 mph. Where a sign is required to display a telephone number and the ‘x’ height is less than the size mention above then an additional sign, at an appropriate ‘x’’ height, to diagram 7006.1 (S13-6-1) should be placed downstream of the sign to S13-9. The distance between the signs should be the relevant clear visibility distance for the expected traffic speed.

For further colour combinations, including signs with white or blue backgrounds, see S13-9.

The design and use of 1050 x 750 mm sign plates

On roads where the speed limit is 40 mph or less, standard size 1050 x 750 mm sign plates (see **Figure A4.1**) may be used in lieu of a sign following basic sign design rules.

The sign image in **Figure A4.1** (a) illustrates a compliant sign at the correct minimum ‘x’ height following the basic sign design rules. Signs that do so often provide advantages to a designer when considering placement of the sign and the need to avoid obstructing non-motorised users. The same legend on a standard size 1050 x 750 mm sign plate is in **Figure A4.1** (b).



(a) (b) (c)

Figure A4.1 1050 x 750 mm standard sign plate sizing

To ensure legibility, the ‘x’ height of text should be the largest that can fit on the plate (see Figure A4.1 case (b)). The minimum ‘x’ height must not be less than 60 mm when it needs to be read from a vehicle in motion See **Figure A4.1** (c). Signs in **Figure A4.1** (a) and (c) have the same minimum ‘x’ height of 60mm.

Horizontal gaps between the border and any text tile or symbol should generally not be less than the borders width on at least a minimum of one axis vertical or horizontal axis, see **Figure A4.1** (b).

The 1050 x 750 mm plate may be used in either a landscape or portrait perspective.

Both vertical spacing of text and the orientation of the plate should be adjusted to balance appearance, see **Figure A4.2**.



Figure A4.2 Sign in Figure A1 (b) adjusted for orientation and size

Permitted retention periods

Irrespective of the permitted retention period, signs should be removed when they are no longer needed, or would provide an unsafe, out of date or conflicting message to road users.

- Signs directly associated with road or street works may be retained on the road for the duration of the works (this does not include construction works adjacent to a road except if relevant TTM is in place on the relevant road).
- Signs related to a temporary obstruction of a road may be retained for the duration of the obstruction (this does not include planned closures).
- Signs related to diversions related to road or street works may be retained for the duration of the works. (this does not include temporary directional signs, only diversions for existing signed destinations).
- Signs related to emergency diversions may be retained for a maximum of six months after they are installed, after which they need to be replaced with prescribed signs.

- Signs relating to checkpoints may be retained for the period the checkpoint is in operation.
- Signs related to a change in route number (or new routes) may be retained for a maximum of two years after they are installed.
- All other signs, including those related to other temporary situations, are limited to a maximum of six months after they are installed, after which they need to be replaced with prescribed signs.

The relevant national authority may permit retention for longer periods (S13-12-16).

To be able to evidence that requirements relating to time limit for retention are being met it is essential to record the installation date for all signs and then record their removal dates. It is recommended that this data is retained for at least three years. In case of the retention of a sign being queried it is for the authority or contractor to provide evidence that signs are within the permitted retention period and then were subsequently removed before this retention period expired.

Sign illumination requirements

Irrespective of any legal requirement to illuminate signs in TSRGD the designer and contractor (or authority for some temporary situations) has a duty to ensure that all S13-9 signs are readable by road users for the period the sign is on the road. Signs will need to be checked for readability on installation and at suitable intervals until the sign is removed. Details of these inspections will need to be retained.

Signs providing the following functions must be illuminated.

- the route of a diversion (except routes exclusively for pedestrians, cyclists or equestrians).
- information about future or ongoing road works.
- information about check points at which goods vehicles or public service vehicles may be required to stop.
- a temporary hazard warning in connection with the execution of works, or a temporary obstruction, or.
- temporary information for drivers of wide loads about action to be taken in respect of road works ahead.

The principles for the options for illumination of signs are covered in Section 11 of Chapter 1.

Where relevant illumination is to be in provided via retroreflective material and the sign is to be placed on a road during the hours of darkness then the sign face material should be to a minimum of class R2/RA2 from BS EN 12899-1.

Temporary variable message signs

Variable Message Signs (VMS) must only be used to display traffic signs as defined in the Road Traffic Regulation Act 1984. Their use to display any other message renders them unlawful.

Statutory Type Approval of VMS products is not now a requirement of TSRGD. Contractors should check with the appropriate authority if there are any contractual requirements for third party type approval of the VMS product. In most cases this third party would be a competent national body, e.g. Traffic Open Products and Specification Ltd (TOPAS). Contractors should check with sign manufacturers which specifications are relevant to their products and obtain copies of any accreditations.

The design and use of VMS

Temporary VMS must conform to the relevant requirements of BS EN 12966: 2014 listed in TSRGD More information can be found in DMRB document CD 130 ‘Design of temporary traffic management at road works and temporary layouts’.

All parts of the VMS, other than those facing traffic, should be coloured grey, black or be in a non-reflective metallic finish.

Any lettering on the VMS housing, required for identification purposes, should be no more than 25 mm high. If the lettering is applied by means of a label, the label should be either transparent or the same colour as the sign housing.

No part of the VMS housing or label should comprise of retroreflective material.

Any part of the VMS housing surrounding the area used to display a message should be coloured grey or black. This area must also have no text or symbols.

Text displayed on a VMS must be in white or yellow. A prescribed sign incorporating a black legend or symbol on a white or yellow background may be displayed on a VMS with the colours reversed, i.e. as a white or yellow symbol on a black background. Any red triangle or circle forming part of a prescribed sign must be displayed in red on the VMS.

When no message is being displayed, a VMS should exhibit a black or grey display area.

Signs displayed on variable message signs may have a black background and, if it does, any letters, numerals, other characters or chevrons must be white or yellow.

Signs displayed on variable message signs may also have yellow backgrounds and, if it does, any letters, numerals, other characters, or chevrons must be black.

Messages displayed on VMS should be as short as possible, consisting of no more than eight words or six units of information (see **Table A4.2**). Messages should however still be fully comprehensible to drivers.

Table A4.2 Number of words comprising Unit of Information for VMS legends

Type of Legend	Unit of Information	Number of words
Place name or other destination, even if it consists of more than one word, e.g. ‘STOKE-ON-TRENT’ or ‘FORTH ROAD BRIDGE’	1	1, 2, or 3
Place name with associated compass point, e.g. ‘READING (E)’ or ‘SLOUGH (WEST)’	1	1 or 2
Place name with associated route number, e.g. ‘DORKING A24’ or ‘LAMPTON (M11)’	1	2
Location comprising route number, junction number or numbers and compass point, e.g. ‘M6 J20-21 NORTH’	2	3
Time, e.g. ‘8.30 – 11.00 am’	2	1 or 2
Date, e.g. ‘1 May – 30 September’	2	1 or 2
Distance, e.g. ‘600 YDS’ or ‘3 MILES’	1	1
All other words, with the exception of prepositions, regardless of length, e.g. ‘FOG’ or ‘WORKFORCE’	1	1
Prescribed sign, e.g. warning triangle, speed limit roundel or wicket (lane closure) pictogram	1	1
Driver information consisting of up to three words (as a defined above), e.g. ‘ACCIDENT’, ‘LONG DELAYS’ or ‘REJOIN MAIN CARRIAGEWAY’	1	1, 2, or 3
Supplementary information associated with warning signs, e.g. ‘3 ‘MILES’ or ‘ICE’	1	1
Arrow or emergency diversion route symbol	1	0
Punctuation marks, dashes, etc.	0	0

All messages must be displayed on a single aspect (S16-1-1(8)). It is unlawful to display messages that require the use of multiple displays (e.g. ‘paging’, or ‘scrolling’ text etc.).

Where possible a prescribed legend from the TSRGD (S16) should be used. A temporary VMS may be used to display message for the same purpose as a temporary fixed sign.

Schedule 13-9 permits the placing of temporary signs to convey various types of messages to traffic. Messages require authorisation by the national authority where the requirements of Schedules 17 and 18 are not met or where symbols are not prescribed in TSRGD.

The size of prescribed signs displayed on VMS must be appropriate to the traffic approach speed, unless special authorisation has been obtained. Due to the loss of resolution at small sizes, signs including complex pictograms should be displayed at the largest size (generally 1500 mm) wherever possible.

Table A4.3 sets out the minimum sizes of text for use on VMS.

On roads where the 85th percentile approach speed of private cars is greater than 40 mph, two VMS displaying the same legend should be provided where possible. This is especially important where the information displayed is likely to conflict that on fixed direction signs (e.g. a VMS message indicating a mandatory or advisory diversion). Approach speeds should be determined in accordance with DMRB CA185 Vehicle speed measurement.

Table A4.3 Sizes of characters on verge mounted VMS

85th percentile approach speed of private cars (mph)	Number of words in longest message to be displayed	x-height of Transport Alphabets (mm)						Upper case letter height (mm)					
		Motorways and all-purpose dual carriageway roads with hard shoulders			All-purpose roads without hard shoulders D = dual carriageway roads S = single carriageway roads			Motorways and all-purpose dual carriageway roads with hard shoulders			All-purpose roads without hard shoulders D = dual carriageway roads S = single carriageway roads		
		2 lane	3 lane	4 lane	1 lane D 2 lane S	2 lane D 4 lane S	3 lane D	2 lane	3 lane	4 lane	1 lane D 2 lane S	2 lane D 4 lane S	3 lane D
Up to and including 30	2				75	100	150				100	100	200
	4				100	150	150				100	200	200
	6				100	150	200				100	200	250
	8				150	150	200				200	200	250
Over 30 and up to and including 40	2	150	200	250	100	150	200	250	300	300	100	100	250
	4	200	250	250	150	150	200	250	300	350	100	250	250
	6	200	250	300	150	200	250	300	350	350	250	250	300
	8	250	250	300	150	200	250	300	350	400	250	300	300
Over 40 and up to and including 50	2	200	250	250	150	150	200	250	300	300	100	100	250
	4	200	250	300	150	200	200	250	300	350	100	250	250
	6	250	300	300	200	200	250	300	350	350	250	250	300
	8	250	300	350	200	250	250	300	350	400	250	300	300
Over 50 and up to and including 60	2	200	250	300	150	200	200	250	300	350	100	250	250
	4	250	300	300	200	200	250	300	350	350	250	250	300
	6	250	300	350	200	250	250	300	350	400	250	300	300
	8	300	350	350	250	250	300	350	400	350	300	300	350
Over 60	2	250	250	300	150	200	250	300	300	350	100	250	300
	4	250	300	350	200	250	250	300	350	400	250	300	300
	6	300	350	350	250	250	300	350	400	400	300	300	350
	8	350	350	400	250	300	350	400	400	400	300	350	400

Non-prescribed legends should broadly follow the same principles as legends prescribed by TSRGD. Non-prescribed strategic traffic and diversion legends should be constructed such that information appears in the following order:

- location (e.g. M1 J3-4 NORTH).
- problem (e.g. ACCIDENT).
- effect (e.g. LONG DELAYS).
- guidance (e.g. USE M40).

Based on the capability of the VMS, some information for non-prescribed strategic traffic and diversion legends may have to be omitted. In these cases, displaying information on the 'effect' is generally more important than information on the 'problem', Partial information should only be given when supported by other signing.

VMS may be used to warn drivers of future events that might affect their journeys. These types of events can include road works or major events. In both cases advance or remote notice should follow the same broad principles (order and style of information) as signs to working drawing 7002A, 7002B, and 7002.1 (S13-9). Dates and times must be expressed in the format prescribed in TSRGD (S18-1).

The display of flashing amber lamps with certain signs is permitted within TSRGD. For temporary VMS, flashing amber lamps may only be with immediate safety-related messages under Schedule 13 Part 9 and prescribed messages from Schedule 14 related to temporary hazards (including tactical diversion messages).

Flashing amber lamps may only be used with specially authorised non-prescribed legends if the authorisation expressly permits it.

APPENDIX A5 SIGNS TO DIAGRAM 7243, SCHEDULE 13 PART 6 ITEM 14

Overview and use of signs to diagram 7243

Signs to diagram 7243 (S13-6-14; **Figure A5.1**) detail temporary road layouts with lane restrictions, closures, or contraflows. These are typically used for non-standard road layouts.

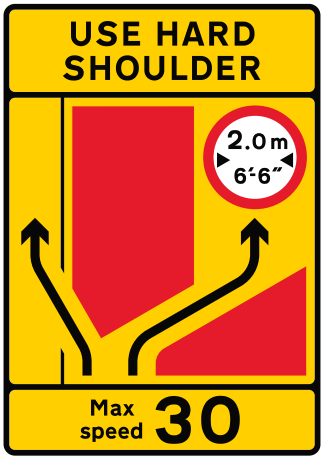


Figure A5.1 Typical sign to diagram 7243 (S13-6-14)

Typically signs to diagram 7243 may be larger and more difficult to locate on site than signs to diagrams 7244 and 7245. Signs of this size may present additional manual handling and installation difficulties over other smaller signs. However, there may be situations where signs to diagram 7243 may be preferable. In Northern Ireland diagrams 7244 and 7245 are not prescribed and lane usage 'wicket' signs will need to be designed to the design rules identified below.

The design of signs to diagram 7243

This section provides guidance on the design of signs to diagram 7243. The sign typically comprises of up to three panels:

- a top panel giving messages and instructions on how lanes may be used.
- a central panel.
- a bottom panel giving advisory messages, including distance or maximum speed.

Design of top panel

The permitted top panel options are shown in **Figure A5.2**.

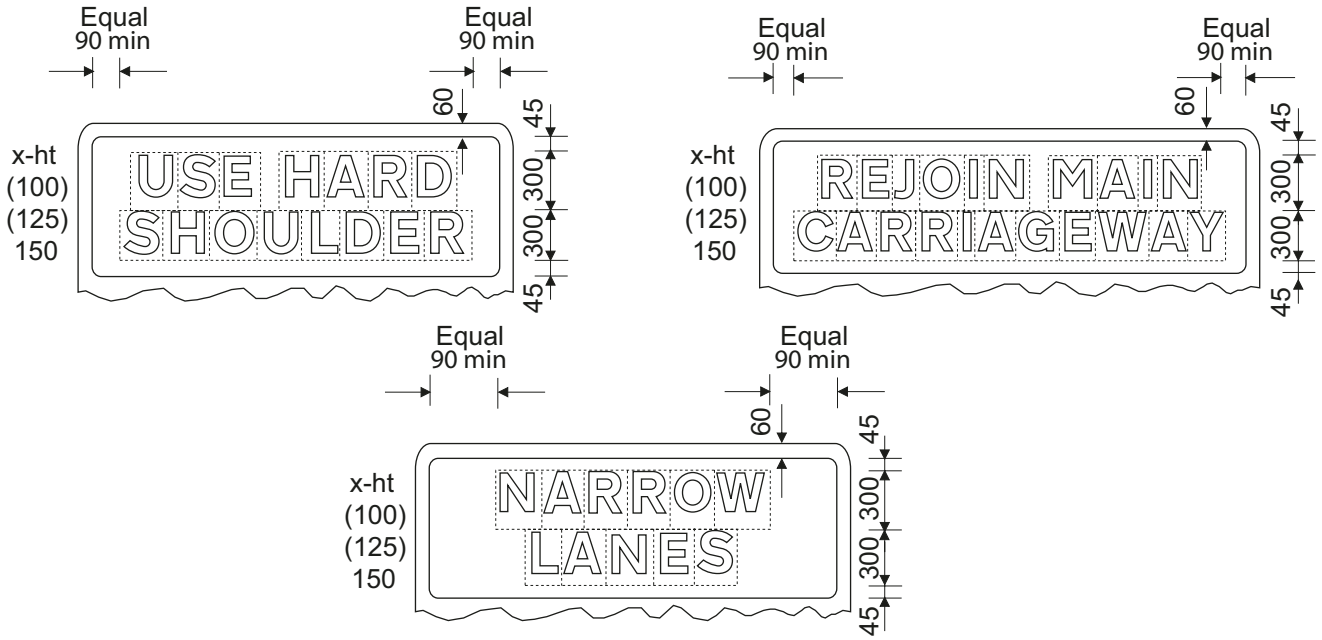


Figure A5.2 Top panel design details

Notes:

1. The legend should be black text and border on a yellow background.
2. The legend is from the Transport Heavy alphabet at the x-heights (in millimetres) shown.
3. All dimensions shown are based on an x-height of 150 mm and should be varied proportionally for other x-heights.
4. In Northern Ireland only the 150 mm ‘x’ height is prescribed. Other legends may also be used in Northern Ireland beyond the three shown in this figure.

Design of central panel

The design of the central panel needs to provide road users with an adequate understanding of the road layout ahead. Advance signs also need to be consistent with the road layout at each sign’s location.

Where the current road layout is inconsistent with the specified change in layout shown within the central panels of advance signs, then either:

- the central panel should be changed to reflect the change in current layout, or.
- the change in current layout should be detailed in a separate sign to diagram 7245 provided in advance.

The number and position of arrows, regulatory roundels, and red blocks (representing the closed areas) within the central panel may be varied to suit the circumstances. Arrowhead shape should be maintained throughout (as shown in **Figure A5.3**).

A single downward-facing white arrow should be used to indicate opposing traffic flows irrespective of the number of lanes. A downward-facing white arrow must be included where there is two way traffic on the relevant carriageway or road.

Route numbers (as shown in **Figure A5.3**) may be added above lane arrows.

Motorway junction numbers may be included below any route numbers (as shown in **Figure A5.3**).

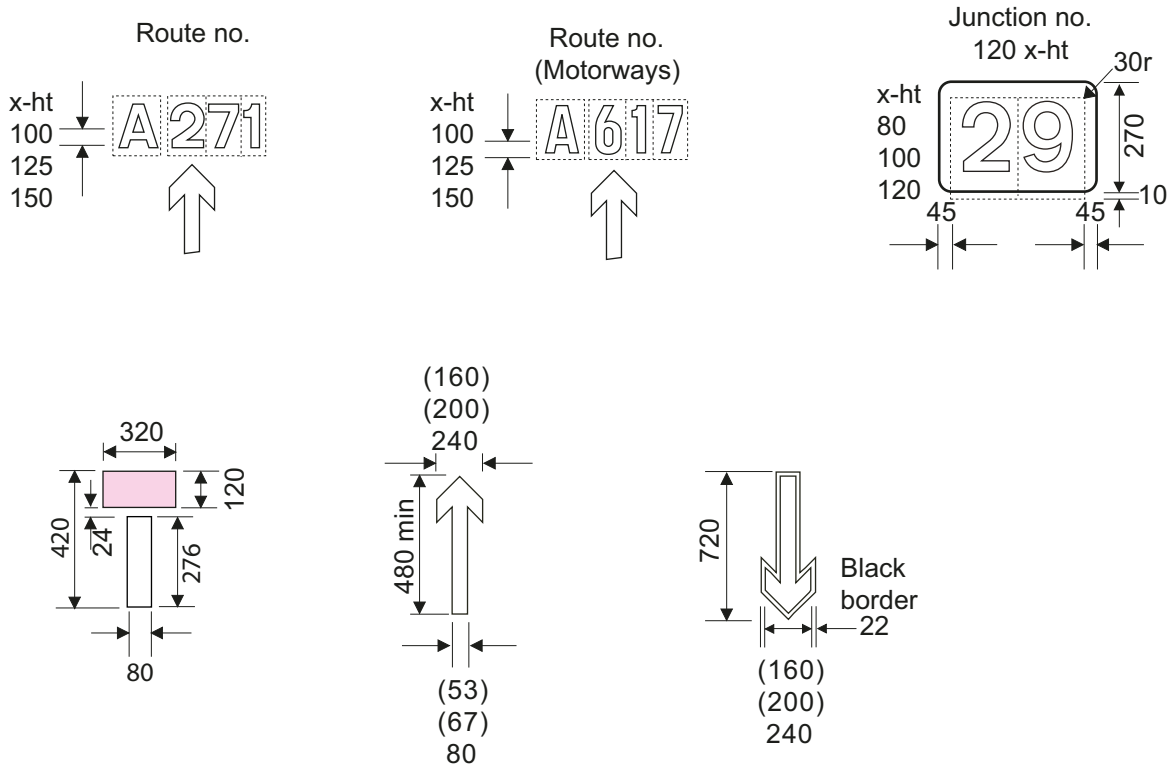


Figure A5.3 Sign element design details

Notes:

1. All dimensions, except for the Junction no, are based on the 150 mm x-height and should be varied proportionally for the smaller x-heights.

2. Motorway junction numbers (white characters on a black patch) using Transport Medium text may be added to the sign.

3. Vertical spacing between lane arrows and route numbers should be 75 mm. Spacing between lane arrows and motorway junction numbers should be 75 mm.

The design of arrows may be changed to show lane changes (as shown in **Figure A5.4**).

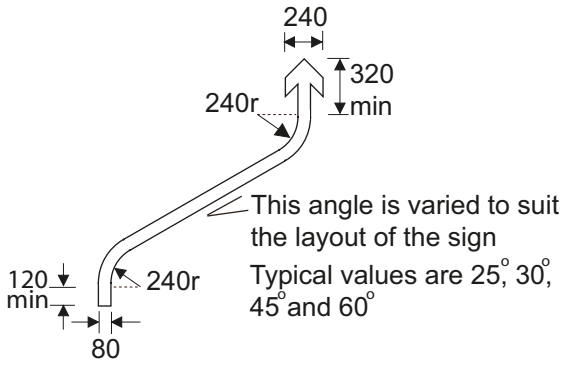


Figure A5.4 Lane change arrow design details

Note:

1. All dimensions shown are based on an x-height of 150 mm and should be varied proportionally for other x-heights.

Where there are three or more lanes on the approach to a lane change, the stems at the base of the arrows should be equally spaced. For vertical elements, the minimum spacing between arrow stems should be 400 mm centre to centre. The minimum spacing between the centre of an arrow shaft and any border, red block, or hard shoulder should be 200 mm. For angled

elements, the minimum spacing between arrow stems should be 300 mm centre to centre. The minimum spacing between the centre of an arrow shaft and any border, red block, or hard shoulder should be 175 mm.

Areas of closed carriageway are represented by red blocks. Where traffic is directed onto a hard shoulder, a thin black line is used to denote the division between the hard shoulder and normal running lane (see **Figure A5.5** for the basic design details).

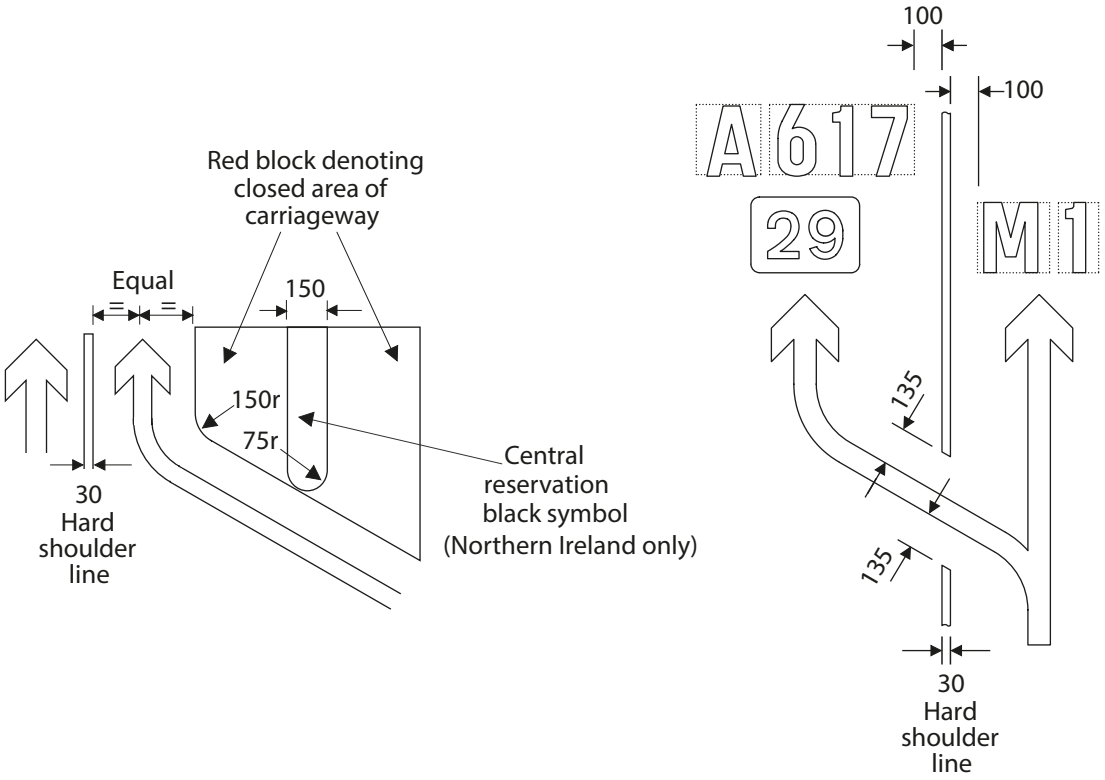


Figure A5.5 Red block, central reservation, and hard shoulder design details

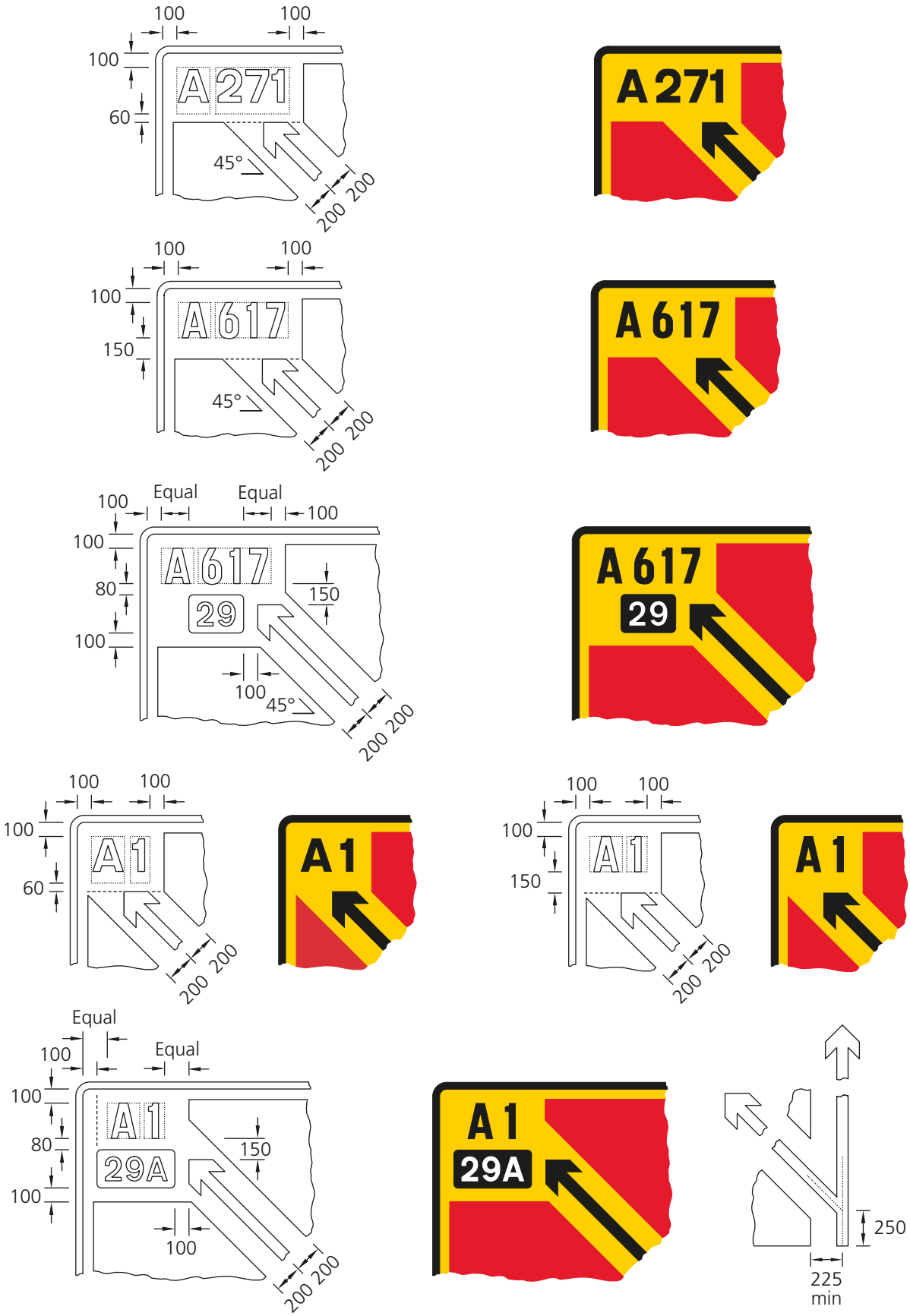
Notes:

1. All dimensions shown are based on an x-height of 150 mm and should be varied proportionally for other x-heights.

2. The 150 mm radius on the red block is only applied where there is a curved arrow immediately adjacent.

Where there is a hard shoulder line between the red block and the arrow, a non-radiused corner is used.

Where traffic may exit the main carriageway, an arrow at 45° upwards to the left should be used, with text positioned as shown in **Figure A5.6**.



All dimensions are in millimetres

Figure A5.6 Junction exit design elements

Note:

1. All dimensions shown are based on an x-height of 150 mm and should be varied proportionally for other x-heights.

The regulatory roundels shown in **Figure A5.7** may be used within the central panel.

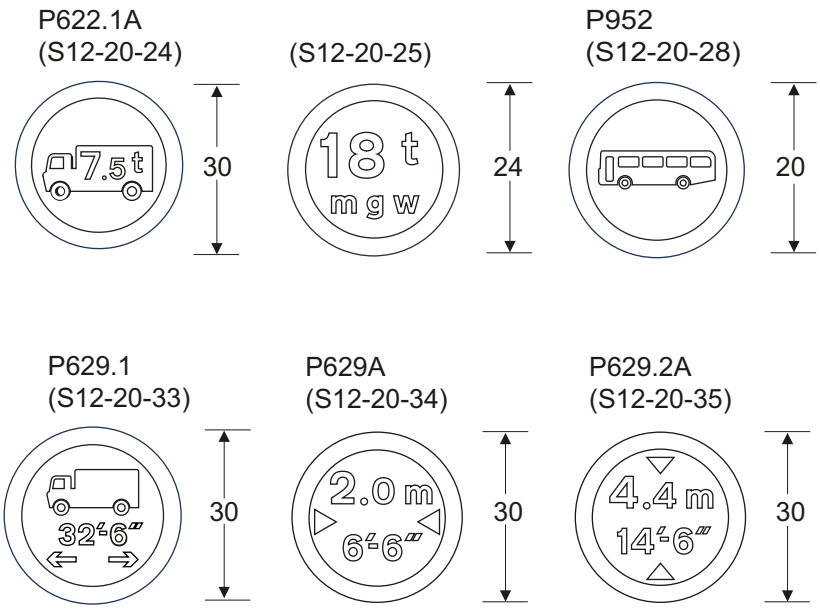


Figure A5.7 Regulatory roundel design details

Notes:

1. All dimensions shown are stroke widths.

2. The minimum diameter of a roundel to P622.1A, P629A, and P629.2A should be 750 mm. As such, any sign featuring a roundel will only ever be at 125 mm or 150 mm w-height with these roundels being 750 or 900 mm diameter respectively.

3. Vertical spacing between lane arrows and regulatory roundels should be 75 mm for an x-height of 150 mm.

4. Where different roundels are used on a sign, the size of the roundels should be the same, with the largest diameter being used for all roundels.

The minimum horizontal space between arrow centres and or roundels are shown in **Table A5.1**.

Table A5.1 Minimum horizontal spaces between central panel elements (mm)

	Arrow	Roundel	Route no.	Border
Arrow	600	775	325	225
Roundel	775	1020	475	550
Route no.	325	475	200	100
Border	225	550	100	n/a

Note:

1. All dimensions shown are based on an x-height of 150 mm and should be varied proportionally for other x-heights.

Where two or more adjacent lanes have the same route number (and junction number, if relevant) or regulatory roundel, then the following may be added:

- a horizontal bar above the relevant arrows.
- a single instance of either the route number or roundel centred above the horizontal bar (see **Figure A5.8**).

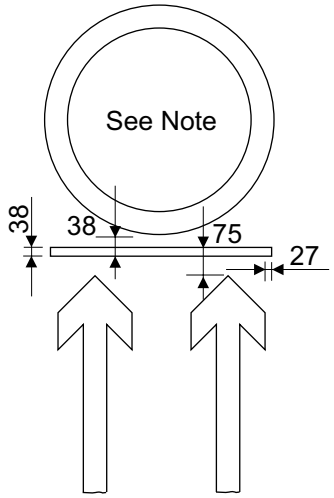


Figure A5.8 Adjacent lane horizontal bar design details

Note:

1. See **Figure A5.7** Regulatory roundel design details for roundels that may be used.

Design of bottom panel

The permitted bottom panel options are shown below in **Figure A5.9**.

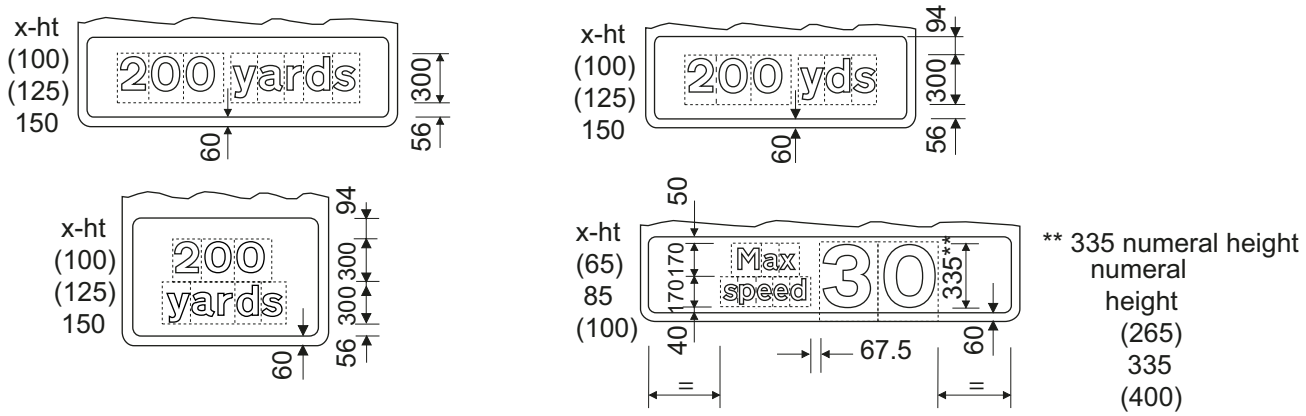


Figure A5.9 Bottom Panel design details

Notes:

1. The legend should be black text and border on a yellow background.
2. The legend is from the Transport Heavy alphabet at the x-heights (mm) shown.
3. All dimensions for distance panels are based on an x-height of 150 mm and should be varied proportionally for other x-heights.
4. The x-heights shown do not apply in Northern Ireland.

The number of lines on the bottom panel should be varied to optimise overall width of the sign to diagram 7243. Where ‘yards’ is placed on a second line, it may not be abbreviated to ‘yds’.

APPENDIX A6 INSPECTION STOPS IN NORTHERN IRELAND

The signing and guarding requirements differ depending on the location and duration of the works, as set out below.

Stops on hard shoulder:

- short duration (up to 15 minutes) – no TTM required.
- medium duration (from 15-90 minutes) – refer to **Plan INI1**.
- long duration (over 90 minutes) – comply with the hard shoulder closure requirements in **Section 7.10**.

Stops on verges on roads with or without hard shoulders:

- short duration (up to 15 minutes) – no TTM required.
- durations over 15 minutes – refer to **Plan INI2**.

When planning works on a hard shoulder or roadside verge, the following should be considered:

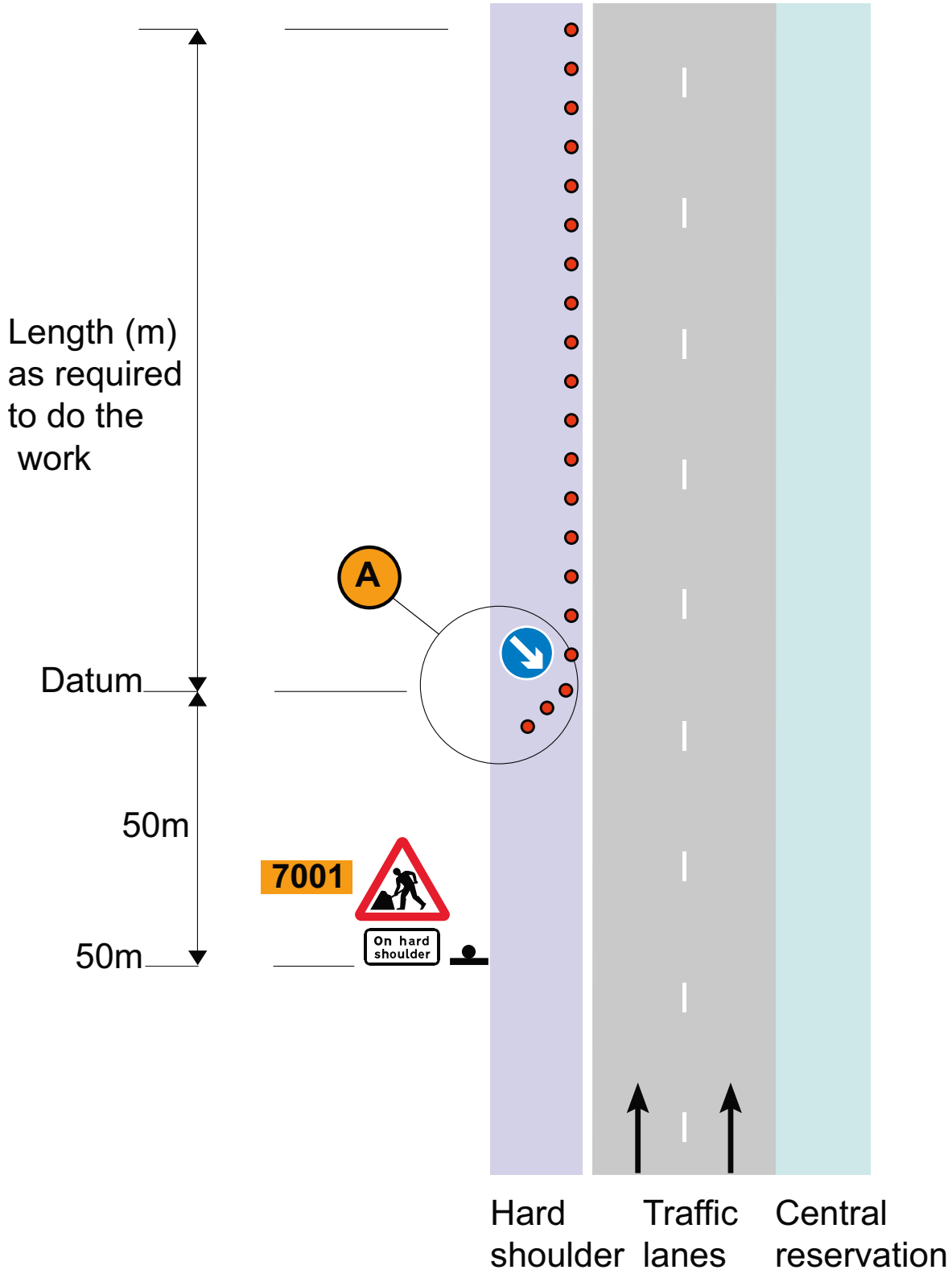
- the length of time needed to complete the work.
- traffic volumes and patterns, including peak traffic flow times and locations.
- worker visibility, including whether work will be carried out in darkness.
- available parking locations, including the number of required vehicles.
- getting in and out of the work location.

Vehicles should be parked facing in the same direction as the traffic flow, at least 0.5 m away from the live lane in a manner that avoids obscuring sightlines. If this distance cannot be achieved, then alternative TTM arrangements will be required.

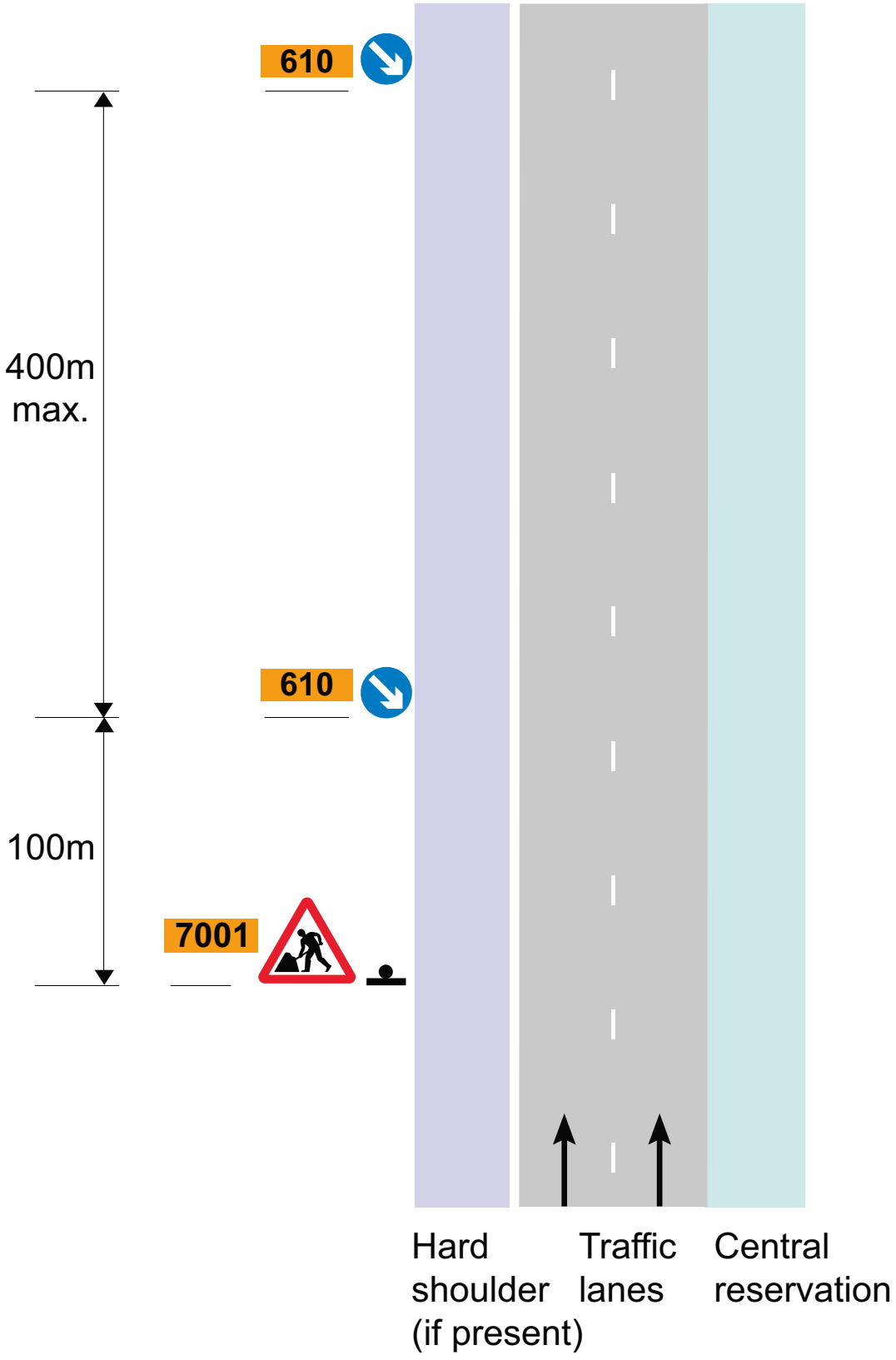
In addition to complying with the safe working methods for their specific work activity, personnel:

- should be at least 1.2 m away from the live lane. If this distance cannot be achieved, then alternative TTM arrangements will be required;
- must wear a high visibility jacket (see **15.2.6** ‘high risk’) throughout the work period.
- should get in and out the vehicle from the side away from live traffic, if possible.
- load and unload tools and equipment from the vehicle on the side away from live traffic.
- work at least 18 m from the front of the works vehicle(s), facing oncoming traffic. If this is not practical, an additional person may be needed to act as a lookout.

Plan INI1 Working on the hard shoulder for medium duration stops



Plan INI2 Working on the roadside verge for greater than 15 minutes



APPENDIX A7 APPROACH ‘WICKET’ SIGNING FOR RELAXATION SCHEMES

The identified flexibilities for the minimum number of lane use ‘wicket’ signs at relaxation schemes is dependent on signs being of sufficient size (and have the required clear visibility) for all road users to read and comprehend the signs. Where signs have been omitted, as identified in this document, road users have a greater reliance in the readability of the remaining signs.

The recommended size and clear visibility requirements for approach signs to Diagrams 7202.1 (Schedule 13 Part 6 Item 43) in this document, are unless stated otherwise, based on signs being placed on both sides of a road or carriageway. When these signs are placed only on one side of the carriageway the sign has to be read at higher offsets and therefore needs to be read from further away.

The recommended sizes for relaxation schemes on dual carriageways subject to the national speed limit have been updated and expanded and is shown in **Table A7.1** to **A7.3**. These provide options where there may be limitations on verge or central reservation width. Options are:

- When signs are provided on both sides of the carriageway sign sizes on either the near or offside may be reduced where there are space constraints.
- When conditions allow, signs are provided only on the side of the carriageway the lane closures are implemented on.

The use of nearside only signs for an offside lane closure is not recommended. This has led to an increase in near misses and taper strikes, particularly where the recommended sizes of signs identified in Chapter 8 Part 3:2020 were not provided. It is considered that options for the use of Mobile Lane Closures (see **Section 10**) and Enhanced Mobile Carriageway Closure technique (see GG117 Appendix A) provide for the safe installation of signs on the same side as the lane closure. Situations where this has not been possible were identified as not being within the scope of relaxation schemes.

Approach ‘wicket’ signing – sizes, clear visibility distances and specification.

Table A7.1 Diagram 7202.1 ‘Wicket’ sign sizes and clear visibility distances for relaxation schemes on dual carriageways (signs provided on both side of the carriageway).

Roads with hard shoulder					
Number of lanes	Sign size Nearside (mm)	Offside (mm)	Reduced offside sign size option Nearside (mm)	Offside (mm)	Clear visibility distance
3 Lanes	1575	1350	1800	1125	190 m
4 Lanes	1575	1350	N/A	N/A	220 m
5 Lanes	1575	1575	2025	1125	N/A
Roads without hard shoulder					
Number of lanes	Sign size Nearside (mm)	Offside (mm)	Reduced offside sign size option Nearside (mm)	Offside (mm)	Clear visibility distance (only)
3 Lanes	1350	1350	1575	1125	170 m
4 Lanes	1575	1350	N/A	N/A	200 m

Table A7.2 Diagram 7202.1 ‘Wicket’ sign sizes and clear visibility distances for relaxation schemes on dual carriageways (nearside only signs)

Roads with hard shoulder					
Number of lanes	Nearside only signs (outside two lanes open) (mm)	Nearside only signs (outside lane open only) (mm)	Clear visibility distance Near and Offside signs	Clear visibility distance (outside two lanes open)	Clear visibility distance (outside lane open only)
3 Lanes	1800	2250	145 m	165 m	190 m
4 Lanes	2250	2475	155 m	200 m	220 m
5 Lanes	2475	N/A	170 m	230 m	N/A
Roads without hard shoulder					
Number of lanes	Nearside only signs (outside two lanes open) (mm)	Nearside only signs (outside lane open only) (mm)	Clear visibility distance Near and Offside signs	Clear visibility distance (outside two lanes open	Clear visibility distance (outside lane open only)
3 Lanes	1575	1800	140 m	150 m	170 m
4 Lanes	1800	2250	150 m	180 m	200 m

Table A7.3 Diagram 7202.1 ‘Wicket’ sign sizes and clear visibility distances for relaxation schemes on dual carriageways (offside closures)

Number of outside lanes closed	**Sign size (mm)**	**Clear visibility distance**
1 Lane	1350	140 m
2 Lanes	1575	175 m
3 Lanes	1800	195 m
4 Lanes	2250	225 m

NOTES:

1. Recommended sign sizes are sign height excluding any distance plate or header – see working drawings for Schedule 13 Part 6 Items 13, 15 and 16.

2. In Table A7.1 where there are constraints on the size of the central reservation, or offside verge, width then the smaller offside sign size identified in the table may be used as long as it is possible to install a sign on the nearside verge of the recommended size. Where there are constraints on the maximum width of nearside verge signs (and it is not possible to move the location of the taper) then it may be acceptable to swap the recommended sign sizes subject to a scheme specific calculation of the required clear visibility distance.

3. While it may be acceptable, on a case by case basis, for smaller individual signs to be used due to space considerations, or the ability to physically install the signs, the lack of immediate availably of signs of the recommended size on a works vehicle is not sufficient to justify the use of a smaller sign.

4. Signs with a height above 1575 mm are not prescribed and come under Schedule 13 Part 9. This results in restrictions in their use and also a maximum time they are allowed to be placed on the road.

5. The clear visibility distance is the distance from which the sign is required to be visible in all traffic lanes, free from obstruction from other signs, other TTM equipment, bridge piers and other features such as vehicles restraint systems. Transient obscuration from light columns etc. may be discounted when measuring the clear visibility distance.

As an alternative to using these tables, the methodology provided in Appendix D of Chapter 7 for calculating the ‘x’ height (and therefore arrow size) of signs may be used. Each lane arrow or ‘T’ bar counts as one item of information, as does the distance plate. The sizes of signs prescribed in the TSRGD may not be sufficient for signs placed only on one side of the carriageway to be sufficiently readable, particularly for carriageways wider than three lanes. For short term use larger signs may be used under the provision of Schedule 13 Part 9. Risk assessments must identify the minimum size of sign and the clear visibility distance which ensures that the signs are readable and clearly communicate the relevant warning, requirement or message to road users.

When calculating the required size of a sign using the identified methodology the designer should, for all schemes, identify the clear visibility distance needed for the sign to be readable. Placing other signs, and anything which could obstruct the ability for road users to read the sign, in the clear visibility distance should be avoided.

For all schemes where a sign smaller than is recommended in this document is used, or where the required clear visibility distance for a sign is greater than 175m, a higher performing sign face materiel should be used – in most cases this would be Class R3B-UK to BS EN 12899-1; however, where the road geometry is suitable a material to Class R3C-UK may provide better performance where clear visibility distances over 200m are required.

APPENDIX A8 SIGN LIGHTING

Part of the changes introduced in TSRGD 2016 was the removal of the requirement to light (externally or externally) many signs; in most cases signs must now be retroreflective and contractors must check that signs are installed so they are visible (and readable) to traffic, and other road users, at night.

However, some signs and equipment still have specific requirements relating to illumination; these are set out in **Table A8.1**. These requirements are mandatory and cannot be omitted via a risk assessment. If the specific requirements for a sign e.g. external lighting, are not achievable, or require an unacceptable risk to the workforce then the design of the works must be adjusted to omit the need to use the relevant sign.

For some signs the need for internal or external illumination is related to the presence of carriageway or street lighting. There may be an exception for roads subject to a permanent speed limit of 20 mph. It must be noted that temporary signs not mounted vertically in these stations are not sufficiently visible or readable to all road users. The presence of diffuse illumination e.g. carriageway or street lights, can reduce the readability of reflective signs for some road users if not mounted vertically. This applies to all classes of retroreflective material.

Unless otherwise identified in this document as requiring a higher performance class, the level of retroreflectivity for unlit signs where there is no carriageway or street lighting is class R2/RA2 to BS EN 12899-1. This also applies where the street or carriageway lighting is not illuminated continuously through the hours of darkness and any external or internal sign lighting is only on when the carriageway or street light is on.

Outside of road works there are some additional lighting requirements for regulatory signs in Schedule 3 for some temporary situations, such as events. Reference to other relevant Chapters as well as the TSRGD would be needed on a case by case basis.

Table A8.1 Specific requirements related to lighting signs and retroflection

Traffic Sign	Description	Requirement	Conditions when illumination required	Ref	Other options or requirements
Diagram 2901 (S9-4-13)	Start of Motorway restrictions	Sign to be lit	Roads within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if it is not continuously lit during the hours of darkness.	S9-8-7	If not illuminated throughout the hours of darkness the sign must also be reflectorized.
Diagram 2930 (S9-4-14)	End of Motorway restrictions ahead	Sign to be lit	Roads within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if it is not continuously lit during the hours of darkness	S9-8-7	If not illuminated throughout the hours of darkness the sign must also be reflectorized.

Traffic Sign	Description	Requirement	Conditions when illumination required	Ref	Other options or requirements
Diagram 2931 (S9-1-15)	End of Motorway restrictions	Sign to be lit	Roads within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if it is not continuously lit during the hours of darkness	S9-8-7	If not illuminated throughout the hours of darkness the sign must also be reflectorized.
Diagram 670 (S10-2-1) Diagram 671 (S10-2-2)	Speed Limit	Terminal signs need to be lit	Trunk and Principal roads within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if it is not continuously lit during the hours of darkness.	S2-3-2	Both terminal signs must be lit by the same method. If not illuminated throughout the hours of darkness the sign must also be reflectorised.
Diagram 670 (S10-2-1)	Speed Limit	Repeater signs	Where carriageway lighting is present a 30 mph roundel must not be uses as a repeater (20 mph in Wales)	S10-4-2	N/A
Diagram 671 (S10-2-2)	Speed Limit	Repeater signs	On all motorways plus other roads which do not have a system of carriageway lighting, this sign must not be used as a repeater.	S10-4-3	N/A
Diagram 611 (S11-2-73)	Bifurcation arrow	Sign to be lit	Roads with a speed limit of above 20 mph, within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if not.	S11-6-4	If not illuminated throughout the hours of darkness the sign must also be reflectorized.
Diagram 7101.1 (S13-6-4)	Traffic cone	Minimum material performance	The cone sleeve must be compliant with the minimum performance levels for Class R1B or R2B in BS EN 143422: 2009		The following classes from BS EN 13422: 2019 exceed the minimum requirements for R1B or R2B:- R2 and R3. Classes R1, R1A and R2A may not lawfully be placed on a road in Great Britain.
Diagram 7011 (S14-2-58)	Portable signals ‘When red light shows…’	Sign needs to be lit	Roads with a speed limit of above 20 mph, within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if not.	S14-4-8	If not illuminated throughout the hours of darkness the sign must also be reflectorised.
Diagram 7011.1 (S14-2-59)	Portable signals ‘Wait here until green…’	Sign needs to be lit	Roads with a speed limit of above 20 mph, within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if not.	S14-4-8	If not illuminated throughout the hours of darkness the sign must also be reflectorised.

Traffic Sign	Description	Requirement	Conditions when illumination required	Ref	Other options or requirements
Diagram 7011.2 (S14-2-60)	Portable signals 'Pedestrian crossing / When red light shows…'	Sign needs to be lit	Roads with a speed limit of above 20 mph, within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if not.	S14-4-8	If not illuminated throughout the hours of darkness the sign must also be reflectorised. Only to be used at a pedestrian only facility, if pedestrian phase is part of a signalised junction diagram 7011 or 7011.1 must be used.
Diagram 7021 (S14-2-62)	'Traffic under signal …'	Sign needs to be lit	Roads with a speed limit of above 20 mph, within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if not.	S14-4-8	If not illuminated throughout the hours of darkness the sign must also be reflectorised
Diagram 7022 (S14-2-63)	'Joining traffic not signal …'	Sign needs to be lit	Roads with a speed limit of above 20 mph, within 50m of a street lighting lamp during the hours of darkness, or when the lamp is illuminated if not.	S14-4-8	If not illuminated throughout the hours of darkness the sign must also be reflectorized.
Diagram 7023 (S14-2-64)	Portable stop/go sign	Sign needs to be lit	Applies to all roads during hours of darkness	S14-4-9 S14-4-6	The whole sign face must be illuminated, not just the text. May only be used for shuttle working, must not be used for closing road or stopping all traffic. Sign must consist of diagram 7023 back-to-back with sign 7024. Should also be retroreflective.
Diagram 7024 (S14-2-65)	Portable stop/go sign	Sign needs to be lit	Applies to all road during hours of darkness	S14-4-9 S14-4-6	As Diagram 7023
Diagram 7031 (S14-2-66)	Stop / works	Elements may need to be fluorescent	The yellow area must be either fluorescent retroreflective material, or alternative strips of reflective fluorescent material and non-fluorescent retroreflective material. The red area must be retroreflective and may also be fluorescent.	S14-4-6 S14-4-11	Only to be used with works and temporary (unplanned) obstructions e.g. not at events. Post must have black and yellow coloured bands each 300mm deep. The yellow may be retroreflective material.

APPENDIX A9 TEMPORARY DIRECTION SIGNING INCLUDING DIVERSIONS AND EVENTS

General

Temporary directional signs (TDS) are signs installed to guide traffic to destinations when either the existing signs have been removed or no longer accurately reflect the situation at a junction. They are also used to direct traffic during events which generate large volumes of traffic or along diversion routes.

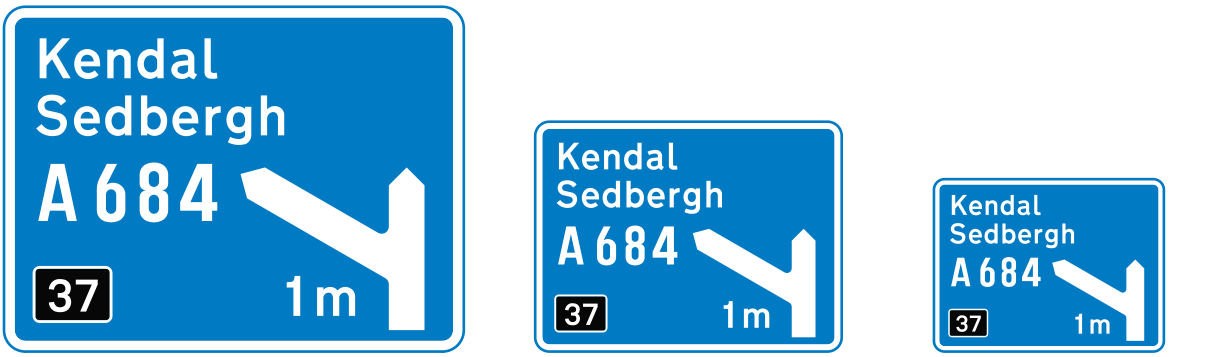
Designers need to be sufficiently competent to design directional signs in accordance with Chapter 7 of the Traffic Signs Manual (TSM7), The Traffic Signs Regulations and General Directions 2016 (TSRGD) and associated Working Drawings. Links to these are shown below. To be lawful, all TDS must conform to TSRGD requirements.

There are five types of TDS.

Copies of the existing permanent directional signs

The design rules in Chapter 7 should be followed for this type of sign. Designers should not assume that the design of the existing sign is correct and simply copy it. Many existing directional signs either contain errors or otherwise don't conform to current design rules or TSRGD requirements. If a reduced mandatory speed limit is in place, it may be possible to provide TDS at a smaller 'x' height than the permanent signs. Designers should refer to Chapter 7 Appendix E, columns 3 or 7 as appropriate.

For example, on a 3 lane motorway, subject to a 70mph speed limit, the permanent directional signs will probably be designed to 300mm 'x' height (Appendix E, line 7). If a temporary mandatory speed limit of 60mph is in place, then the white on blue TDS could be provided at 200mm 'x' height (Appendix E, line 5), or if the limit was 50mph 150mm 'x' height (Appendix E, line 4), see illustration below. Designers should note that such reduced size signs may still be quite large and thus possibly difficult to erect on sites where work activities are ongoing.



Sign at 300mm 'x' height
4835mm x 3625mm
(70mph speed limit)

Sign at 200mm 'x' height
3220mm x 2415mm
(60mph speed limit)

Sign at 150mm 'x' height
2415mm x 1815mm
(50mph speed limit)

Figure A9.1 To scale examples of directional signs at differing 'x' heights

Note TSRGD does not permit TDS to be black on yellow versions to mimic the original sign face.

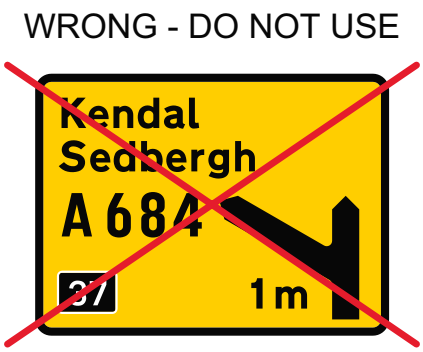


Figure A9.2 Incorrect copy for temporary situation

Additionally - and although not directional signs - where countdown markers, (Diagrams 823, 824 and 825), located on the approach to a junction have been removed, any temporary ones must be the same colour as the permanent ones – black on yellow versions are not prescribed.

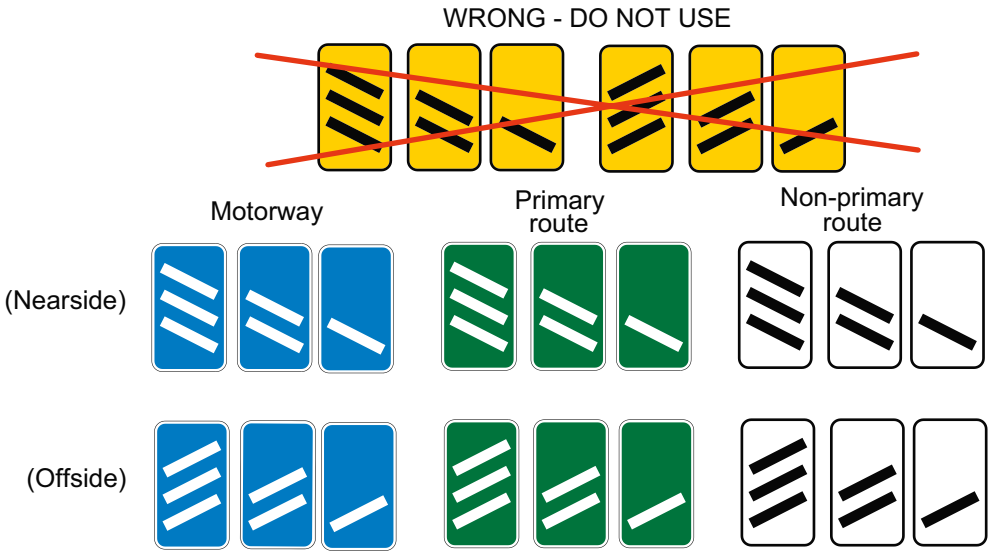


Figure A9.3 Junction 'countdown' signs to Diagrams 823, 824 and 825

Where appropriate, for example at an at grade junction a chevron ended Direction Sign may be provided, based on the class of road that traffic is about to join thus as below. With the exception of diversion route signing, signs of this type are not permitted to be black on yellow.

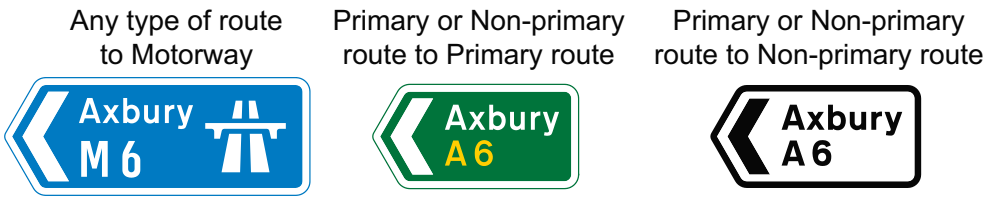


Figure A9.4 Junction chevron ended direction signs – Not permitted to be Black on Yellow

'For X follow Y' signs

The use of 'For X follow Y' signs may be required to give drivers the otherwise 'missing' information that was on absent permanent signs or if an alternative route to a destination requires signing. Details of the permitted legends for these signs are detailed in S12-3-8. Note that TSRGD does not generally permit this type of sign to be black on yellow unless their presence on site is less than six months, see the section on S13-9 signs below. Prescribed symbols may be included in 'For X follow Y' signs as appropriate.



Figure A9.5 Examples of 'For X follow Y' signs

Note. Use Transport Medium alphabet when quoting motorway route numbers.

As this type of sign will be the only reference to 'X', careful siting is required to ensure the sign is not obscured. Where obscuration is likely to be a problem a duplicate 'For X follow Y' sign should be provided. This type of sign must be located in advance of other directional signing. The size of these signs should be in accordance with Chapter 7 Appendix E.

Signs to TSRGD Diagram 7244 (S13-6-15)

If the signs replace existing lane loss signs, they should be placed, as much as is practical, in the same locations as the permanent signs which they replace, as drivers may be expected to be accustomed to the presence of the lane loss. It may be desirable to provide additional 7244 signs closer to the lane loss location.

Note that countdown markers, as illustrated above, are not provided at lane drops.

If the signs are to advise of a temporary lane loss, the number and location of signs should be appropriate to the site and prevailing traffic conditions. This may result in the provision of more signs than a permanent lane loss situation and in different locations.

The quantity of text or symbols that are permitted to be displayed on Diagram 7244 signs is deliberately limited to help keep them legible to drivers in the limited time they have to read them.

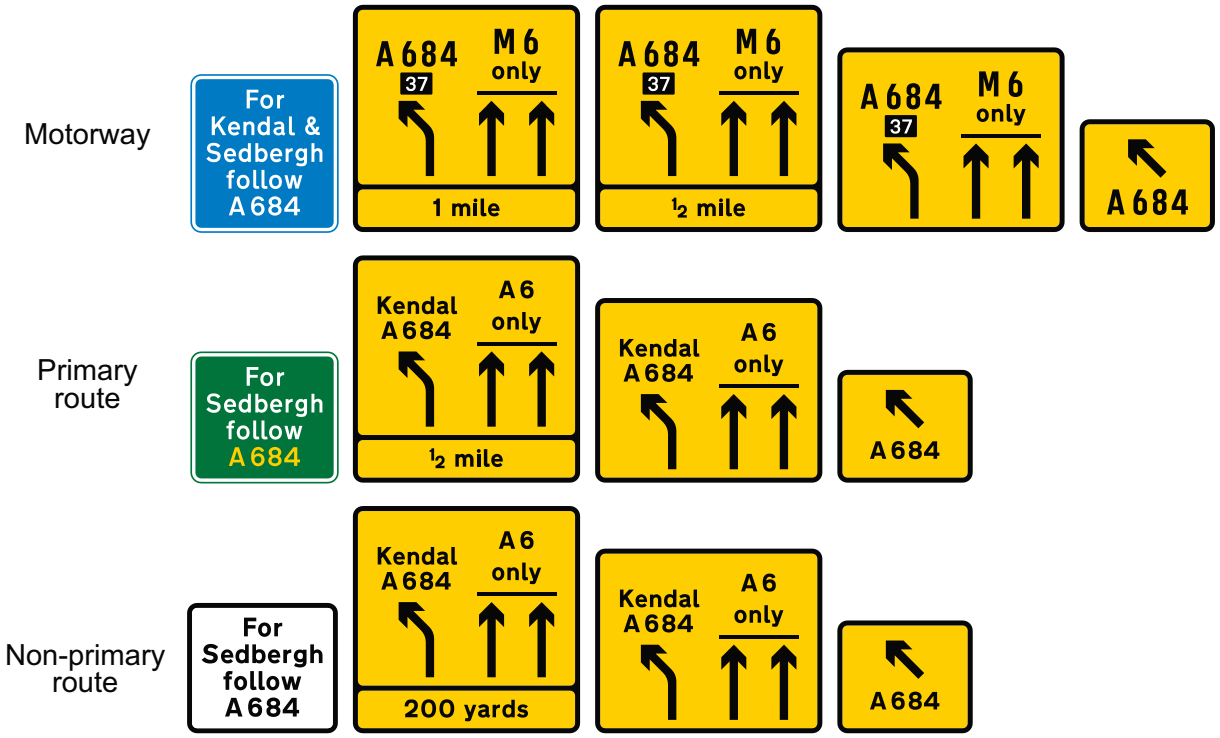


Figure A9.6 Examples signing arrays showing the use of 'For X follow Y', Diagram 7244 signs and a Diagram 7245 sign located on different classes of road on the approach to a grade separated junction (quoted distances vary in accordance with TSRGD, Schedule 18)

Signs to TSRGD Diagram 7245 (S13-6-16)

The quantity of text or symbols that are permitted to be displayed on these signs is deliberately limited to help keep them legible to drivers in the limited time they have to read them. As with Diagram 7244 signs, the use of 'For X follow Y' signs may be required to give drivers the otherwise 'missing' information that was on the permanent signs.

Designers should note that signs to Diagram 7245 will often be smaller than copies of existing permanent directional signs, even if those signs were provided at a smaller 'x' height, thus possibly making them easier to place on site.

On the examples below note that only one ahead lane is indicated. Whilst there is no requirement to show the number of lanes in use, additional ahead arrows may be added to the 7245 signs. However, this will result in a wider sign that may prove difficult to place without obstructing the passage of works vehicles within the site.

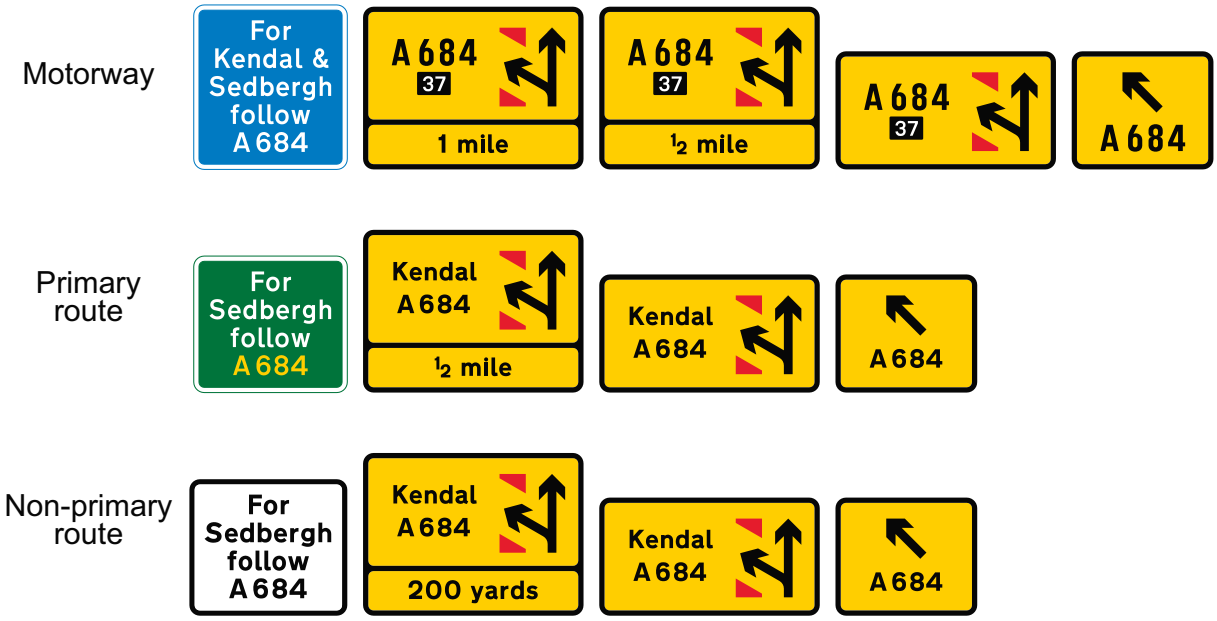


Figure A9.7 Example signing arrays on the approach to an at-grade junction (quoted distances may vary in accordance with TSRGD Schedule 18)

Schedule 13, Part 9 signs for events, alternative routes and diversions

This part of TSRGD restricts the use of TDS to the following temporary directional signing scenarios, (S13-9-1 refers).

The colour combinations and accompanying Transport alphabet may be any of the following for a sporting event, an exhibition or any other public gathering which is likely to attract a large volume of traffic or an alternative route:



Figure A9.8 Colour combinations for Schedule 13 Part 9 Signs route and diversion signs

The colour combination and accompanying Transport alphabet for diversions for motorised vehicles is black on yellow (S13-9-9 refers):



Figure A9.9 Black on yellow sign colour combination – Motorised vehicles

The colour combination and accompanying Transport alphabet for pedestrians, cyclists or equestrians is white on red (S13-9-8 refers), with all text except ‘miles’, ‘m’ (denoting a distance in miles), ‘yards’ or ‘yds’ (S18-3 refers) being upper case.

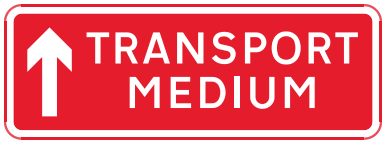


Figure A9.10 White on red colour combination for Non Motorised Users

S13-9 signs may remain in place for a period of six months beginning with the day the sign is placed. The time limit does not apply to diversion signing. The period may be extended with the approval of:

(a) the Secretary of State in relation to a road in England.

(b) Scottish Ministers in relation to a road in Scotland, or.

(c) Welsh Ministers in relation to a road in Wales.

Event signs

Note that S13-9, unlike the rest of TSRGD, does permit black on yellow ‘For X follow Y’ signs but only where users are expected to follow either existing permanent directional signing or other TDS after viewing the ‘For X follow Y’ sign.

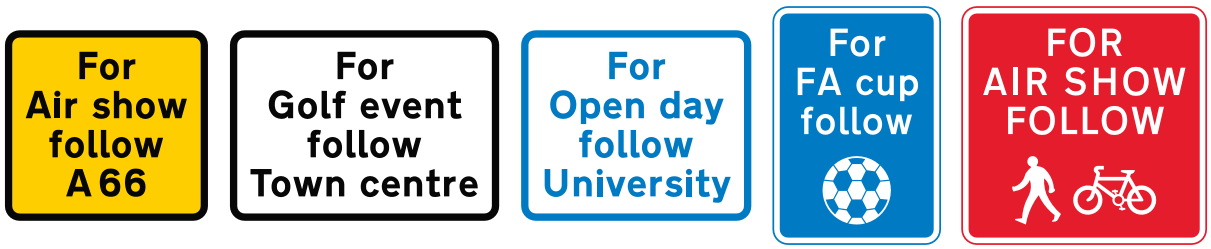


Figure A9.11 Colour combinations for Schedule 13 Part 9 event signs

The first three signs shown above would be used when the legend ‘A66’, ‘Town centre’ or ‘University’ appeared on subsequent existing permanent directional signs.

For the blue background sign above either the existing signs would already bear the football symbol or alternatively TDS bearing the symbol would be placed:



Figure A9.12 Schedule 13 Part 9 Football direction signs

For the red background sign above, subsequent TDS bearing the symbols would be placed:



Figure A9.13 Red Non-Motorised User Event Signs

Note that some prescribed symbols, in this example both the pedestrian and the cycle, are directional and must point either left or right as appropriate.

Alternative route signing

This type of signing is used where works or other events are expected to cause congestion or delays and an alternative route to a location is available.

Note. When the sign shows a prohibition, restriction, requirement a sign to Diagram 818.4 (S12-28-22) must be used. When the sign gives warning of a low bridge a sign to Diagram 818.5 (S12-28-23) must be used.

Consequently, S13-9 signs are only used when the alternative route has no prohibitions, restrictions or requirements that would make the route otherwise unsuitable.

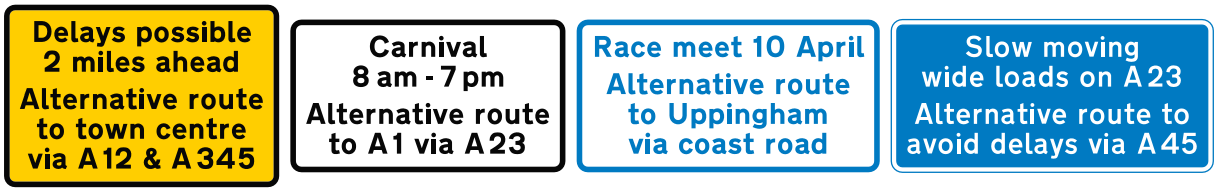


Figure A9.14 Alternative route signs for events

Diversion signing

For diversion signing, the Department for Transport has produced Working Drawings, showing how some diversion signs are laid out. See drawings P2702, P2703, P2704, P2706, P2716 and P7018 for some examples.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/884298/schedule-13-part-09-examples.pdf

For designers in Wales, Working Drawings for bi-lingual diversion signs may be found here:

https://gov.wales/traffic-signs-temporary-and-emergency-directional-signs-schedule-7-part-8

and

https://gov.wales/traffic-signs-miscellaneous-warning-informatory-and-regulatory-signs-road-works-schedule-12-part-1

Although the above documents provide the full picture there are a few things in TSRGD and Chapter 7 that aren't obvious to a casual glance. For example, the Working Drawings and Chapter 7 Fig. 11-6 show the signs to bear EITHER text OR one of the nine prescribed diversion route symbols. NOT both.

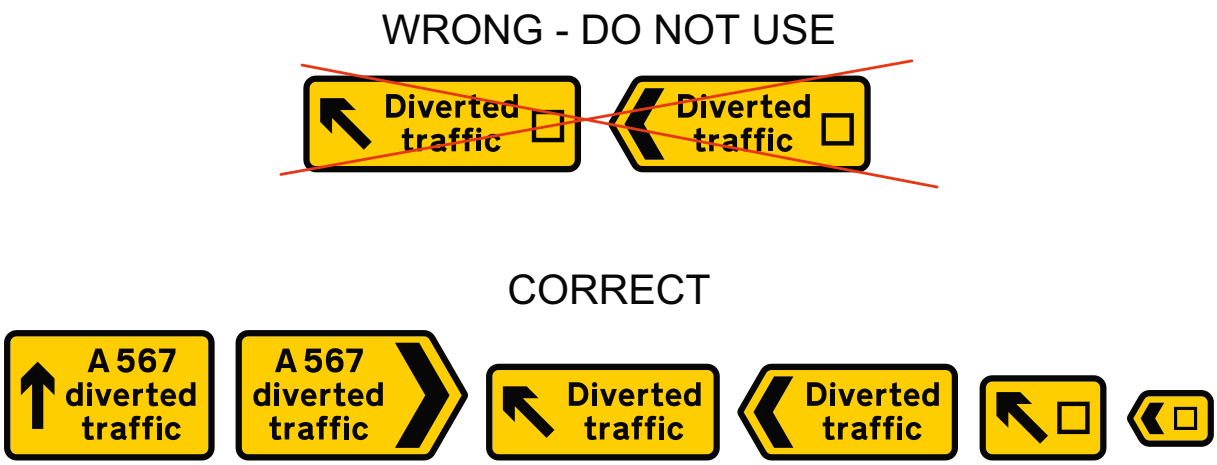


Figure A9.15 Schedule 13 Part 9 Temporary diversion route signs

Note how the lower case ‘d’ is used if ‘diverted’ is preceded by a route number, place name/ description or other word (for example ‘Overheight’).

Advance warning signs for diversions

Advance warning of a diversion ahead on low-speed or single carriageway roads may be given by signs to Working Drawing P2702. The yardage, where used, may be in increments of 10 yards, although 50 yard increments are usually more practical. On such roads, the first warning sign (Diagram 7001) for the closure will normally be no more than 400 yards out, followed by a ‘ROAD AHEAD CLOSED’ type sign then a P2702, thus a yardage of no greater than 200 yards will usually be required on this sign.

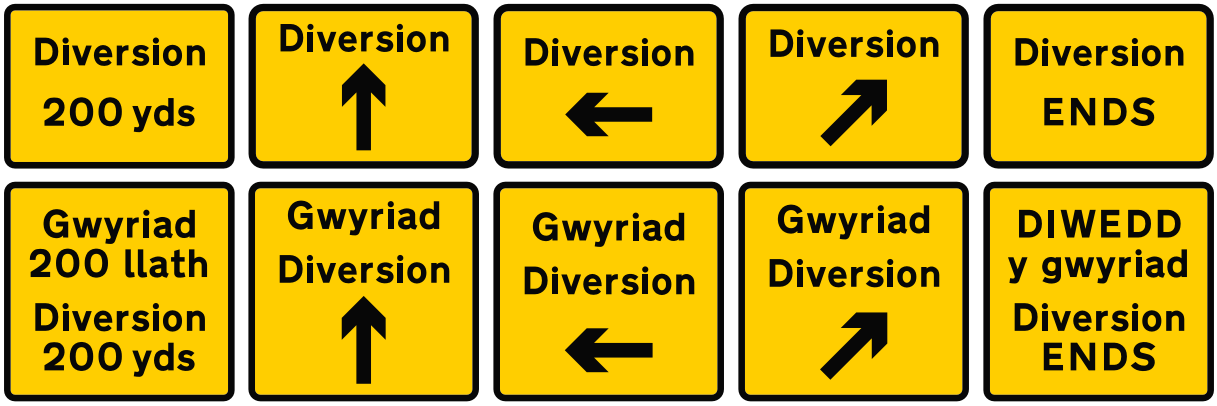


Figure A9.16 Schedule 13 Part 9 Example working diagram 2702 Signs commencing and ending a diversion route

Note that the vertical position of ‘Diversion’ on the mono-lingual sign face is only in the same location when other text is present or the arrow points horizontally left or right.

At the end of a diversion route a sign to Working Drawing P2702 should be placed, on both low and high-speed roads. This sign is also suitable when symbolic signs have been used, with no need to include the symbol on the sign.

On high-speed roads, P2702 signs are not large enough to be read in time. Instead, for simplicity, signs following the standard design rules in Chapter 7 are often the easiest solution. The ‘Exit closed’ sign (below) is particularly useful on dual carriageways/motorways where a closed exit means traffic can only travel ahead. Such a sign thus becomes reusable at most grade separated junctions, saving the cost of site-specific signs.

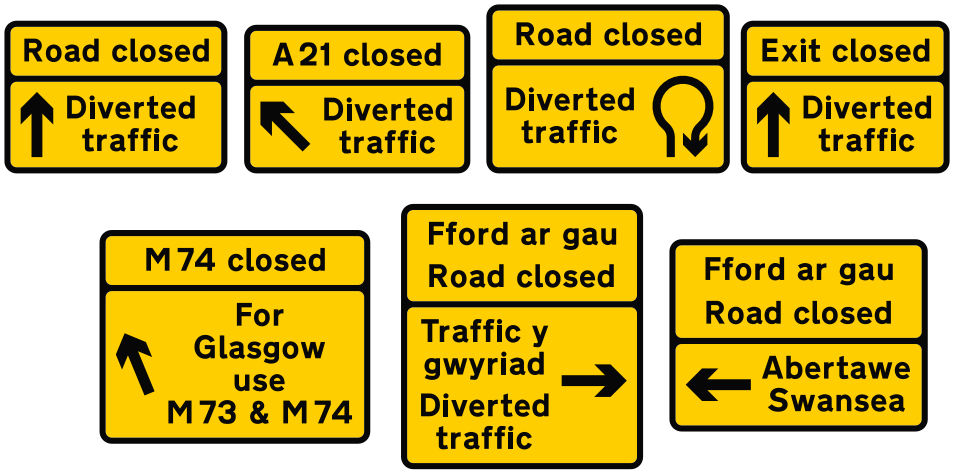


Figure A9.17 Example signs for commencing a diversion route on a 'high speed' road

Diversion signs with route symbols

For signs which carry a route symbol, typically at a roundabout, the size of the symbol may vary from the size it would be if displayed on a permanent sign, S13-9-12 refers:

12. *If a route symbol provided for in the sign table in Part 7 of Schedule 12 is incorporated in the sign, the requirements as to size that would otherwise apply to that symbol, do not apply.*

(Schedule 12, Part 7 being the section of TSRGD that specifies the size of route symbols.)

What this means in practise is that a sign bearing a route symbol need not be as large as was the case prior to TSRGD 2016 being published, although a designer may still design a sign with the route symbol at 'full' size if necessary. Example signs, all of which comply with TSRGD requirements.

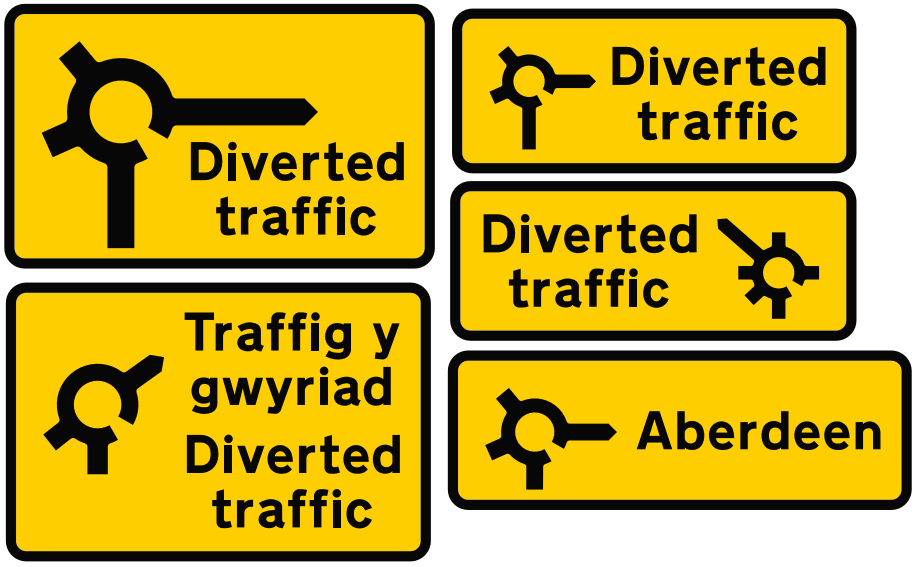


Figure A9.18 Example map type diversion signs with a junction route symbol

The sign at top left bears a full-size route symbol. The other signs all have route symbols that are 16 stroke widths high. It should be clear that the signs with smaller route symbols are significantly smaller than if full-size route symbols were used, making it easier to place such signs on site as well as making them cheaper.

Diversion route symbol signs

At the start of a diversion route using symbol signs, drivers need to be told which symbol to follow. This can be either to a sign following the rules laid out in Working Drawing P2716 or, perhaps less challenging for the designer, by using standard Chapter 7 rules as shown on the sign on the right below.

Along a diversion route the signs show one of the prescribed 9 diversion route symbols. If the sign bears only the symbol and an arrow or chevron, the height of the symbol needs to be 7.7 stroke widths. Examples below:

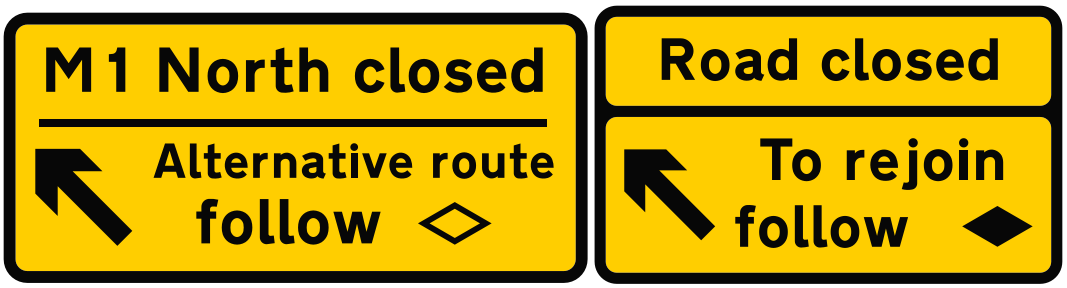


Figure A9.19 Diagram 2716 signs for diversions including symbols - examples

Pedestrian and cycle diversion signs

Diversion signs for cyclists and pedestrians must be white on red, as required by TSRGD S13-9-8. Example signs below. Note that in areas where people whose first language is not English are present, the symbolic signs should be more readily understood. No ‘End’ signing should be required.

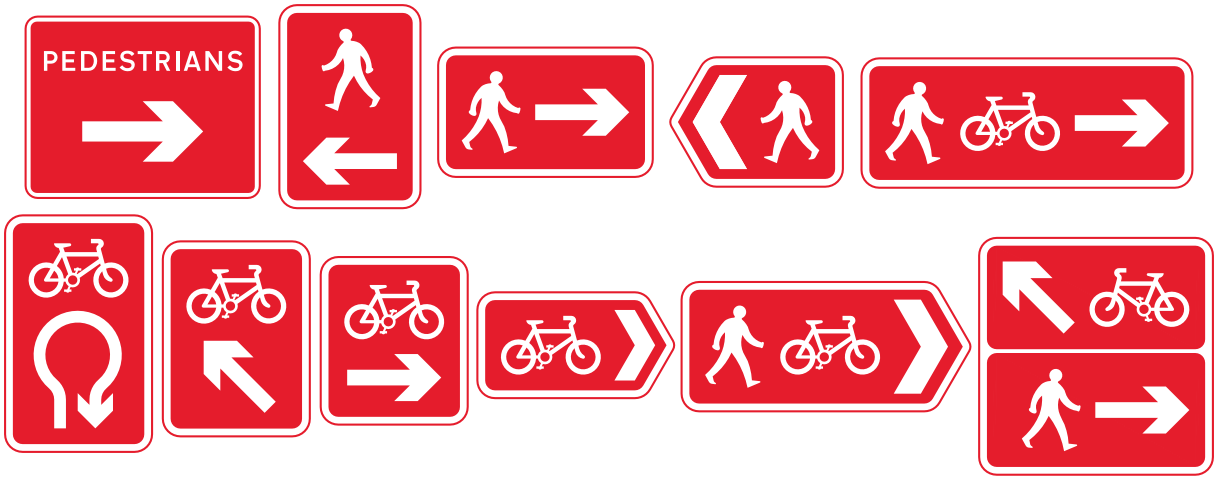


Figure A9.20 Schedule 13 Part 9 Temporary Non-Motorised User diversion route signs

APPENDIX B Legislation, Standards, Codes of Practice and other documents

B1 Legislation

B2 British Standards: British Standards Institution

B3 British Standards for traffic signs

B4 British Standards for road markings

B5 Other relevant British Standards

B6 Department for Transport: The Stationery Office Ltd

B7 Design Manual for Roads and Bridges (DMRB): The Stationery Office Ltd

B8 HSE documents

B9 Other documents

APPENDIX B1 LEGISLATION

Unless indicated otherwise, these documents are available from The Stationery Office and from www.legislation.gov.uk

The Builders' Skips (Markings) Regulations 1984 (SI 1984 No. 1933)

The Construction (Design and Management) Regulations 2015(SI 2015 No. 51), or in Northern Ireland, the Construction (Design and Management) Regulations (NI) 2016 (SR 2016 No. 146)

The Control of Substances Hazardous to Health (Amendment) Regulations 2004 (SI 2004 No. 3386)

Data Protection Act 2018

Disabled Persons Act 1981

EEC Directive No. 72/245 'Radio Interference (Electromagnetic Compatibility) of Vehicles'

The Equality Act 2010

Health and Safety at Work etc. Act 1974, or in Northern Ireland, the Health and Safety at Work (NI) Order 1978

The Health and Safety (Safety, Signs and Signals) Regulations 1996 (SI 1996, No 341)

Highways Act 1980

The Management of Health and Safety at Work Regulations 1999 (SI 1999 No. 3242), or in Northern Ireland, the Management of Health and Safety at Works Regulations (NI) 2000 (SR 2000 No. 388)

The Manual Handling Operations Regulations 1992 (SI 1992 No. 2793)

The Motor Vehicle (Construction and Use) Regulations 1986 (SI 1986 No 1078)

The Motor Vehicles (Construction and Use) Regulations (Northern Ireland) 1999 (SR 1999 No. 454)

Motorway Traffic (England and Wales) Regulations 1982 (SI 1982 No 1163) (as amended)

New Roads and Street Works Act 1991

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (SI 2013 No. 1471) (see also https://www.hse.gov.uk/riddor/)

Road Traffic Regulation Act 1984, or in Northern Ireland, the Road Traffic Regulation (NI) Order 1997 (SR1997 No. 410)

The Road Traffic Regulation (Northern Ireland) Order 1997, Regulation 42 (Certain temporary signs) 1997 Regulations

Roads (Scotland) Act 1984

Street Works (NI) Order 1995

The Road Vehicles (Construction and Use) Regulations 1986 (SI 1986 No. 1078)

The Road Vehicles Lighting Regulations 1989 (SI 1989 No. 1796) as amended by the Road Vehicles Lighting (Amendment) Regulations 2017 (SI 2017 No. 852)

The Street Works (Qualifications of Supervisors and Operatives) Regulations 1992. (SI 1992 No 1687)

Statutory Instruments No. 1675 (S.162) The Road Works (Qualifications of Supervisors and Operatives) (Scotland) Regulations 1992

Statutory Instruments No. 20 Street Works (Qualifications of Supervisors and Operatives) Regulations (Northern Ireland) 1998.

Statutory Instruments SI 2016 No 1147 The Street Works (Qualifications of Supervisors and Operatives) (England) Regulations 2016

Statutory Rules Roads (Control of Builders Skips) Regulations (Northern Ireland) 1979

Traffic Management Act 2004

The Builders' Skips (Markings) (Scotland) Regulations 1986 (SI 1986 No.642)

The Traffic Signs Regulations and General Directions 2016 (SI 2016 No. 362)

The Traffic Signs Regulations (Northern Ireland) 1997 (SR 1997 No. 386)

The Workplace (Health Safety and Welfare) Regulations 1992 (S.I .1992, No 3004)

UN/ECE Regulation No. 65 on Special Warning Lamps

UN/ECE Regulation 10 'Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility'

Work at Height Regulations 2005 (SI 2005 No. 735)

Working Time Directive (93/104/EC) 1993

Zebra, Pelican and Puffin Pedestrian Crossings Regulations 1997 (SI 1997 No. 2400)

APPENDIX B2 BRITISH STANDARDS: BRITISH STANDARDS INSTITUTION

Traffic signs and road markings should conform to relevant British Standards, many of which are English language versions of adopted European Standards. Where a National Annex has been published, this sets out recommended performance classes most suitable for UK conditions and practice. Specifiers should note that it is not sufficient to simply require compliance with a Standard. The required performance class or classes must be specified to avoid the risk of suppliers providing the lowest performance class, which will seldom be adequate.

British Standards current at time of publication are listed below. Designers and specifiers should ensure that they are using the most up-to-date Standard and National Annex (where available). Reference should be made to the British Standards Institution's website at: www.bsigroup.com

BS AU 152:1970 'Specification for rear marking plates for vehicles'.

BS EN 1317-3: 2010 'Road restraint systems. Performance classes, impact test acceptance criteria and test methods for crash cushions'.

BS 5489-1:2020 'Code of practice for the design of road lighting. Lighting of roads and public amenity areas'.

BS 7818:1995 'Specification for pedestrian restraint systems in metal'.

BS EN ISO 20471:2013+A1:2016: 'High visibility clothing. Test methods and requirements'.

BS EN 12966:2014+A1:2018: 'Road vertical signs. Variable message traffic signs'.

BS EN ISO 9001:2015 'Quality Management Systems, Requirements'.

PAS 43:2018 'Safe working of vehicle breakdown, recovery and removal operations. Management system specification'.

ISO 7637-1:2015. Road vehicles — Electrical disturbances from conduction and coupling — Part 1: Definitions and general considerations.

APPENDIX B3 BRITISH STANDARDS FOR TRAFFIC SIGNS

- BS EN 12899 – Fixed Vertical Road Signs:
  - Part 1:2007/A1 – Fixed signs (with National Annex)
  - Part 2:2007 – Transilluminated traffic bollards
  - Part 3:2007 – Delineator posts and retroreflectors
  - Part 4:2007 – Factory production control
  - Part 5:2007 – Initial type testing
- BS EN 13422:2004+A1:2009 – Vertical road signs. Portable deformable warning devices and delineators. Portable road traffic signs, cones and cylinders.
- BS EN 13422:2019 Vertical road signs. Portable deformable warning devices and delineators. Portable road traffic signs. Cones and cylinders (with National Annex)
- BS 8442:2022+A1:2023 – Miscellaneous road traffic signs and devices. Requirements and test methods.

APPENDIX B4 BRITISH STANDARDS FOR ROAD MARKINGS

- BS EN 1423:1998 – Drop on materials. Glass beads, antiskid aggregates and mixtures of the two.
- BS EN 1424:1998+A1:2003 – Premix glass beads.
- BS EN 1436:2018 Road marking materials. Road marking performance for road users and test methods BS EN 1790 – Material specifications. Preformed road markings. (with National Annex)
- BS EN 1824:2020 ‘Road marking materials. Road trials’
- BS EN 1871:2020 Road marking materials. Paint, thermoplastic and cold plastic materials. Physical properties
- BS EN 12802:2000 – Laboratory methods for identification.
- BS EN 13197:2001 – Wear simulators, turntable.
- BS EN 13212:2001 – Requirements for factory production control.
- DD ENV 13459-1:1999 – Quality control. Sampling from storage and testing.
- DD ENV 13459-2:1999 – Quality control. Guidelines for preparing quality plans for materials application.
- DD ENV 13459-3:1999 – Quality control. Performance in use.
- PD CEN/TR 16958:2017. ‘Road marking materials. Conditions for removing/masking road markings’.

APPENDIX B5 OTHER RELEVANT BRITISH STANDARDS

- BS EN 40-3 – Lighting columns. Design and verification (and PD 6547:2004+A1:2009 - Guidance on the use of BS EN 40-3-1 and BS EN 40-3-3).
- BS EN 1991-1-1-4:2005 – Eurocode 1. Actions on structures. General actions. Wind actions. (and National Annex in a separate volume.)
- BS EN 12352:2006 – Traffic control equipment. Warning and safety light devices (with National Annex)
- BS EN 1463-1:2009 Road marking materials. Retroreflecting road studs. Initial performance requirements (with National Annex).
- BS EN 1463-1:2021 – Road marking materials. Retroreflecting road studs. Initial performance requirements (with National Annex).
- BS EN 1463-2:2020 – Road marking materials. Retroreflecting road studs. Road test performance specifications.
- BS EN 12767:2019+A1:2024 Passive safety of support structures for road equipment. Requirements and test methods
- BS 1376:1974 – Specifications for colours of light signals.
- BS 381C:1996 – Specification for colours for identification, coding and special purposes.

APPENDIX B6 DEPARTMENT FOR TRANSPORT: THE STATIONERY OFFICE LTD

Department for Transport (2007). 'Manual for Streets'

Department for Transport (2013). 'Safety at Street Works and Road Works – A Code of Practice'

Department for Transport. Traffic signs Working Drawings. These can be obtained directly from the Department for Transport's website at: www.dft.gov.uk

Department for Transport (Northern Ireland). Code of Practice, 'Co-ordination of Street Works and Works for Road Purposes and Related Matters'. This can be obtained directly from the Department for Transport (NI)'s website at: www.infrastructure-ni.gov.uk

Department for Transport Local Transport Note 1/98, 'The Installation of Traffic Signals and Associated Equipment'. This can be obtained directly from the Department for Transport's website at: www.dft.gov.uk

Department for Transport Traffic Advisory Leaflet 15/99, 'Cyclists at road works'. This can be obtained directly from the Department for Transport's website at: www.dft.gov.uk

Department for Transport, Department for Infrastructure (Northern Ireland), Transport Scotland, Welsh Government. 'Traffic Signs Manual Chapter 1 Introduction 2018'

Department for Transport, Department for Infrastructure (Northern Ireland), Scottish Government, Welsh Government. 'Traffic Signs Manual Chapter 3 Regulatory Signs 2019'

Department for Transport, Department for Infrastructure (Northern Ireland), Scottish Government, Welsh Government. 'Traffic Signs Manual Chapter 4 Warning Signs 2018'

Department for Transport, Department for Infrastructure (Northern Ireland), Scottish Government, Welsh Government. 'Traffic Signs Manual Chapter 5 Road Markings 2019

Department for Transport, Department for Infrastructure (Northern Ireland), Scottish Government, Welsh Government. 'Traffic Signs Manual Chapter 6 Traffic Control 2019'

Department for Transport, Department for Infrastructure (Northern Ireland), Scottish Government, Welsh Government. 'Traffic Signs Manual Chapter 7 the Design of Traffic Signs 2019'

These can be obtained directly from the Department for Transport's website at: https://www.gov.uk/government/publications/traffic-signs-manual

APPENDIX B7 DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB): THE STATIONERY OFFICE LTD

Available at https://www.standardsforhighways.co.uk/dmrb.

GC 106 ‘Working on the highway’

GG 117 ‘The design and implementation of temporary traffic management’

GG 119 ‘Road Safety Audit’

CC 120 ‘Construction of permanent traffic signs, road markings and road studs’

CC 130 ‘Construction of temporary traffic signs, road markings and road studs’

CC 133 ‘Construction of temporary automatic speed cameras at road works (TASCAR)’

CD 109 ‘Highway link design’

CD 120 ‘Design of permanent traffic signs, road markings and road studs’

CD 122 ‘Geometric design of grade separated junctions’

CD 127 ‘Cross sections and headrooms’

CD 130 ‘Design of temporary traffic management at road works and temporary layouts’

CD 131 ‘Design of temporary retroreflecting road studs’

CD 132 ‘Design of flat traffic delineators’

CD 133 ‘Design of temporary automatic speed cameras at road works (TASCAR)’

CD 169 ‘The design of lay-bys, maintenance hardstandings, rest areas, service areas and observation platforms’

CD 192 ‘The design of crossovers and changeovers’

CD 352 ‘Design of road tunnels’

CD 377 ‘Requirements for road restraint systems’

CD 378 ‘Impact test and assessment criteria for truck mounted attenuators’

CS 125 ‘Inspection of traffic signs’

CS 126 ‘Inspection and assessment of road markings and road studs’

TA 92 ‘Crossover and Changeover Design’ (legacy document)

TA 11/81 ‘Traffic surveys by roadside interview’ (legacy document)

APPENDIX B8 HSE DOCUMENTS

Available from the HSE website (www.hse.gov.uk) and HSE Books books.hse.gov.uk or

PO BOX 29, Norwich, NR3 1GN.

‘Avoiding Danger from Underground Services’ HSE Guidance publication HSG47, 2014 publication.

‘Avoidance of danger from overhead electric power lines’ HSE Guidance Note GS6, 2013 publication.

‘Reducing risk in temporary traffic management operations. CIS 53.’ HSE 2015 publication.

‘A brief guide to controlling risks in the workplace’’ HSE Guidance publication INDG163.

‘Five steps to risk assessment’ HSE Guidance publication INDG163.

Manual Handling, Manual Handling Operations Regulations 1992, Guidance on the Regulations’ HSE Legal Series publication L23.

‘Manual Handling at work A brief guide’ HSE Guidance publication INDG143(rev4), 2020.

‘Managing Health and Safety in Construction, Construction Design and Management Regulations 2015, Approved Code of Practice’ HSE Legal Series publication L153.

‘Workplace health, safety and welfare’. Workplace (Health, Safety and Welfare) Regulations 2013. Approved Code of Practice and guidance’ HSE Legal Series publication L24, 2013.

The Health and Safety (Safety Signs and Signals) Regulations 1996. Guidance on Regulations. HSE Legal Series publication L64.

APPENDIX B9 OTHER DOCUMENTS

Highways Agency (2007) 'Policy and Procedures for the use of Matrix Signals by Regional Control Centres'

Highways Agency (2011) 'Policy and Procedures for the use of Variable Message Signs by the Regional Control Centres'

Highways Agency (2006) – 'Speed Limit Enforcement at Road Works: Guidance and Best Practice'

Highways Agency, 2003 'Temporary Road Markings: Working Group Findings'. Available on the TRL website: www.trl.co.uk

Highways Agency 'Performance Specification for Pedestrian Facilities at Temporary Stand-alone Traffic Signals'. Document TR 2503 Issue B. Available on the following website: www.gov.uk/guidance/traffic-systems-and-signing-plans-registry-how-to-access-documents

Highways Agency, 2006 'Specification for discontinuous Variable Message Signs'. Document TR 2516 Issue B. Available on the following website: www.gov.uk/guidance/traffic-systems-and-signing-plans-registry-how-to-access-documents

Highways England 'Code of Practice: Lighting and Marking for Abnormal Load Self escorting vehicles incorporating Operating guidance'

Highways England 'Code of Practice: Lighting and Marking for Special Order, VR1, STGO and C&U loads'

Office of Rail Regulation (ORR): 'Level crossings: A guide for managers, designers and operators'. Railway Safety Publication 7, 2011

Highways England, 2018 'Policy for the use of variable signs and signals'

RSTA / ADEPT (2021) Guidance for Temporary Traffic Management at Surface Dressing Sites. Available at https://www.rsta-uk.org/document-gallery

RSTA / ADEPT (2021) Guidance on Temporary Traffic Management on Slurry Surfacing and Microsurfacing Sites. Available at https://www.rsta-uk.org/document-gallery

Supply Chain Safety Leadership Group. Raising the Bar 2 Traffic Management Entry and Exit

Supply Chain Safety Leadership Group. Raising the Bar 27 Managing and Preventing incursions

Supply Chain Safety Leadership Group. Raising the Bar 39 Traffic Safety and Control at Roadworks

Supply Chain Safety Leadership Group. Raising the Bar 42 Working on Hard shoulders and verges

Available at www.highwayssafetyhub.com/raising-the-bar-guidance.html

SURVIVE Group. 'SURVIVE Best Practice Guidelines v4/18'. Available on the SURVIVE website: www.survivegroup.org

Traffic Management Contractors Association (TMCA) (2020). TMCA TTM Advice Note 1 ‘Temporary Traffic Management Vehicle Selection and Operation on High Speed Dual Carriageways including Motorways’.

Traffic Management Contractors Association (TMCA) (2020). TMCA TTM Advice Note 3 ‘Guidance on requirements for total closures’.

Traffic Management Contractors Association (TMCA) (2020). TMCA TTM Advice Note 4 ‘Guidance on BS 8442: 2015 Ballasting of Temporary Road Signs’.

Traffic Management Contractors Association (TMCA) (2020). TMCA TTM Advice Note 5 ‘Guidance on use of P7306 Works Access signs’.

TMCA documents are available at www.tmca.org.uk

UNECE (United Nations Economic Commission for Europe). 2011. UNECE R65 Regulation – Uniform provisions concerning the approval of special warning lamps for power-driven vehicles and their trailers.

Available at

https://digitallibrary.un.org/record/606484?ln=en&v=pdf

Sector Schemes publications. ‘Particular Requirements for the Application of ISO 9001:2015 for The Design, and / or Manufacture and / or Assembly and / or Provision of Permanent Road Traffic Signs’

Sector Schemes publications. ‘National Highways Sector Schemes for Quality Management in Highway Works 12A /12B for static temporary traffic management on motorways and high speed dual carriageways including on-line widening schemes’

Sector Schemes publications. ‘Particular requirements for the application of ISO 9001:2015 for MLC traffic management on motorways and other dual carriageways’

Sector Schemes publications ‘National Highway Sector Schemes for Quality Management in Highway Works. Sector Scheme document 12D. Particular requirements for the application of ISO 9001:2015 for installing, maintaining and removing temporary traffic management on rural and urban roads

Sector Schemes publications. ‘Scheme 17/17B. Particular Requirements for the Application of ISO 9001:2015 for Vehicle Recovery at Highway Construction Sites (NHSS 17) and Vehicle Recovery and Removal on Control Roads including storage (NHSS 17B)

Available at https://www.lantra.co.uk/national-highway-sector-schemes-nhss

UK Roads Liaison Group (2016). ‘Well-managed Highway Infrastructure: A Code of Practice’

Available at https://ukrlg.ciht.org.uk

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Traffic Safety Measures and Signs for Road Works and Temporary Situations provides the official detailed guidance for traffic authorities, contractors, and others undertaking activities on roads in the UK on the use of traffic signs and road markings.

This Chapter has been consolidated into one Part to enable easier comprehension for the various people involved with road and street works. In addition, aspects relating to temporary situations, such as events, have been updated to provide clearer guidance on how this Chapter can be used.

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