Chapter 5 – Guarding and segregation

5.1 Introduction

This chapter of the handbook is intended to provide assistance to those who are designing, planning or preparing a works site on the TLRN where there is a potential risk to the safety of those undertaking the works activity, road users navigating past it, or adjacent properties or infrastructure. It should also help those either assessing traffic management proposals or those responsible for checking compliance on site.

To support the Mayor's objectives and the Healthy Streets Approach to encourage active travel, there is renewed focus on ensuring pedestrian routes are well signed and guarded, and that works sites in London are safe, look tidy, and are consistent across London. This will help road user familiarity where roadworks are taking place.

Appropriate, well-maintained, correctly installed barriers will not only ensure increased safety of the workforce and public, but as barrier equipment will invariably form a boundary to which the public have access, the appearance of barriers plays a significant part in how the works site and contractor are portrayed to the public.

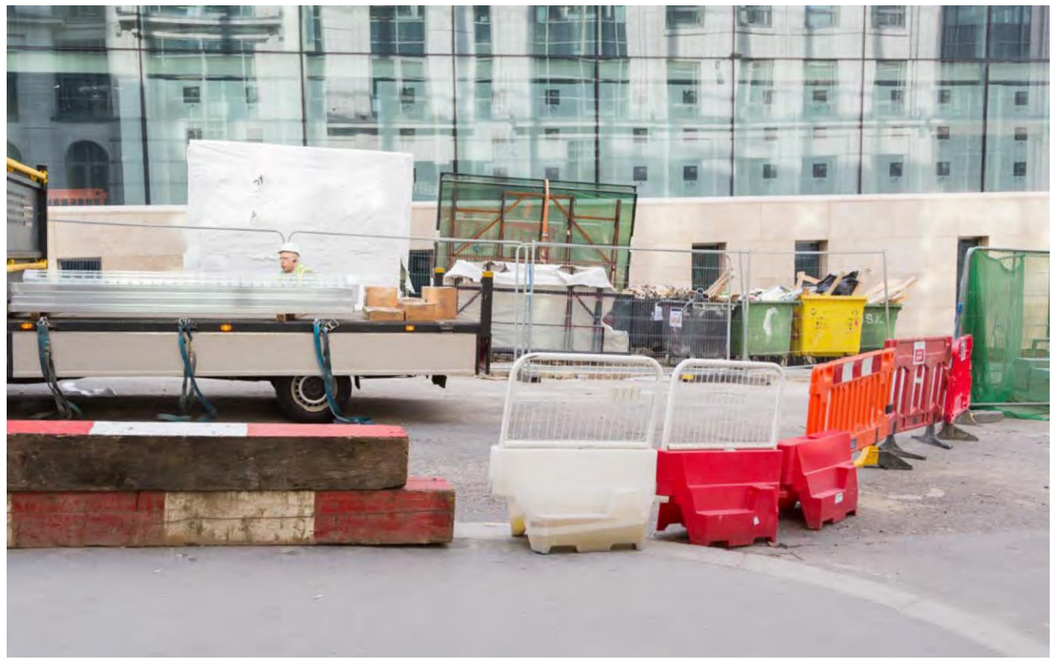
The minimum standards required for segregation of vehicles and pedestrians from work areas are described in the Safety Code, although it does not cover dual carriageways with a speed limit of 50mph or more. Further guidance on segregation for these higher-speed carriageways should be sought from Chapter 8 and Highway England's Interim Advice Note 142/11 (Temporary Barrier Decision Tool).[22]

The need, type and nature of works site segregation and guarding will be determined from the designer's risk assessment. This will establish the nature and magnitude of the risks associated with the location and work activities being carried out, before they can be mitigated and controlled. The designer will need to make an assessment on how and where to segregate and guard road users from hazards and, if necessary, consider barriers to a crash-tested specification to restrain errant vehicles in the event of an accident.

A significant determining factor in barrier product selection will be whether a barrier is required to provide lightweight, physical and visual segregation; or whether, due to an increased risk from crowds or vehicles, a crowd or vehicle restraint barrier is necessary.

22 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian142.pdf

Good practice: tidy, correctly assembled and well-maintained barrier



Bad practice: multitude of mixed barrier types, which are not assembled into a continuous barrier

Works promoters are expected to deliver a high level of service to road users, particularly the most vulnerable, ensuring works sites are set out in accordance with the Safety Code. A robust risk assessment providing full justification must be provided where compliance with the Safety Code is not achievable and an alternative product or design is being considered.

Innovation is welcomed where it improves road user experience and enhances the temporary works environment so that road users are not deterred from making their usual
journeys. Any new approaches should be discussed with the relevant TfL traffic management assessment team before works begin.

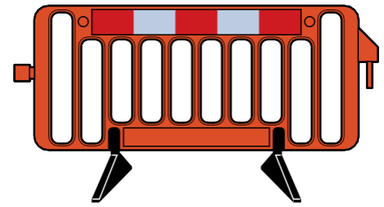
Well-maintained and appropriate barrier

5.2 Choosing the correct type of works site guarding

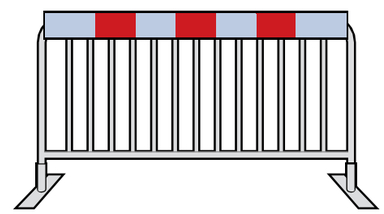
Traffic barriers segregate the works site from traffic by providing an advance warning though their retroreflective design, whereas pedestrian barriers provide a separation from the works site solely for pedestrians. Each barrier system serves a very specific purpose, but can sometimes be confused as they are similar in appearance. Traffic barriers do not have a 150mm deep tapping rail across the base of the product, which is used by visually impaired and blind people who rely on the use of a stick to navigate around works site obstructions. Traffic barriers must not be used where pedestrians are likely to interact with them.

Pedestrian barriers in their most simplistic form consist of a post and board-style product that is usually assembled on-site (see image).

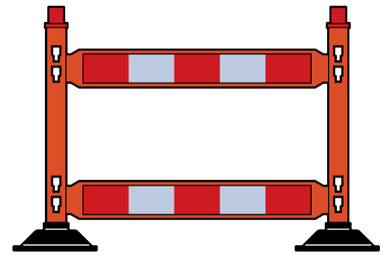
Typical barrier products



Plastic traffic barrier



Metal traffic barrier

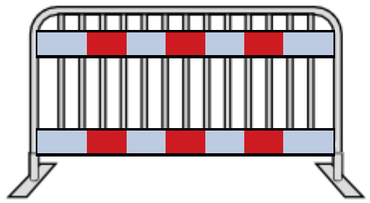


Basic pedestrian barrier system

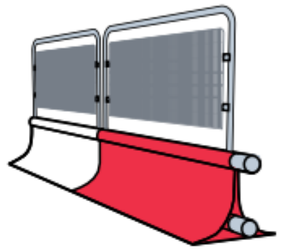
While the basic post and barrier system (see previous graphic) meets the minimum requirements, it may not always be suitable for all locations because of the large opening between barrier boards and posts. Barriers with smaller gaps and greater protection
to mitigate the risk of unauthorised access (see figure to the right) should be considered, especially where high numbers of small children are expected.

More robust pedestrian barrier systems should be used where increased footfalls are predicted or known (such as busy high streets, near event venues, stadiums, etc). They should be able to withstand more physical pressure and are less likely to be dislodged.

Barrier systems offering increased protection from works

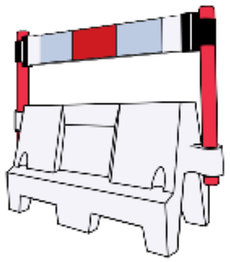


Metal pedestrian barrier

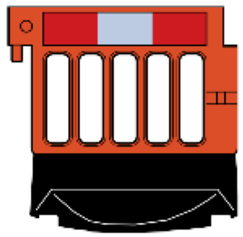


Crash-tested pedestrian barrier

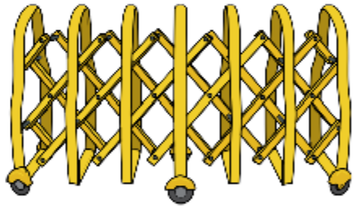
High barrier system



Water-filled barrier system

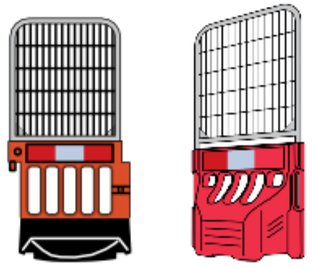


Self-weighted barrier systems



Retractable barrier

Ballasted pedestrian barrier



Weighted high barrier systems

Weighted high barrier system with vertical support

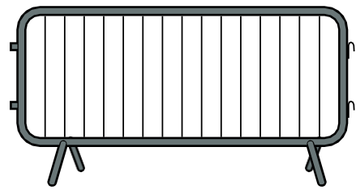
Where there is further risk of individuals climbing over the barrier and to improve the security of the site, it may be necessary to increase the height of the barrier (see examples in previous graphic on page 97), particularly where deep excavations (more than 1.5 metres deep) are required.

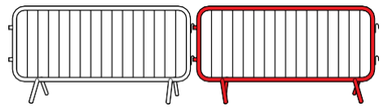
The non-compliant barrier systems shown on page 99 are not favoured for protecting or guarding works sites as they do not fully meet the requirements of the Safety Code or Chapter 8.

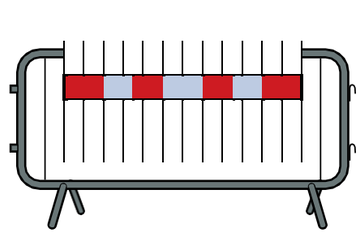
The use of retractable barriers (see page 97) is only acceptable where the barrier is fully marshalled and only used for short durations for temporary footway closures to allow works vehicles access/ egress to construction sites or similar situations. When marshals are not present, the barrier system must be locked in its closed position.

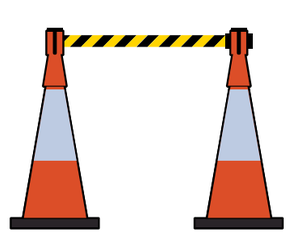
All barriers should be in a conspicuous colour and signed if required so that road users are clear about what is expected of them as they approach the barrier.

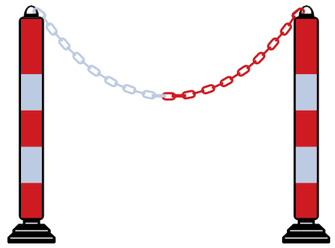
Non compliant barrier systems











5.3 Barrier stability

Barriers must be installed correctly to suit the prevailing conditions otherwise they are likely to become defective and present a hazard or obstruction to road users, with the potential to cause injury.

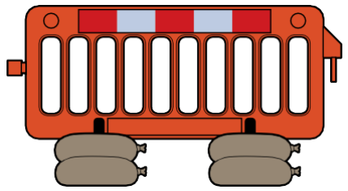
The first duty of the contractor is to ensure the location is safe to install the barriers and that their placement does not become an intrinsic hazard when installed. The ground must be clear
of debris, stable and suitably level so that the barrier is secure to the ground. Certain barrier systems do not readily adapt to sudden changes in gradient. This can be a particular issue when running along the edge of a footway where there are dropped kerbs.

Contractors must be aware of the limitations of some barrier systems. Barriers can vary in specification and the degree of wind loading they can tolerate. Where higher winds are forecast or when barriers are in place for longer-duration works when higher winds could reasonably be expected, the barrier system should be upgraded to a weighted variety with a vertical supporting mechanism accordingly.

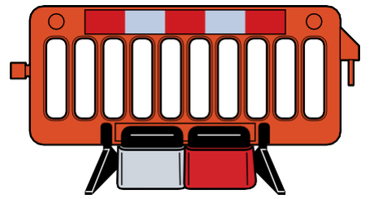
Traffic/pedestrian barrier products must meet standard BS 8442:2015 (Miscellaneous road traffic signs and
devices. Requirements and test methods) which, among other requirements, defines categories of wind speed for barriers to withstand.

Class of wind speed / barrier	Effective wind speed
Class A: Tested to withstand wind speed to a maximum 26.3m/s (58mph) – excludes highly exposed sites	Designed to meet a wind speed likely to be experienced on any one day across the whole year. Best suited for longer-term works
Class B: Tested to withstand wind speed to a maximum 17.6 m/s (39mph)	Designed to meet a wind speed likely to be experienced on any one day in the months of May, June and July. Best suited for unattended sites at less windy times of the year
Class C: Tested to withstand wind speed to a maximum 8.7 m/s (19mph)	Best suited for short-term works where operatives are present, or for emergency situations that would not require Class A or B.

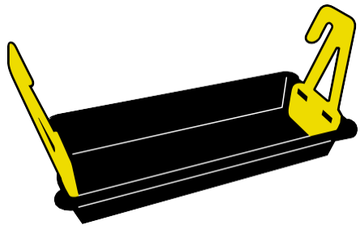
Approved methods of ballasting pedestrian and traffic barriers



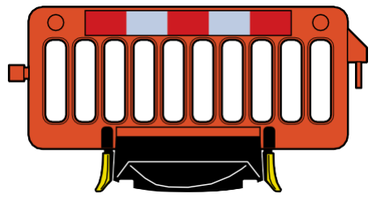
Sandbags placed on barrier feet



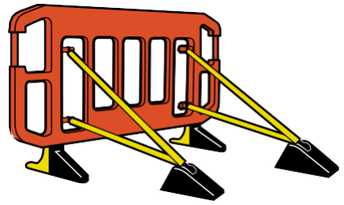
Weighted barrier base



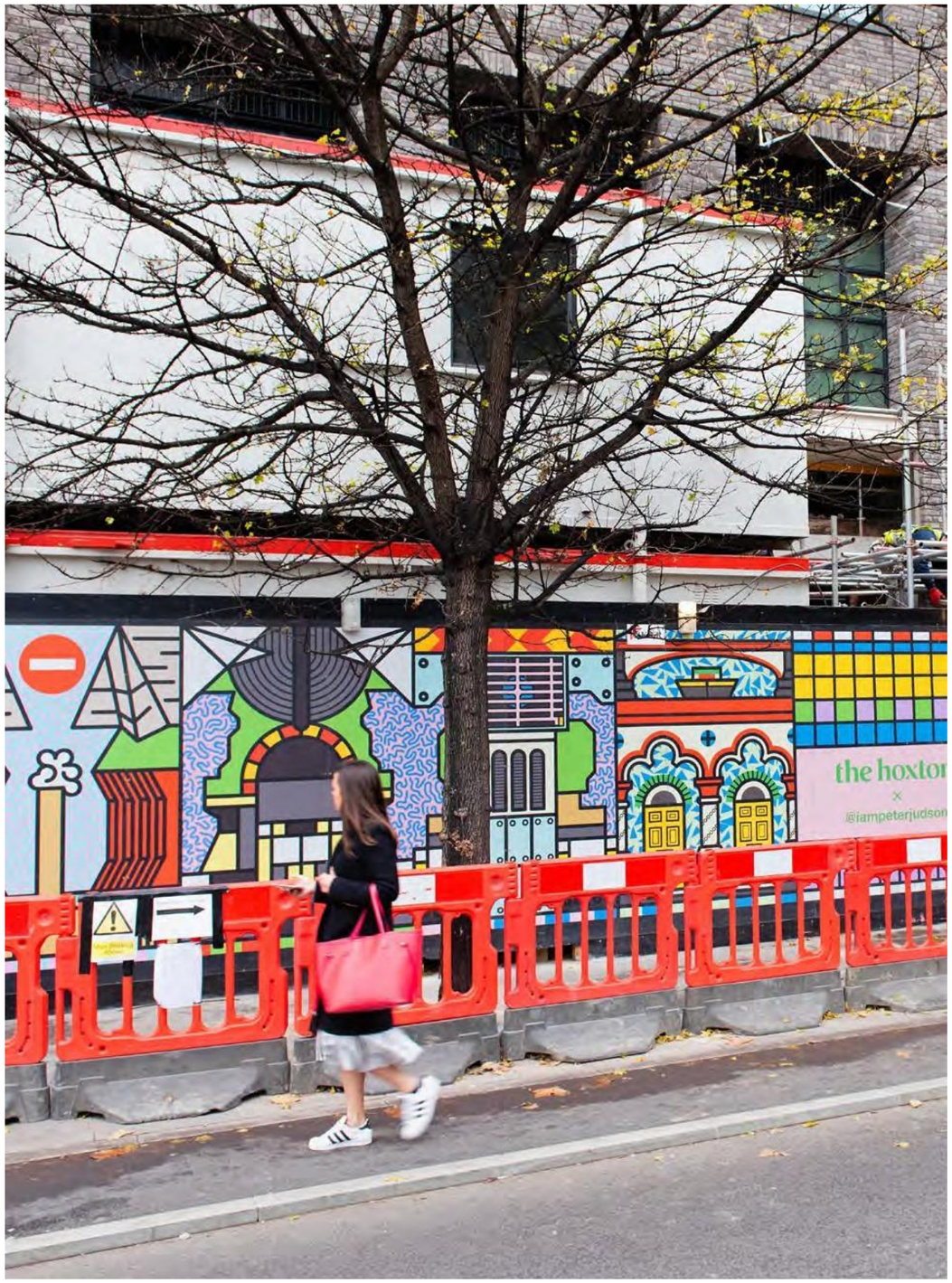
Clip-on ballast trays



Weighted barrier base



Barrier with vertical support system



A secure and well maintained site

5.4 Security and protection

The minimum standard of guarding for works undertaken on or adjacent to a footway is a continuous pedestrian barrier system. This may be required to be supplemented with pedestrian signs. Beyond the basic need for minimum guarding requirements, it may be necessary to provide enhanced protection for members of the public from hazards, or to increase protection for the workforce from vehicles.

Example situations that would necessitate enhanced barrier systems include:

- Deep excavations
- Unattended excavations within 2 metres of a pedestrian route, depending on risk assessment
- Sites situated in high pedestrian footfall areas
- High volumes of traffic flow adjacent to the works site
- Width restriction across the highway at the works site that increases the risk profile to a level where additional protection is required
- Longer-duration static work
- Plant operational activities adjacent to the highway or walkway
- Protection of sites involving vulnerable excavations or structures

Separate to the requirements relating to protection is the need to guard against the threat of intentional intrusion with menace. The site-specific risk assessment may indicate that a higher level of security is required supplementary to the protection requirements.

Example situations that would necessitate a higher level of security include:

- Sites situated in areas known for antisocial behaviour. These may include areas frequented by protesters, near venues selling alcohol, stadiums and public events
- Works located near high-risk or high-security locations such as government buildings, military facilities, or railway lines
- Works with exceptionally high risks to members of the public if they were to access the works area, such as exposed utility services
- Sites where plant and materials are left on site and are vulnerable to theft

There should be suitable access points through the barrier system and into the workplace to allow personnel and vehicles to enter the works site safely and without affecting the security of the site, or the passage of road users.

All site access points should be closed and secured as soon as possible after the need for their use has ended.

When barriers are left open for contractors to enter and exit without further controls, the integrity of the barrier system and the safety and security of the site is compromised.

It is unacceptable to have barriers that are not secured into a continuous interlocking system. Correctly installed barriers not only increase site security, but also stabilise each panel.

Where an excavation is to be left open for a long period of time, consideration shall be made to cover the excavation with a ‘road plate’ or other proprietary plating system. Plates must be secured from inadvertent movement.

When deploying barriers to protect trees and other sensitive structures, ensure the placement of the barrier does not itself become a hazard to the tree or root system.

5.5 Pedestrian barriers

Further guidance on pedestrian barriers and the management of pedestrians is covered in Chapter 3 of the handbook.

Retractable barrier system marshalled to allow site access

5.6 Carriageway barriers

When deciding on the need for barriers at a works site, designers must assess their intended purpose. Barriers should comply with BS EN1317 (Road Restraint Systems) if they are required for containment or restraint to protect the workforce, vulnerable structures, or to ensure the public are not placed in grave danger. A list of compliant road restraint systems approved for use on the TLRN can be found here.[23]

Subject to a site-specific risk assessment, it may be acceptable to use non- approved proprietary barrier systems where they are required to segregate traffic or provide delineation on single carriageway streets that are well lit and have speeds of 40mph or below, or on dual carriageways of 30mph or below.

Barrier units should be installed in an alternate red and white sequence and installed in accordance with the manufacturer's instructions, making sure end sections and connectors are not left exposed in a hazardous way to road users. If the barriers are water filled, care must be taken when considering discharging the water onto the highway to ensure road users are not placed at risk.

Care must be taken when installing higher barrier systems with top panels to ensure safety-critical sight lines for road users are not obstructed, particularly in the proximity of traffic signals, pedestrian crossings, junctions or on bends.

Prior to any barrier installation, the designer should consider the impact on lighting and avoid inadvertently creating locations that could become ambush points or introduce antisocial behaviour.

Barrier systems are intended to make works areas inaccessible, but where barriers are placed to segregate vehicles in areas where there are high numbers of pedestrians (who could previously freely cross the road) they may now be prevented from doing so, which could lead to footway congestion. Supplementary measures or barriers may consequently be needed to ensure pedestrians are kept safe. Examples of where this may occur are near stadiums and parks where a large number of pedestrians may pass in a short space of time.

Barriers providing good delineation

23 http://www.standardsforhighways.co.uk/ha/standards/tech_info/en_1317_compliance.htm

Chapter 6 – Temporary traffic signs

6.1 Introduction

Traffic signs must be clear, concise, legible and consistent. With so many works on the road network delivered by hundreds of different contractors, a significant amount of inconsistency has evolved over the years when implementing traffic signs for temporary works and events.

Where a journey passes through multiple works locations undertaken by different contractors, it is important that signing is consistent and to a high standard. This will reduce confusion by enabling road users to understand messages more readily, and make decisions in good time.

It is essential that signs are not used excessively and only where required to ensure unnecessary risk is not introduced for road users. Their placement must be considered carefully to prevent a site becoming non- compliant by reducing road user widths below the minimum required standards.

6.2 Temporary traffic sign face colours

Where a designer requires a temporary sign for a situation that is not an already prescribed sign in the TSRGD, Schedule 13 Part 9 of the regulations allows designers to create temporary signs within certain parameters. Traffic management designers should familiarise themselves with these regulations, especially to avoid using unlawful signs.

Incorrect use of colour on signs is a common issue. Chapter 8 gives guidance on the use of colour coding temporary signs.

White characters or symbols on a red background must be used for any signs that are:

- Hazard warning signs
- Information signs for pedestrians, cyclists (or horse riders)
- Works access/exit signs

Traffic Advisory Leaflet 01/14[24] (Quick guide to temporary white on red signs at road and street works), serves as a very useful guide to designers creating temporary signs, although some of the references to the TSRGD are now outdated.

Black characters or symbols on yellow signs should be used for any signs conveying temporary information relating to roadworks, or information about checkpoints.

Temporary traffic signing for special events should also comply with the TSRGD, and the Traffic Advisory Leaflet 04/11[25] (Temporary Traffic Signs for Special Events) serves as a useful guide. It allows for four variations of traffic sign face colour, but references to the TSRGD are now outdated.

24 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/305857/tal-temporary-white-on-red-signs.pdf

25 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/4393/4-11.pdf

Sign face colours

Hazard warning signs

Roadwork information signs

Example event signs

6.3 Duplication of prescribed signs

Sign designers are not permitted to create a temporary sign that is already provided for by the TSRGD. The examples shown below illustrate commonly seen signs on the road network and are shown alongside images of the correct signs prescribed by the TSRGD.

Duplication of prescribed signs

	Incorrect signs	Correct signs
Slippery road signs		
Signing for works access points	 	
Signing for cyclist dismount situations	  	

6.4 Traffic signs with the TfL logo

The TSRGD permits the use of traffic authority logos on certain traffic signs, but no sign may contain the logo without the permission of the highway authority. If a traffic management designer intends to place the TfL logo on traffic signs for a scheme or works, they should ensure they have the approval to do so from the relevant TfL Assessment team (see Contacts chapter on page 180). There are a range of design standards available for use by staff, suppliers and design agencies involved in graphic design and layout.

Although some guidelines apply across different modes and business areas, key differences between them mean it is essential that the correct set of standards is applied.

The correct logo to use for TfL for traffic signs is the 'mark', which consists of the TfL roundel with the TfL logo type. To ensure clarity and impact when producing the mark, no other graphic elements should be placed within the minimum margins around the logo.

No other TfL roundels should be used that represent different modes of transport, or marks containing the 'Every Journey Matters' strapline on traffic signs.

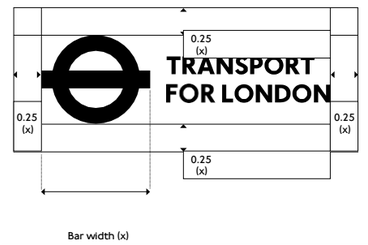
Further information on TfL design standards can be found here.[26]

26 https://tfl.gov.uk/info-for/suppliers-and-contractors/design-standards-and-licensing

Examples for using the TfL logo on traffic signs

End of works sign

Logo used in a top panel



TfL logo design standard

Signing for local businesses

Typical sign that can be used to highlight access is maintained for businesses.

6.5 Business names on traffic signs

TfL does not permit the inclusion of business names on temporary traffic signs.

Where works have the potential to disrupt normal traffic flows and it may not be clear to the public that access to local businesses is maintained, signs may be placed with the legend 'Businesses open as usual'. This ensures TfL is not seen to promote a particular business.

6.6 Other general temporary signing principles

The following guidance is provided to tackle the most common errors TfL has encountered with the use of traffic signs.

- Static signs should have no more than 12 units of information with a unit defined as a word, name, date or symbol
- Messages should be concise and clear and be appropriate to the speed of traffic to enable drivers to understand the message and minimise distraction
- Days of the week may be abbreviated as appropriate and times of the day must always be in the 12-hour format – the 24-hour clock must not be used
- Web addresses must not be used on traffic signs
- Diversion route signing may use sign Ref: 2703 in advance of junctions and/ or sign Ref: 2704 at junctions, but there is no expectation that designs must always use both in the vicinity of all junctions. Surplus signs contribute to sign clutter and have the potential to restrict footways
- Map-based diversion signs are not required for works where the directed route can be clearly signed using sign Ref: 2703. If the road network or roundabout is more complex, then their use can be justified

Different types of diverted traffic sign

Sign used in advance of a junction to indicate the direction diverted traffic should take at the junction ahead (Ref: 2703)

Sign used to indicate the direction diverted traffic should take at a junction (Ref: 2704)

6.7 Portable Variable Message Signs

Variable Message Signs (VMS) are used widely across the TLRN, particularly where major or long-duration works are taking place. They are an effective advance warning mechanism to road users about potential disruption upstream.

They are usually trailer-mounted and towed or craned into position.

Where there is adequate width to place VMS units on the footway, they should be sufficiently guarded with pedestrian barriers to Chapter 8 standards to protect pedestrians from colliding with them, particularly blind or partially sighted pedestrians.

Care should be taken to ensure VMS do not present a hazard at head height, and where necessary barriers should be extended to prevent people walking underneath the signs if they cannot be raised to a safe head room height for pedestrians and/or cyclists.

VMS should be positioned where tow hitches point downstream where possible or are secured in the upright position where allowed, which will minimise the hazard in the event of a vehicle collision.

Wherever possible, VMS units should be located behind any existing or temporary crash barriers.

VMS units should be clearly referenced to the connected works site to enable the highway authority or the police to identify the organisation responsible for its placement.

Messages for planned works should conform to the following format:

- Time/Date
- Where
- What
- Advice

Where signs are utilised for emergency situations, the following format should be applied:

- Location
- Direction
- Cause

Messages should not normally contain more than eight words or six units of information.

VMS units must be compliant with TOPAS 2516C[27] (Performance Specification for Discontinuous Variable Message Signs). Chapter 8 Part 3 Section U5.16 gives further information on the use of temporary VMS.

27 http://www.topasgroup.org.uk/MyFiles/Files/specifications/2516C v3 draft uploaded.pdf

Variable message sign

Chapter 7 – Traffic signals

7.1 Introduction

TfL is responsible for the maintenance, management and operation of London's 6,000+ permanent sets of traffic lights and processes more than 2,000 sets of portable and temporary signal applications a year.

Keeping London moving is a key TfL responsibility. Due to the large volume of road users in central London and the sensitivity of the TLRN to delays, managing the large volumes of temporary works in London is complex. The use of portable traffic signals helps to control road user movement at works and they are a vital tool in making sure the network remains safe.

Portable traffic signals (PTS, or sometimes referred to as Portable Light Signals (PLS)) are distinct from temporary traffic signals, which are permanent signals mounted in a temporary fashion. They are connected to power and a central traffic signal control system, and were conventionally mounted into barrels, although lately have a more sophisticated base.

Portable signals typically have their own power source, usually battery powered, and are manoeuvrable in nature. The decision on what type of facility to provide rests with TfL as the traffic authority.

Works promoters should consult with TfL's traffic management assessment teams (see Contacts chapter on page 180) when planning works that propose the use of portable signals before seeking formal permission to install them on the TLRN.

7.2 Equipment standards and specification

Portable traffic signal control equipment must comply with the Traffic Open Products and Specifications (TOPAS), most notably:

- TOPAS 2502B[28] (Performance Specification for Portable Traffic Signal Control Equipment for use at Roadworks)
- TOPAS 2504A[29] (Performance Specification for Vehicle Detection Equipment for Vehicle Actuated Portable Traffic Signals)
- TOPAS 2537A[30] (Performance Specification for Portable Traffic Signal Control Equipment with Pedestrian Facilities for use at Roadworks)
- TOPAS 2538A[31] (Performance Specification for Portable Traffic Signal Control Equipment for a Standalone Pedestrian Facility)

Traffic signal equipment not meeting the required TOPAS specifications is not authorised for use on the TLRN.

Traffic management contractors should check with their traffic signal suppliers that the equipment meets the required standard.

Contractors should ensure their staff are suitably trained and readily available to adjust timings or introduce manual control (stop and go board in case of failure) where necessary. Operators and designers require specialist training, particularly with pedestrian-controlled facilities. Contractors working on behalf of TfL are required to operate to the National Highway Sector Scheme 12D.[32]
It is strongly recommended this standard be adopted by all works promoters using multiphase signals and pedestrian crossing systems.

Manual control of traffic signals refers to the continual presence of a suitably qualified operative actively controlling the phasing of the signals in real time.
This method enables the controller to manage demand and respond to traffic flows to help mitigate delays and disruption on the road network.
TfL will need to consent or may impose conditions for the use of manual control.

28 http://www.topasgroup.org.uk/MyFiles/Files/specifications/2502B v4 170415.pdf
29 http://www.topasgroup.org.uk/MyFiles/Files/Specifications 2016/TOPAS 2504A 11316.pdf
30 http://www.topasgroup.org.uk/shop/topas-2537a-performance-specification-for-portable-traffic- signal-control-equipment-with-pedestrian-facilities-for-use-at-roadworks/
31 http://www.topasgroup.org.uk/MyFiles/Files/Specifications 2016/TOPAS 2538A 11316.pdf
32 https://www.ukas.com/download/publications/publications_relating_to_certification_bodies/NHSS 12D 9001 2008 - Issue 10 November 2016.pdf

Manual control should be a method of last resort in controlling traffic signals. In some locations and situations, pre- set or pre-agreed timings may not be deemed responsive enough to sensitive locations or in instances when a sudden surge of traffic can be predicted, such as when people are leaving large events. Manual control can have the capability to flush traffic through an area to prevent sections of the road network becoming gridlocked. Furthermore, it is likely to be required in locations near emergency service stations and Accident and Emergency departments, or security sensitive parts of the road network.

Traffic management proposals with portable traffic signals will be required to show:

- Proposed method of control – manual, fixed, vehicle actuation, Urban Traffic Control (UTC)
- Stage diagram including pedestrian phases with green, vehicular and pedestrian red and blackout duration
- Distance between 'Wait Here' signs or 'Wait Here' and the datum point
- Traffic signal manufacturer and model with confirmation traffic signal equipment is TOPAS approved

7.3 Standard and UTC PTS systems

Temporary works with traffic signals, if not carefully managed, can disrupt London-wide operations. Therefore, standard portable signals, which are widely used throughout the country, are not suited to all locations within London.

TfL has developed the technology to control PTS through London's UTC system, which centrally controls the traffic signals in London. PTS can now be operated using the following methods:

- Full UTC: This is achieved by commissioning the PTS onto a UTC system and operating the site with plans and a timetable, allowing the PTS to be coordinated with the surrounding network. TfL is able to control these signals remotely and override deployed plans when required. A communication line is required for the Full UTC and downloadable software plan to connect with the on-street equipment. It should be noted that not all available systems in the UK are able to interface with TfL systems so the contractor will need to ensure they source compatible products
- Indirect control: Downloadable plans, signal timing plans and timetables are sent to and operated by the PTS controller. This is in isolation of UTC so the timings will not be coordinated to the surrounding signalled sites, but will be operating the required green times as per the signal timing plans. This can either be delivered by TfL or by the traffic management contractor. It must be possible for these systems to respond to updated signal timings within 15 minutes of a request from TfL
- Standalone: PTS can be operated independently by the traffic management contractor. TfL will provide suggested green timings but the operation/timings are the sole responsibility of the works promoter. In London, these systems are more suited for use in non traffic-sensitive and non-complex locations without UTC

7.4 When to use UTC PTC systems

During the design phase, the works promoter will assess the site and the traffic management/traffic control arrangements and submit a design proposal to TfL. This will include details of the chosen system and method of communicating with the signals.

The proposed traffic management will be assessed and will look at the following considerations in determining whether the implementation of a UTC system is appropriate:

- Planning and notification: Unless special circumstances dictate, TfL requires the decision to use UTC (with all the necessary documentation complete and in place) 10 working days in advance of the works start date
- Works duration: Due to cost and complexity of operations in the mobilisation and demobilisation of the systems, it is recognised they are generally not suited to works that are less than two days in operation except in extraordinary circumstances
- Peak time operations: UTC systems are well suited to heavy demand situations. Off-peak setups and low flow periods during school holidays and Christmas Day/New Year's Day are less likely to warrant UTC systems
- Road layout type: Certain types of road layout such as a roundabout or a gyratory will require rigorous and careful planning and implementation
- Location: If the works are in a sensitive/strategic location or if they could contribute to secondary congestion into sensitive/strategic areas
- Traffic flows: If traffic flows are considered moderate/high, or where abnormal queues are predicted that cause congestion above acceptable levels either in the local area, or cause secondary congestion at other adjacent sensitive/strategic locations
- Modal usage: Minimising disruption to sustainable modes such as buses is an influential factor, particularly if there are more than 30 buses per hour over all arms of an intersection in the vicinity of a works area

7.5 UTC PTS systems assessment and commissioning

When assessing traffic signal applications, the traffic management proposals are assessed to determine the requirement for UTC systems in the following steps:

1. Works promoter (or their traffic management designer) submits a traffic management proposal to TfL for assessment
2. TfL will respond to the works promoter with their traffic management assessment decision including if UTC is required, which must be included in their permit application
3. Works promoter completes a UTC portable request form
4. The method of control and communication to the signals is agreed, bearing in mind resilience in problematic locations
5. UTC portable request form is updated to enable UTC commissioning
6. Several tasks by TfL and the works promoter are required before the UTC PTS is ready for use, which is generally within 10 working days of an order being placed

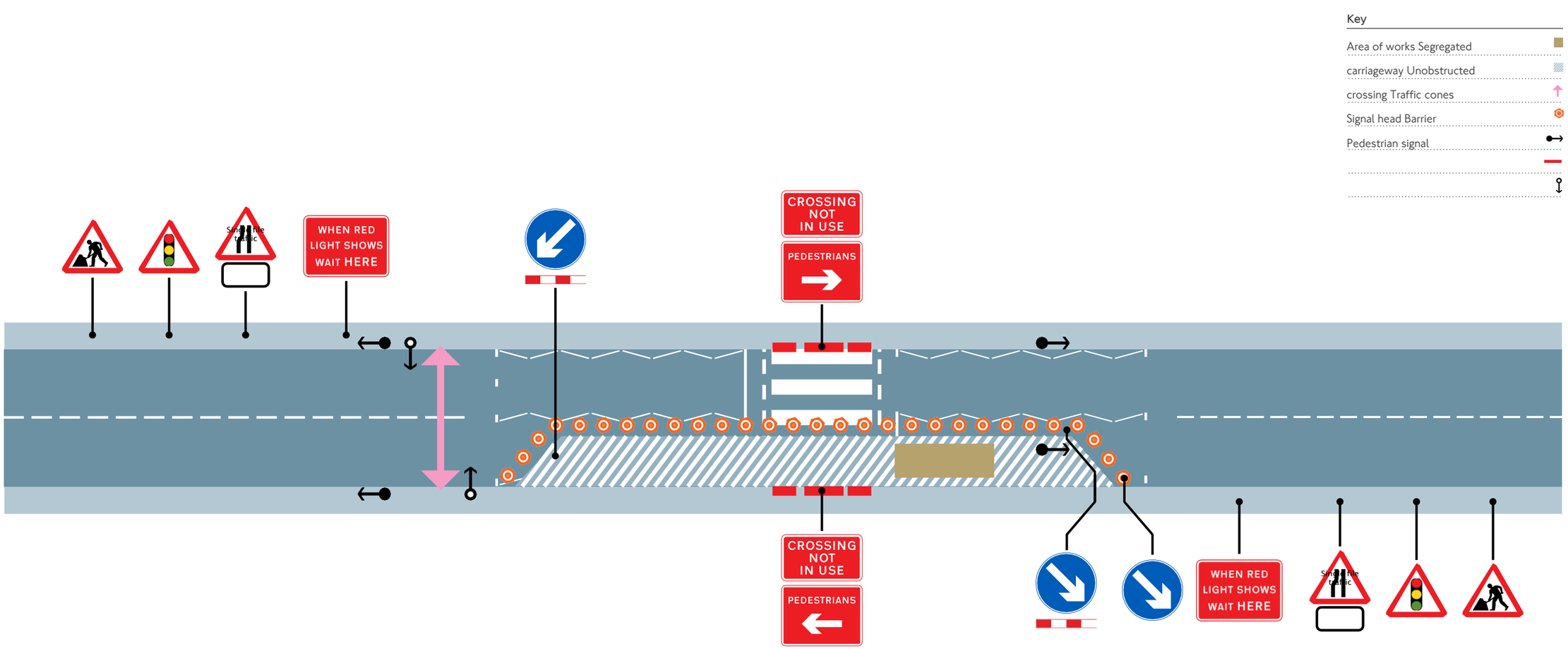
7.6 PTS signal timings

TfL may provide signal timings to contractors, but when they are not supplied, the contractors will need to propose their own timings. It is important that the designer ensures the cycle times are reasonable and not excessive. Long cycle times lead to significant frustration from all road users due to the long wait times for each movement. Research shows that pedestrians are less likely to wait for the green man after 30 seconds, so shorter cycle times are preferable.

7.7 Portable crossing systems at zebra crossings

Where traffic management with a shuttle lane is required to span a zebra crossing, it will be necessary to provide a controlled crossing facility to replace the zebra crossing so that it may operate in sync with the signals. However, it should not be placed in exactly the same location as the zebra crossing as this may lead to road user confusion in terms of who has right of way. The zebra crossing should be closed with pedestrian barriers and the signalised crossing located in a nearby convenient location between the main signal heads.

Closed zebra crossing at roadworks



7.8 Portable pedestrian crossing facilities

If it is necessary to close a pedestrian crossing facility, it will be expected that an alternative route using an existing crossing point be available via a short diversion route or a replacement facility provided. Reasonable facilities to provide accessible routes to all pedestrians
must be maintained, including those in wheelchairs, mobility scooters, pushchair users, or those less able to walk. The aim should be to ensure no one is disadvantaged by achieving a similar standard of safety as at a permanent site.

The Traffic Advisory Leaflet (TAL) 3/11[33] (Signal-controlled Pedestrian Facilities at Portable Traffic Signals) gives advice to designers for temporary pedestrian crossing facilities. It states 'audible and/ or tactile signals can be used. Ramps from the footway to the carriageway should be provided, which are also expected to be provided if existing drop kerbs or a carriageway level location are not available – this requirement shall be established as part of the permit conditions on NCT06a'. Chapter 3 (on page 40) of the handbook has further information on the requirements for footway ramps.

TAL 3/11 also gives advice on how to manage uncontrolled side road and driveways in shuttle lanes when a pedestrian crossing facility is present. It indicates a supplementary signal and a 'Wait here' sign should be placed within the shuttle lane in order to capture traffic approaching the crossing when the green man is showing. Not all proprietary PTS systems may conform to this design functionality as standard. Designers must therefore design out this situation wherever possible.

33 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/482503/3-11.pdf

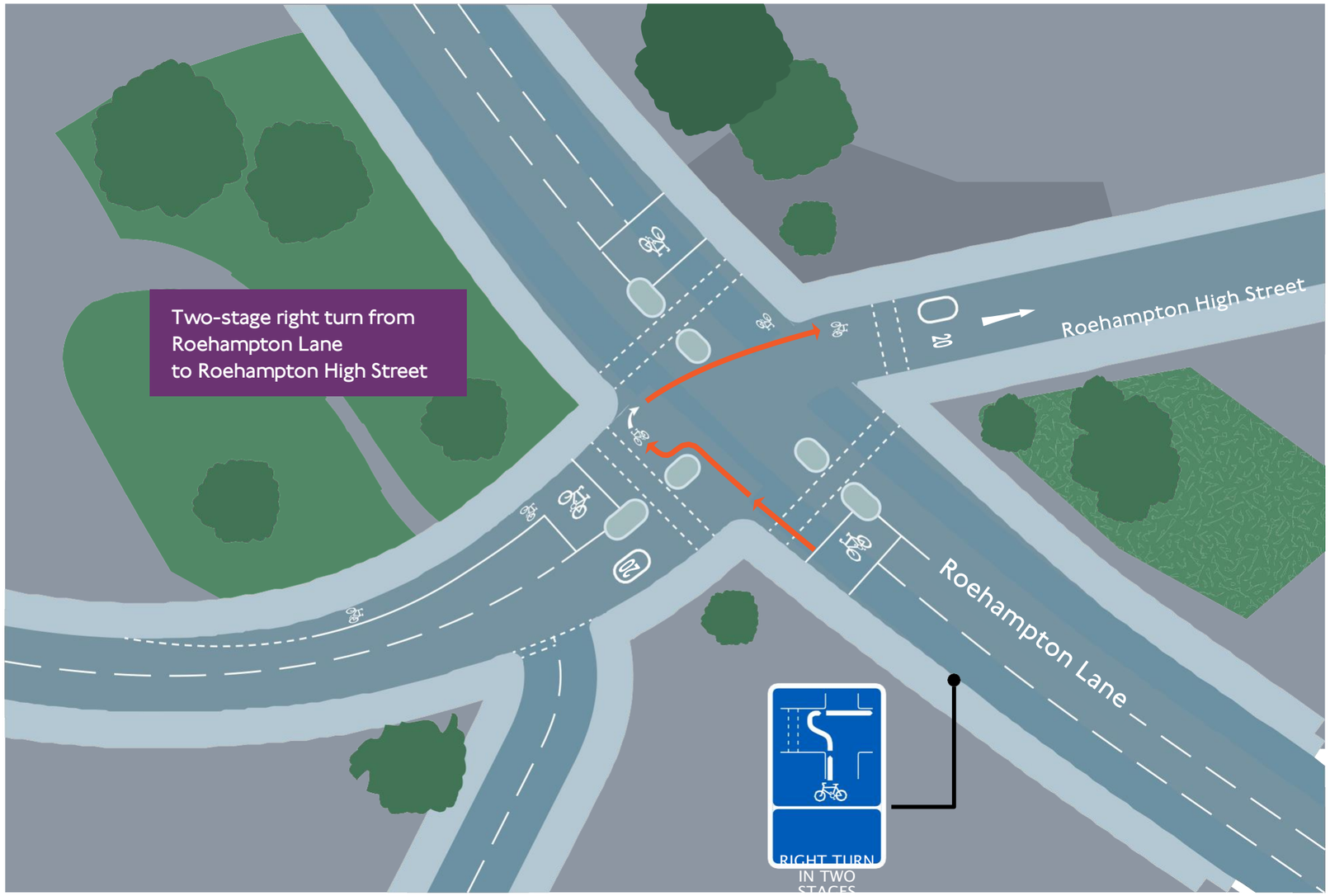
7.9 PTS and cycle facilities

When placing signal heads at junctions with advanced stop lines, care must be taken not to obstruct dedicated facilities for cyclists. Traffic signal heads should be placed after the advanced stop lines line with the 'When red light shows, wait here' or 3/4 control variant located at the advanced stop lines.

Ensure signal heads and 'Wait here' signs do not prevent cyclists using advanced stop lines

When using portable signals at traffic light-controlled junctions with segregated cycle tracks, designers will need to plan very carefully how all approaches are managed, including the cyclists. Many junctions will have two stage right turns (as shown below). Phasing can be complex and the stages must be managed to ensure traffic is not enabled to pass through pedestrian crossings that have a green man. Uncontrolled approaches are unacceptable.

Example of a road layout with a two-stage right turn for cycles



7.10 PTS Cable Protection

Most PTS systems are self-contained units, however for systems that have external cables at ground level, the signals should be set up in a way so the cables are free from interference and do not present a trip hazard. Cable shrouds offer a tidy and safe method to hide
and protect cables. If shrouds cannot be used, the temporary signals should be behind barriers to avoid trip hazards.
Push buttons to call the pedestrian green phase must be accessible at all times.

7.11 Maintenance of PTS

In accordance with TAL 3/11, daily inspections of traffic signals are required as a minimum. TfL's network carries large volumes of traffic and is sensitive to network impacts, so TfL would expect more frequent inspection regimes and in the most sensitive locations a constant presence on site during sensitive times.
When traffic signals stop working or have inappropriate timings set, unnecessary congestion and delay can occur.

PTS units should be secured and locked to prevent controls being tampered with, and to

PTS cables should not be easily accessible

7.12 Changes to permanent traffic signals

Where the developer requires changes to be made to the existing highway layout, including the traffic signals, or where new traffic signals are proposed, modelling will be required to understand the combined effects of both the traffic management and construction traffic on the road network.

If proposals significantly impact the network, it may be possible to mitigate any disruption caused through revised traffic signal timings, revisions to the road layout or a new signal installation. In these instances, the developer should seek to optimise proposals through the use of traffic modelling. Traffic models enable proposals to be designed to achieve the right balance for all road users at a particular location.

Where modelling is required, developers or contractors will need to liaise through TfL Assessors (see
Contacts chapter) to have the modelling checked and validated by specialists.
The timescale for validating traffic signal modelling depends on the size, complexity and ultimately the quality of the model. Guidance on modelling can be found here.[34]

To alter existing traffic signals, a new programmable read-only memory chip, known as a PROM (which goes into the controller box located near to the traffic signals) may be required. This is arranged with TfL's Engineering Services via the TfL assessor.

It is important that the developer makes contact with TfL as soon as possible to enable the above tasks to fit in with their desired delivery programme, as these processes can take up to three months.

34 http://content.tfl.gov.uk/traffic-modelling-guidelines.pdf

7.13 Modelling and traffic infrastructure timescales

Before a traffic management proposal is submitted for assessment, the developer should make contact with the TfL Assessment team to share the proposals.
This enables collective agreement to be made on what work will need to be undertaken to understand the impact of the proposal, which will subsequently inform the timescales for design.

Below is an indication of typical timescales for each of the processes that may be required.

Requirement	Time
Base model assessment and audit of proposed layout	4 weeks for each iteration
Proposed model (including inter-greens)	4 weeks for each iteration
Scheme impact report	4 weeks
Manufacturing a new PROM	Up to 3 months
Provision of a new controller (if required)	6 weeks advance notice

7.14 Existing traffic signal switchouts

Where permanent traffic signals need to be switched out, contractors will initially need to get agreement from TfL's traffic management assessment teams before submitting a request to the TfL Fault Control Centre:

Call: 0845 606 1005
Email: atsswitch@tfl.gov.uk

The standard notice period is three days, although more urgent requests can be completed for a higher charge.

Any developer-promoted scheme that includes new, or changes to existing, traffic signals on the TLRN will require the developer to progress the scheme as part of a Section 278 agreement under the Highways Act.

Email: S278SufaceDP@tfl,gov.uk

Chapter 8 – Working on dual carriageways

8.1 Introduction

A total of 295km (51 per cent) of the TLRN comprises dual carriageways, of which 122km are classified as high- speed roads (50mph +), and 16km have the national speed limit. Much of the network is considerably complex with many constraints and hazards imposed on the traffic management design. Large sections of the network have a high density of flyovers, underpasses, traffic signals, guardrail and barriers, off and on slip roads, cycle tracks, footways, access roads and driveways. As a result,
signing strategies and taper positions for lane closures need to be very carefully considered to ensure minimal risk for the workforce and public during works. This means that site-specific risk assessments are needed for operating the traffic management.

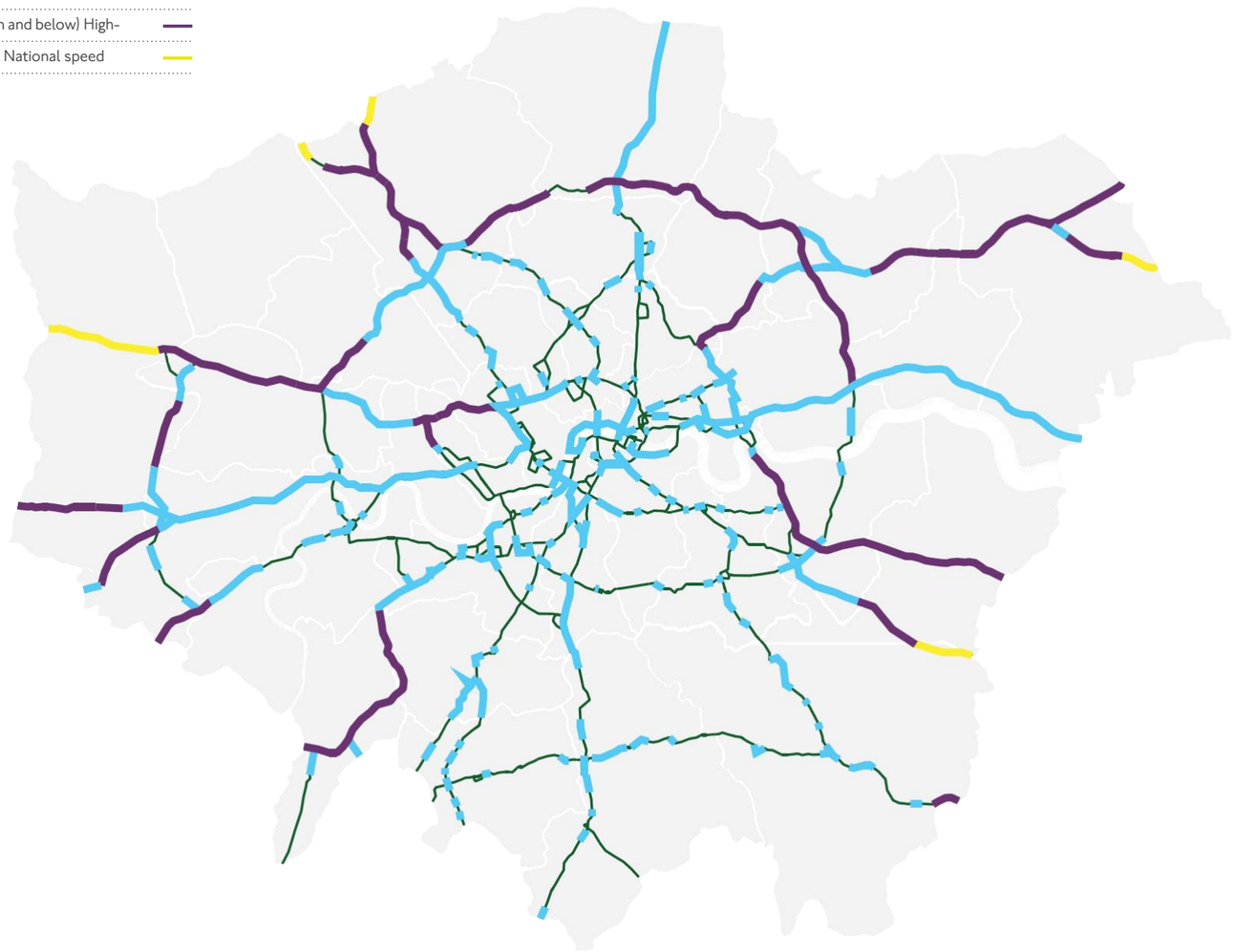
This section of the guidance aims to bring clarity around some of the issues in designing and operating on the dual carriageway and high-speed sections of the network.

TLRN dual carriageways

Key

TLRN

Low-speed dual carriageway (40mph and below) High-speed dual carriageway (50-60mph) National speed limit dual carriageway



Technical Specification
Numbered Appendices

8.2 Highways England Interim Advice Notes

Guidance is issued by Highways England (HE) on a range of topics relating to its motorway and trunk road network in the form of Interim Advice Notes (IANs), although other highway authorities may also adopt their use. Several of these cover traffic management design and operational techniques permitting innovative ways of operating to improve road safety and network performance. Detailed here are selected IANs that predominantly apply to the high-speed dual carriageway network, and have been reviewed by TfL and authorised for contractors to use on the TLRN subject to a site-specific risk assessment.

35 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian115r2.pdf
36 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian137.pdf
37 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian150_16.pdf
38 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian163.pdf
39 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian179.pdf
40 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian181.pdf
41 https://www.tmca.org.uk/sites/default/files/downloads/htma_guidance_ttm_vehicle_selection_and_operation.pdf
42 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian187.pdf
43 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian188.pdf

Interim advice notes (IANs) authorised by TfL for use on the TLRN

IAN publication title	TfL comments
115/08:[35] Guidance for works on the hard shoulder and roadside verges on high-speed dual carriageways	
137-10:[36] The use of stepped speed limits at roadworks	
150/16:[37] Guidance on alternative temporary traffic management techniques for relaxation works on dual carriageways	Application of the method and techniques are authorised and approved for use on the TLRN
163/12:[38] Alternative entry taper at relaxation scheme temporary traffic management on high speed roads	
179/14:[39] Guidance on the use of vehicle-mounted, high-level VMS to provide advance warning of lane closures for relaxation works on dual carriageways with a hard shoulder	
181/14:[40] Guidance on the use of impact protection vehicles for temporary traffic management	Application of the method and techniques contained with the IAN and the HTMA guidance are authorised and approved for use on the TLRN
Read in conjunction with: Highways Term Maintenance Association (HTMA)[41] guidance on temporary traffic management vehicle selection and operation	
187/15:[42] Use of a convoy vehicle for controlling traffic through guide islands at relaxation works on dual carriageways	Application of the method and techniques are authorised and approved for use on the TLRN
188/16:[43] Guidance on omission or warning lights (road danger lamps) for relaxation works on dual carriageways	

8.3 Dual-vehicle working

In recent years, there have been significant advances in the methodology of works operations to prevent harm occurring to the public
and road workers. In 2014, the Health and Safety Executive (HSE) gave clear support to the IAN 181/14 and the HTMA guidance temporary traffic management vehicle selection and operation.

> 'HSE will expect vehicles carrying operatives in an unsecured position should be "protected" by a second vehicle, a dedicated impact protection vehicle, positioned 75 (+ or – 25) metres upstream of the works vehicle. In effect, combined traffic management vehicles, with operatives working on the rear, could not be used on their own whilst in a live lane.'

It is recognised that installing traffic management in some restricted locations with dual vehicles may not provide the safest method of working. This should be identified in the robust risk assessment. Routine operations should allow for a dedicated impact protection vehicle, separate to the vehicle from which operatives are working, during the installation and removal phases of works.

TfL strongly recommends that the above techniques are considered for dual carriageways below 50mph where
the 85th percentile speed exceeds the signed speed limit.

8.4 Short-duration works and inspection stops

Contractors wishing to undertake short-duration works or inspection stops on the TLRN should ensure the method of operation is in accordance with Chapter
8. If an operator wishes to use alternative techniques, the method should be discussed with TfL prior to work starting.

TfL will require notification of the works through the appropriate channels for network management purposes in the usual way.

8.5 Works site encroachment

There is a persistent risk of members of the public entering the safety and works zones at works sites, which
creates an inherent risk to the workforce as well as to themselves. There are three circumstances where this occurs and each requires a different approach to risk mitigation:

Unintentional encroachment: will occur where either the information given to motorists is unclear or where the boundary of the vehicular route is not clearly defined. The resulting road user confusion can lead to pedestrians, cyclists or motor vehicles unwittingly entering the perimeter of the traffic management and potentially into working areas. At the design stage, designers should ask themselves the first of the key questions in the Safety Code – 'Will someone using the road or footway from any direction understand exactly what is happening and what is expected of them?' Advance and information
signs should be clear, the correct size and well positioned to be effective. The edge of the vehicular route must also be clear from all approaches and the whole site should be regularly maintained and inspected. Physical and visual barriers can be used to help communicate what is expected of the road user.

Designers should not rely on marshals or gatemen as an effective method of communicating with moving traffic.

The placement of personnel needs to be carefully considered as the sight of a workforce near a road closure point or in close proximity to moving traffic can act as a magnet for vehicles to stop in dangerous locations to engage in conversations.

Intentional encroachment: is the wilful decision of a road user to ignore signs and barriers to enter a prohibited section of carriageway or works site. This could be the result of intoxication, frustration or criminal intent. Contractors should consider the security of their works
sites and the danger they pose to the public and have procedures in place to manage incidents as and when they occur. Barriers and physical obstructions should be considered appropriate to the assessed risk on a site-specific basis. Lone working risk assessments should be reviewed, particularly in areas where disruption can be expected in town centres, close to events and night clubs.

Incident encroachment: occurs as the result of road accidents, or during emergency or major incidents. Working to the required safety zone margins and risk should be assessed on a site- specific basis. Designers will need to assess emergency access arrangements for emergency vehicles and ensure
escape routes to adjacent properties are maintained and managed. The following stages in the table on page 144 should be observed to safeguard the risks posed by works sites.

Five key stages to ensuring works sites and closures are effective and risks minimised

Stage	Actions
1	**Giving advance notice to road users** For road closure and other disruptive or major works, consider installing advance warning signs deployed several days in advance of the works along with communications via press releases or media outlets. This will allow motorists to plan ahead and alter journey plans. Encountering unexpected delays or having a journey hindered is a frequent source of frustration to road users. The installation of these signs can reduce motorist frustration and consequently the desire to breach a closure point.
2	**Approach zone signing** On the approach to the lane closure or road closure, ensure signing informs the motorist of what is happening and what is expected of them, so that they can process the information in good time and make better decisions on how to reroute past the works. Notification of the works upstream of the site at key junctions allows people to take alternative routes. Without this time to digest, some motorists are likely to panic or get frustrated more easily and again try to breach a closure point.
3	**Maintenance of signs** Most inadvertent breaches of closures occur when the signs, barriers or traffic cones have been displaced or knocked over. Regular inspections and maintenance will ensure the integrity of the works site is retained and prevent road user confusion.
4	**Barriers and visual deterrents** Despite clearly signed approach zones and well maintained traffic management, the risk remains that some people will still attempt to encroach into safety and working zones, particularly when the works area is not visible from the closure point. Reliance on traffic cones may not be sufficient and in problematic locations it is recommended supplementary traffic barriers be deployed across the full width of the potential access route. Gatemen or traffic marshals may also be considered to allow controlled access, although designers must be aware of the risk of vehicles stopping to verbally engage with marshals which could cause an obstruction to the flow of traffic.
5	**Restraint systems** For works with higher risk, such as excavations, works near railway lines, major works or where security must be tighter, then more robust barriers should be considered or traffic management vehicles parked broadside to physically block routes.

8.6 Gantry and fixed signing for temporary works

Certain sections of the TLRN have gantry and permanently fixed signs for use in temporary situations and closures, particularly on approaches to tunnels and underpasses. Works promoters should seek to use these where possible and ensure the gantry signing does not conflict with the temporary traffic management arrangements.

If there is the potential for a conflict, the traffic management should be discussed with TfL for resolution.

Chapter 9 – Look and feel of roadworks

9.1 Public perception

While roadworks are an inevitable part of everyday life, well-designed and maintained temporary traffic management and work sites will help retain healthy and pleasant street environments where Londoners feel safe and relaxed. The site boundary is invariably the perimeter of the traffic management and plays a critical role in communicating the professionalism and integrity of the company and its contractors.

Creating clear and consistent information for people living and working near roadworks sites will keep road users better informed, with traffic signs integral to this – see Chapter 6.
Good information helps to reduce public confusion and complaints.

Well-planned works outside peak usage hours or returning the road to its users at peak hours all help keep London moving.

Well-maintained traffic cones keep a site safe and routes clearly defined


Straight and tidy barriers maximise safety and give a good impression on site

9.2 Maintenance

National guidance for site maintenance is provided in Chapter 8. Site maintenance regimes should be planned in advance of works and proportionate to the risk of disruption expected. Any maintenance regime should be monitored and reviewed on a regular basis to ensure roadworks do not deteriorate to unsafe levels for extended periods of time.

Maintenance frequency will be determined on a site-by-site basis following a risk assessment. As much of the TLRN has high traffic volumes, including pedestrians and cyclists, two-hourly inspections would be appropriate in most locations.

It is recommended that diversion routes are inspected frequently, particularly when signs are located on footways and other areas where signs are prone to being disturbed. Where a Roadworks Inspector identifies that a site has become non-compliant with the Safety Code, the site is classified as follows:

- High risk: The site needs rectification without delay and within two hours of notification of the failing
- Low risk: The site requires making good within four hours of notification of the failing

One of the most critical parts of improving the appearance of roadworks is to ensure the guarding and barrier systems are correctly installed and straight and the cones are tidy, correctly aligned and clean.

Barriers and other traffic management equipment should not be utilised to support tools, plant or building materials.

It is incumbent upon works promoters to keep works sites compact and as minimally disruptive as possible although this should not compromise compliance with the Safety Code.
As works progress, surplus traffic management should be removed and the site reduced if reasonably practicable without detriment to safety zones.

9.3 Tidiness: safety, security, aesthetics

Sites should be kept orderly, with materials safely stored in an organised manner and contractors should make provision to promptly remove waste and litter from sites. Construction debris is a potential trip hazard to the workforce, or could be used as a missile or weapon during public disorder, and it has a detrimental impact on the appearance of the local street scene.

Where there are high numbers of road users and the storage of materials, tools, plant or welfare facilities is occupying too much road space, consideration should be given to creating storage facilities within less busy nearby side streets, with the agreement of the relevant highway authority.

The corporate image and professionalism of a works promoter, contractor and TfL as the highway authority can be severely called into question when sites are untidy.

Street litter collecting within a site and along its boundaries, particularly within walkways and cycle lanes, should be removed. Not only is it unsightly but litter can present a hazard to more vulnerable road users. This is particularly pertinent in the case of longer-duration works, where traffic barrier and hoarding has a solid edge at floor level, as it can trap wind-blown litter alongside it.

Cluttered, untidy sites have the potential to be vulnerable to the hiding and disguising of suspect packages.
A tidy site, with well maintained barriers, can help reduce this risk.

Developers and TfL aspire to make local areas more attractive to walking and cycling to help meet the Mayor's transport strategy and promote active travel. A temporary streetscape environment should minimally impact the area and not lower the visual amenity and attractiveness of an area.
Traffic management equipment should be kept clean of grime, dirt and dust often emitted through undertaking roadwork operations.

Untidy sites are potentially unsafe and several reduce the attractiveness of an area

Barriers can create litter traps that can make sites appear unsightly

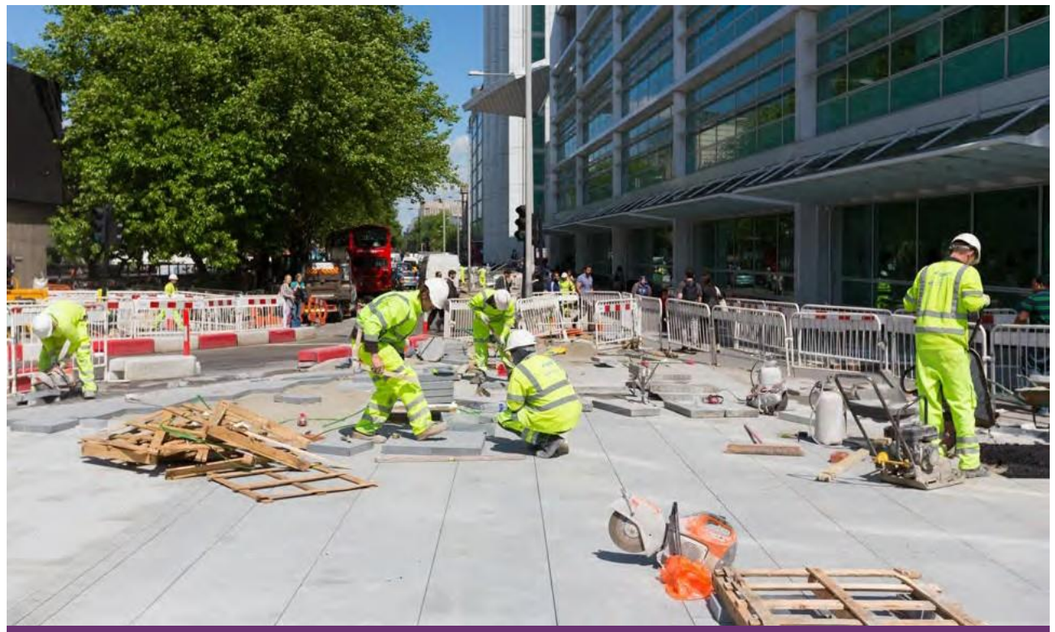
9.4 Workforce

Contractors and visitors to sites should be qualified for the roles they are undertaking and suitably dressed in Personal Protective Equipment as required by the demands of their role.
However, the cleanliness and appearance of the Personal Protective Equipment not only affects the safety performance of the product but it can demonstrate publicly the company policy towards maintaining high safety standards throughout all its operations.

All site personnel should also carry a form of identification.

Historically, one of the biggest frustrations of road users has been the appearance of inactivity within roadworks. Works promoters are encouraged to ensure works are planned to keep periods of inactivity to the absolute minimum where possible. Where inactivity is unavoidable, explain why with signing – for example, concrete drying.

Site personnel should be suitably dressed



Clean and consistent Personal Protective Equipment for all site staff helps to demonstrate high safety standards

Technical Specification
Numbered Appendices

9.5 Targeting information

The perception and experience of roadworks can be significantly improved with a well-considered communications strategy, which can significantly reduce disruption on the road network, and road user confusion and frustration.

Designers must also be mindful to avoid information overload or message clutter, which can inadvertently contribute to confusion. The key types are:

Advance remote communication:

Consultations or letter drops for major or disruptive works are the first tool to engage with the public and communicate why, what and when work is taking place. When the local community
feels engaged with the planning and advance notice of the works, complaints are reduced and it affords them the opportunity to consider alternative means of reaching their destination.

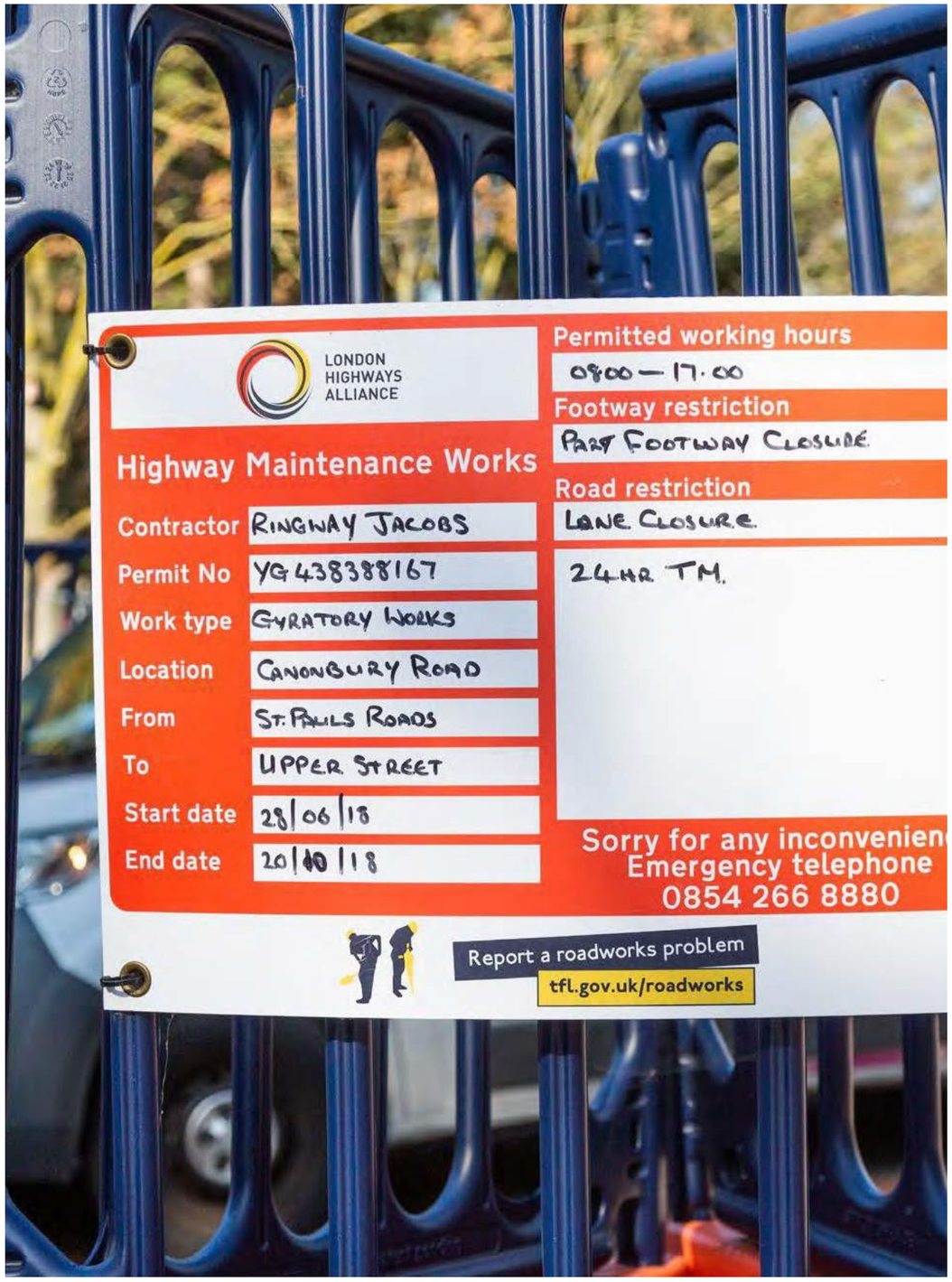
Advance roadside communication:

Designers assessing the impact of works should propose the necessary mitigation measures with their traffic management submissions. TfL can then assess the proposals and make further recommendations. Messaging strategies will be heavily influenced by other works in the area. Reflective and
variable message traffic signs are not the only tool in roadside communication.
Hoardings and some barrier systems can often be utilised to display pedestrian-facing local information in advance of works or before a new phase of works is about to commence. These are especially effective at passenger transport interchanges such as train stations and bus stops.

In accordance with the Safety Code, it is a statutory requirement to ensure all approaches to a works site must sufficiently inform a road user what is happening and what is expected of them. Therefore, it is important to consider all pedestrian and cycle approaches such as footpaths from housing estates and the cycle tracks from parks, and not only the main carriageway.

When providing targeted information on larger schemes, consider completion dates and benefits of the works as well as the nature of the works and who will be most affected by and/or interested in the works, including:

- People living and working near works sites
- People travelling through the area
- Community groups and centres – including schools and colleges, places of worship, leisure centres, and hospitals and other health service providers
- Political representatives
- London boroughs



Communicating with road users

Technical Specification
Numbered Appendices

9.6 Branding

With major works, sites may be branded to help members of the public identify who is carrying out the works alongside explaining the nature of the works and when they will be delivered. The branding should not interfere with the performance of the traffic management installation, mask or obscure any traffic signs or be detrimental to personal security, eg by inadvertently creating ambush points or blocking lights and visibility.

Branding should not feature on any traffic sign or equipment.

Branding site hoarding is aesthetically pleasing to passing road users

Technical Specification
Numbered Appendices

Chapter 10 – Assessment, approval and monitoring

10.1 Purpose of this section

Both roadworks and building construction activities can cause traffic disruption in London, but timely and effective planning can keep that disruption to a minimum. The purpose of this chapter is to provide organisations, especially those that are not familiar with working on the TLRN or SRN, with the information required to execute works. This includes outlining the relevant processes and procedures required to assess work proposals and obtain the necessary approvals.

This chapter will help those proposing to undertake works to understand:

- The relevant TfL processes required to undertake works that impact the TLRN
- Some of the challenges that could arise
- The value to all parties of early engagement
- How TfL monitors works for compliance

10.2 Background

Roadworks are primarily governed under two Acts of Parliament – the New Roads and Street Works Act 1991, and the Traffic Management Act 2004 (TMA).[44] TfL, as a street authority, and those that operate on our network, are bound by this legislation.

The TMA tackles congestion and disruption on the road network. It places a duty on local traffic authorities to ensure the that traffic moves freely on their road network and those networks of surrounding authorities. The TMA gives authorities additional tools to better manage parking policies, moving traffic enforcement and the management of street works.

Those undertaking roadwork play a key role in this regard and must consider the effects on all road users, the community and businesses when undertaking construction works. Each proposal must be subject to careful planning, assessment, and coordination before consent is given to proceed.

44 https://www.legislation.gov.uk/ukpga/2004/18/contents

Works assessment process

Works type	Work promoter	Work promoter	Assessment team	Assessment system	Work type examples
Major schemes	Highway Authority Developer	TLRN / SRN	Network Impact Specialist	Londonworks TMAN	• Major scheme • Cycle Superhighways • S278 schemes • Structures & tunnels investment programme
Standalone works	Highway Authority Utility	TLRN / SRN TLRN	Coordination & Permitting	Londonworks TMAN Slip number Management system	• Drainage • Resurfacing • Traffic signal modernisation • Highways England • Lighting • Scoot • Structural maintenance • Block closures • Crane operations • Utility renewals, upgrades, connections • New Roads and Street Works Act s50

10.3 Proposals to undertake works

Any organisation undertaking particularly disruptive works will be required to submit its traffic management proposals to TfL for assessment. This process ensures that all mitigation measures have been considered to deliver the works in the least disruptive way, the relevant stakeholders are engaged, and the works are adequately communicated to the relevant parties that may be impacted by the works.

The TfL Assessment team will vary depending on the type of work being proposed, as will the assessment system used to process proposals.

The table to the left sets out areas of responsibility for each assessment team.

A major scheme generally involves a permanent change to the road network layout or long-term temporary traffic management arrangements more than six months in duration that will have a significant impact on highway capacity. Any other standalone works that are proposed within the immediate vicinity will also be determined as part of the major scheme assessment.

Standalone works do not realign the permanent nature of the road network, are independent from a scheme, and have a duration of less than six months.

Each traffic management assessment process is slightly different, depending on the type of works being undertaken and the team processing the proposal. TMAN applications are generally determined within one calendar month of receipt, and SNMS applications require 10 days' advance notice. Both assume the application is complete, with all the correct documentation provided.

The table on 164 provides an overview of the information required and the areas a traffic management application should address (where relevant).

Works assessment information

Application type	Information required	Impact of proposal on:
Major scheme	• Existing and proposed layout drawings • Accident data • Traffic surveys/data • Traffic/transport modeling • Scheme impact report where traffic signals are impacted • Multi-modal traffic impact assessment or summary • Road safety audit • Construction Logistics Plan (CLP) • Lorry loading, holding and consolidation areas • Long Goods Vehicle flow data • Supporting information, including stakeholder comments	• Road safety • Accessibility • Pedestrians/cyclists/ buses • Motorised traffic/taxis/ interchanges • Road network capacity • Parking • Adjoining roads/wider area impacts • Environmental and streetscape • Surrounding network and adjacent activities
Standalone works	• Existing and proposed layout drawings with dimensions • Traffic management plan with dimensions • Timing/programme of work; • Accident/survey data • Traffic/transport modelling • Traffic impact assessment or summary • Highway asset impact • Road Safety Audit • Construction Logistics Plan (CLP); • Lorry loading, holding and consolidation areas • Long Goods Vehicle flow data • Mitigation strategy covering all affected modes • Supporting information including stakeholder comments	• Road safety • Accessibility • Pedestrians/cyclists/ buses • Motorised traffic, including motorcyclists and taxis • Interchanges • Capacity/traffic impact • Parking • Adjoining roads/wider area impacts • Environmental and streetscape • Surrounding network and adjacent activities

Further information on the traffic management assessment process can be found by contacting the relevant TfL Assessment team, whose contact details can be found in the Contacts chapter.

The TMAN Assessment component forms part of an overarching system known as Londonworks, which also houses other modules that help to minimise congestion caused by roadworks and construction activity.

There is a Forward Planning portal to enable works promoters to share long-term plans, and a Central Register providing visibility of all works across London that are either proposed or in progress. Both modules are useful as they can help to establish collaborative working opportunities, while the Central Register is a helpful reference to identify potential timeframes when there are no other works being carried out.

TfL's City Planning team is responsible for submitting TMANs on behalf of a developer wishing to work on the TLRN. Contact: Section278Team@tfl.gov.uk.

10.4 Road safety audits

In many situations, the guidance contained within the national codes of practice is insufficient to guide designers to cover the complex scenarios likely to be encountered in London. A Road Safety Audit (RSA) may be required for temporary traffic management schemes, even if the arrangements remain in operation for less than six months.
This is particularly the case where significant impact on the highway network is anticipated.

TfL's project sponsors will initiate the RSA for TfL-promoted works, and external works promoters should liaise with TfL's traffic management assessors to determine if an RSA is required.

Further information on TfL's RSA procedure (SQA-0170) can be found here.[45] TfL's RSA team can be contacted at: TfLSafetyAudit@tfl.gov.uk.

45 http://content.tfl.gov.uk/tfl-road-safety-audit-procedure-may-2014-sqa-0170.pdf

10.5 Street and roadworks permits

In addition to the traffic management assessment process, consent to undertake street and roadworks activity on the TLRN from TfL's Coordination and Permitting team is a mandatory requirement.

The London Permit Scheme came into effect in January 2010 to assist in the coordination of street works and roadworks on the TLRN. All planned, non-planned and emergency works will require a permit.

Under the scheme, works promoters are required to obtain permission from TfL to work on the TLRN. This allows TfL to determine the best time for the works to be carried out when there is the least disruption to traffic and also identify any collaborative working opportunities.

Permit conditions regarding the way the works are to be carried out are also agreed as part of the approval process.

Below are the minimum advance notice periods for applying for a permit to work.

Further information on TfL's permit scheme can be found here.[46]

Works type	Application period			Response period		
	Provisional advance authorisation	Permit	Variation	Provisional advance authorisation	Permit	Variation
Major	3 months	10 days	2 days or 20 per cent of original duration	1 month	5 days	2 days
Standard		10 days			5 days	
Minor		3 days			2 days	
Immediate		2 hours after			2 days	

46 https://tfl.gov.uk/info-for/urban-planning-and-construction/roadworks-and-street-faults#on-this-page-4

10.6 Highway licence approval

A separate approval process is required for activities that require licensing under the Highways Act. These activities include:

- Crane operations
- Mobile elevated platforms
- Hoardings
- Scaffolding
- Building materials
- Skips

Application forms for highway licensed activities can be found here.[47]

Licensed activity

47 https://tfl.gov.uk/info-for/urban-planning-and-construction/highway-licences

10.7 Temporary traffic regulation orders and suspensions

A regulatory order or notice is required when it becomes necessary to prohibit, regulate or restrict traffic on a road on part of the road network as a consequence of the work. This includes scenarios such as temporary
road closures, banned turns, changes in kerb line controls and loading/parking suspensions. Under the Road Traffic Regulation Act 1984,[48] such changes to the way the permanent road network normally operates requires either a Temporary Traffic Regulation Order/ Notice (TTRO/N) or a Temporary Suspension Request (TSR). Advance notice periods for legally making the relevant TTRO/N or TSR are as follows:

Temporary order type	RTRA reference	Description	Advance notice
Regulation Order	Section 14(1)	Planned traffic prohibitions or restrictions	12 Weeks
Regulation Notice	Section 14(2)	Traffic prohibitions or restrictions required without delay	Not required
Temporary suspension request	Section 6	Suspension of bus lanes, parking controls, such as parking, loading, disabled or motorcycle bays	3 weeks

Any new permanent arrangements introduced on the highway, such as new loading/parking facilities, banned turns and kerb line control changes, will require amendments to existing traffic orders.

For scheme-related work, these will commonly be as follows:

Order type	RTRA reference	Description	Advance notice
Experimental Order	Section 9	Temporary road layout for experimental purposes	8 Weeks
Permanent Order	Section 6	Changes to permanent traffic prohibitions or restrictions	12 weeks

Further information can be found by contacting TfL's traffic order team:
TrafficOrderSection@tfl.gov.uk

48 https://www.legislation.gov.uk/ukpga/1984/27/contents

10.8 Lane rental

The Transport for London Lane Rental Scheme was introduced on 11 June 2012 and updated on 1 July 2014. The Lane Rental Scheme applies to 56 per cent of the TLRN and is designed to minimise disruption due to roadworks and street works in specified traffic-sensitive locations by applying a daily charge for each day that the street is occupied by the works.

Lane Rental Scheme charges can be either low (£800) or high (£2,500) and are applied for each day of impact.
Works promoters must establish if charges apply to their proposals before commencing works. Further details on TfL's Lane Rental Scheme can be found here.[49]

10.9 Stakeholder communications

Engaging stakeholders is fundamental to the success of well-executed roadworks. All relevant stakeholders affected by work proposals must be consulted for awareness and to ensure any adverse effects are mitigated. This should include, where applicable:

- Vulnerable road users (cyclists, powered two-wheelers, those with mobility impairments and pedestrians)
- Other members of the public
- Freight industry
- Local boroughs
- Local businesses
- Residents groups
- Public transport sectors (buses, Tube and overground rail)
- Emergency services
- Taxis
- Established development related working groups

There are a variety of ways to provide awareness of roadworks to help customers avoid delays by making pre-planned changes to their journeys. Communication conventionally involves notifying residents and businesses by sending letters in the near vicinity of works, as well as the installation of variable message signs.

Depending upon the scale of the activity and the anticipated operational impacts for road users, the following enhanced communication tools should also be considered:

- Transport planning and analysis – to understand the specific locations' users; their make-up, frequency of journeys, origins and destinations, and to predict how individual journeys will be affected and the disruption that will be experienced by time of day and day of week
- Analysis-based travel advice content – captured in a single factsheet which is then used as a single source of truth to inform all communications and engagement including:
    - Dedicated travel advice webpage including interactive mapping of works and associated diversions / other travel advice
    - Targeted emails to registered road users
    - Targeted emails to registered regular bus users
    - Tailored letters across immediate residential area, any wider area(s) anticipated to be impacted by works, and other key stakeholders
    - Other tailored printed information including advice for businesses in the locality, cyclists and pedestrians
    - Industry standard road closure data for satnav and other road network information providers
    - Communication of timings to ensure optimal customer and road user response based on frequency of travel through the specific location

TfL Assessment teams are able to provide contact details for stakeholders that should be contacted, which will be dependent on the type and locality of the works.

49 https://tfl.gov.uk/info-for/urban-planning-and-construction/lane-rental-scheme

10.10 Works monitoring

Legislation empowers TfL, as a street authority for the TLRN, to undertake inspections of roadworks to ascertain if a statutory undertaker has complied with its duties.

These inspections include checking if roadworks in progress are compliant with the technical standards prescribed within the Safety Code. Works are also inspected to assess if they are being undertaken in accordance with the approved permit conditions, if they are incurring Lane Rental charges or are overrunning their estimated end date.

Inspections are also carried out once the works are complete to assess whether the reinstated highway is compliant with the performance standards specified within the DfT's Specification for the Reinstatement of Openings in Highways.[50]

More than 40,000 inspections a year are carried out on roadworks. Video analytic technology is sometimes deployed to monitor activity on longer- duration works, such as schemes, s278 development works and utility mains replacement works. These mobile CCTV cameras auto-detect whether activity is taking place on-site when expected – providing alerts containing still images to a back-office system for validation. This ensures finite roadspace is being actively occupied when expected.

Partnerships are also in place with other TfL business areas that have an on-street contingent, who supply observations on roadworks they encounter. In total, more than 20,000 reports on roadworks per year are received from in excess of 380 officers who frequently patrol the network. The reports are submitted through mobile software and transmitted to a back-office system where they are validated by specialist roadworks inspectors.

Alongside this, a further 7,700 reports per year are received from members of the public reporting roadworks problems through TfL's website, which are also validated for compliance.

With access to more than 5,000 CCTV cameras, our Network Management Control Centre also monitors the road network 24 hours a day, regularly identifying concerns it has observed with roadworks.

It is essential that construction organisations provide TfL with a 24/7 contact point empowered to rectify any non-compliant defects within two hours of being notified of a high-risk failure, or within four hours for lower-risk issues.

50 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/11042/sroh.pdf

10.11 Works enforcement

Any breaches of safety standards are taken seriously, with the appropriate remedial interventions implemented against the parties concerned, with prosecution considered if this is deemed the most appropriate course of action. The interventions at our disposal include:

- Operation of a Fixed Penalty Notice system - this provides TfL with the option of dealing with specified streetworks offences through the payment of a fine in lieu of prosecution

- Prosecution in the magistrates' courts where the use of Fixed Penalty Notices are not considered appropriate or available, for example safety offences or where they have failed to discharge liability through the Fixed Penalty Notice scheme, and

- Action plans to address specific areas of under performance, which are then closely monitored with the works promoter through enhanced reporting, regular progress review meetings and toolbox talks

Charges are also imposed where works are found to be overrunning, or are being undertaken during Lane Rental operational hours.

10.12 Roadworks patrols

TfL undertakes regular roadworks patrols with the delivery team, road users, campaign groups, and developers to cycle and walk through traffic management on the TLRN both before and during roadworks. This active traffic management experience provides first-hand intelligence to road users encountering temporary road network conditions, and realising the constraints arising.

Issues are discussed along the route with observations collated into a report for dissemination to the group, site managers and other stakeholders. The emphasis is on ensuring high-quality provision for vulnerable road users at works sites.

The patrol methodology has been a catalyst for change, especially in the way TfL approaches roadworks design and conflict mitigation as part of the traffic management assessment process. This includes interventions such as mandatory and advisory cycling facilities around roadworks and the provision of loading areas.

Further information relating to cycle patrols can be requested from: TMWorkinggroup@tfl.gov.uk.

References

Service	Notice period
Mayor's Transport Strategy[51]	Greater London Authority
Healthy Streets for London[52]	Transport for London
Vision Zero action plan[53]	Transport for London
Safety at Street Works and Roadworks: A Code of Practice[54] (the Safety Code)	Department for Transport
Chapter 8 of the Traffic Signs Manual[55] (Chapter 8)	Department for Transport
Traffic Signs Regulations and General Directions[56] (TSRGD)	Her Majesty's Stationery Office
Health and Safety at Work Act 1974[57]	Her Majesty's Stationery Office
Construction (Design and Management) Regulations 2015[58]	Health and Safety Executive
Management of Health and Safety at Work Regulations 1999[59]	Her Majesty's Stationery Office
New Roads and Street Works Act[60]	Department for Transport
Walking action plan[61]	Transport for London
Pedestrian Comfort Guidance[62]	Transport for London
Equality Act 2010[63]	Government Equalities Office
Inclusive Mobility[64]	Department for Transport
Crime and Disorder Act 1998[65]	Her Majesty's Stationery Office
BS 8442:2015: Miscellaneous road traffic signs and devices	British Standards
BS EN12899-1: 2007 Fixed, vertical road traffic signs	British Standards
Traffic Advisory Leaflet 01/14[66] (Temporary white on red signs at roadworks)	Department for Transport
Traffic Advisory Leaflet 15/99 Cyclists at Roadworks[67]	Department for Transport
Local Transport Note LTN 01/12[68] (Shared use routes for pedestrians and cyclists)	Department for Transport
Local Transport Note LTN 02/08[69] (Cycle infrastructure design)	Department for Transport
An Introduction to the use of Portable Vehicular Signals[70]	Department for Transport
CLOCS Standard for construction logistics: managing work related road risk[71]	Construction Logistics and Community Safety
Interim Advice Note 142/11 (Temporary Barrier Decision Tool)[72]	Highways England
BS 8442:2015 Miscellaneous road traffic signs and devices. (Requirements and test methods)	British Standards
BS EN1317 (Road Restraint Systems)	British Standards
List of compliant road restraint systems[73]	Highways England
TOPAS 2516C[74] (Performance Specification for Discontinuous Variable Message Signs)	Highways England
TOPAS 2502B[75] (Performance Specification for Portable Traffic Signal Control Equipment for use at Roadworks)	Highways England

Service	Notice period
TOPAS 2504A[76] (Performance Specification for Vehicle Detection Equipment for Vehicle Actuated Portable Traffic Signals)	Highways England
TOPAS 2537A[77] (Performance Specification for Portable Traffic Signal Control Equipment with Pedestrian Facilities for use at Roadworks)	Highways England
TOPAS 2538A[78] (Performance Specification for Portable Traffic Signal Control Equipment for a Standalone Pedestrian Facility)	Highways England
National Highway Sector Scheme 12D[79]	Highways England
Traffic Advisory Leaflet (TAL) 03/11[80] (Signal-controlled Pedestrian Facilities at Portable Traffic Signals)	Highways England
IAN 115/08:[81] Guidance for works on the hard shoulder and roadside verges on high speed dual carriageways	Highways England
IAN 137-10:[82] The use of stepped speed limits at roadworks	Highways England
IAN 150/16:[83] Guidance on alternative temporary traffic management techniques for relax works on dual carriageways	Highways England
IAN 163/12:[84] Alternative entry taper at relaxation scheme temporary traffic management on high speed roads	Highways England
IAN 179/14:[85] Guidance on the use of vehicle mounted high level VMS to provide advance warning of lane closures for relaxation works on dual carriageways with a hard shoulder	Highways England
IAN 181/14:[86] Guidance on the use of impact protection vehicles for temporary traffic management. Read in conjunction with: Highways Term Maintenance Association (HTMA)[87] Guidance on temporary traffic management vehicle selection and operation	Highways England
IAN 187/15:[88] Use of a convoy vehicle for controlling traffic through guide islands at relaxation works on dual carriageways	Highways England
IAN 188/16:[89] Guidance on omission or warning lights (road danger lamps) for relaxation works on dual carriageways	Highways England

Service	Notice period
Traffic Management Act 2004 (TMA)[90]	Her Majesty's Stationery Office
Highways Act 1980[91]	Her Majesty's Stationery Office
Road Safety Audit procedure[92]	Transport for London
Highway Licence Application Forms[93]	Transport for London
Road Traffic Regulation Act 1984[94]	Her Majesty's Stationery Office
Lane Rental Scheme[95]	Transport for London
Specification for the Reinstatement of Openings in Highways[96]	Department for Transport
Transport for London website[97]	Transport for London

51 https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf 52
http://content.tfl.gov.uk/healthy-streets-for-london.pdf
53 http://content.tfl.gov.uk/vision-zero-action-plan.pdf
54 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/321056/safety-at-streetworks.pdf
55 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/203669/traffic-signs-manual-chapter-08-part-01.pdf
56 http://www.legislation.gov.uk/uksi/2016/362/pdfs/uksi_20160362_en.pdf
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61 http://content.tfl.gov.uk/mts-walking-action-plan.pdf
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66 https://www.gov.uk/government/publications/temporary-white-on-red-signs-at-road-works
67 http://www.ukroads.org/webfiles/tal 15-99 cyclists at roadworks.pdf
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71 https://www.clocs.org.uk/page/clocs-standard
72 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian142.pdf
73 http://www.standardsforhighways.co.uk/ha/standards/tech_info/files/List_of_EN1317_Compliant_RRS_March_2016.pdf
74 http://www.topasgroup.org.uk/MyFiles/Files/specifications/2516C v3 draft uploaded.pdf 75
http://www.topasgroup.org.uk/MyFiles/Files/specifications/2502B v4 170415.pdf
76 http://www.topasgroup.org.uk/MyFiles/Files/Specifications 2016/TOPAS 2504A 11316.pdf
77 http://www.topasgroup.org.uk/shop/topas-2537a-performance-specification-for-portable-traffic- signal-control-equipment-with-pedestrian-facilities-for-use-at-roadworks/
78 http://www.topasgroup.org.uk/MyFiles/Files/Specifications 2016/TOPAS 2538A 11316.pdf
79 https://www.ukas.com/download/publications/publications_relating_to_certification_bodies/NHSS 12D 9001 2008 - Issue 10 November 2016.pdf
80 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/482503/3-11.pdf
81 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian115r2.pdf 82
http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian137.pdf
83 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian150_16.pdf
84 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian163.pdf
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86 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian181.pdf
87 https://www.tmca.org.uk/sites/default/files/downloads/htma_guidance_ttm_vehicle_selection_and_operation.pdf
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91 https://www.legislation.gov.uk/ukpga/1980/66
92 http://content.tfl.gov.uk/tfl-road-safety-audit-procedure-may-2014-sqa-0170.pdf
93 https://tfl.gov.uk/info-for/urban-planning-and-construction/highway-licences
94 https://www.legislation.gov.uk/ukpga/1984/27/contents
95 https://tfl.gov.uk/info-for/urban-planning-and-construction/lane-rental-scheme
96 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/11042/sroh.pdf
97 http://www.tfl.gov.uk/

Contacts

TfL Assessment Teams

Contact Type	Area	Boroughs	Email
Network Impact Specialist Team	North	Barking & Dagenham, Barnet, Brent, Enfield, Hackney, Hammersmith & Fulham, Haringey, Harrow, Havering, Hillingdon, Hounslow, Redbridge Waltham Forest	NPDNetworkImpactSpecialist @tfl.gov.uk
	Central	Camden, City of London, Islington, Kensington & Chelsea, Tower Hamlets, Westminster	
	South	Bexley, Bromley, Croydon, Ealing, Greenwich, Lambeth, Lewisham, Kingston, Merton, Newham, Richmond, Southwark, Sutton, Wandsworth	
Coordination & Permitting	East	Barking & Dagenham, Bexley, Enfield, Greenwich, Hackney, Haringey, Havering, Newham, Redbridge, Tower Hamlets, Waltham Forest	CaPEast@tfl.gov.uk
	West	Barnet; Brent, Ealing, Harrow, Hillingdon, Hounslow, Kingston-upon-Thames, Richmond-upon-Thames, Wandsworth	CaPWest@tfl.gov.uk
	Central	Camden, City of London, Hammersmith & Fulham, Islington, Kensington & Chelsea, Westminster	CaPCentral@tfl.gov.uk
	South	Bromley, Croydon, Lambeth, Lewisham, Southwark, Sutton	CaPSouth@tfl.gov.uk
Londonworks System Access			Londonworks@tfl.gov.uk
Slip Number Management System Access			SNMS@tfl.gov.uk

Service	Contact
TfL Bus Operations Team	020 3054 0195
TfL bus suspensions	North London: north.rsm@tfl.gov.uk Central London: central.rsm@tfl.gov.uk South London: south.rsm@tfl.gov.uk
TfL traffic signal switchouts	0845 606 1005 atsswitch@tfl.gov.uk
TfL's City Planning Team	Section278Team@tfl.gov.uk
TfL's Traffic Order Team	TrafficOrderSection@tfl.gov.uk
Police anti-terrorist hotline	0800 789 321

Any queries relating to this document should be emailed to TMWorkingGroup@TfL.gov.uk

Appendix 1/20 – Vehicle Recovery

General

1. Unless otherwise permitted the *Contractor* shall have recovery vehicles available for immediate deployment with a response time of no less than one hour.

Appendix 1/23 – Health and Safety Requirements

1. General

1.1. The *Client*'s vision for health and safety is of world class delivery with zero harm. The *Client*'s strategy for delivering this is to implement effective health and safety management systems and behaviours to get ***"Everyone home safe and healthy every day"***.

1.2. The *Contractor* complies with the spirit and intent of the *Client*'s Health, Safety and Environment Policy and Health and Safety strategy.

1.3. The *Contractor* and his supply chain implements measures to mitigate and manage the key risks to as low as reasonably practicable (ALARP) through:

a) robust design risk management;

b) effective processes for assessing risk and developing safe systems of work;

c) Construction Phase Plans and Emergency Preparedness Plans;

d) behavioural safety programme with full participation by all;

e) high levels of leadership commitment and supervision and engagement in monitoring and managing the *contract*, rectifying deficiencies and continuously improving;

f) personal competency, development and innovation;

g) exemplary standards of health and safety performance and management whether in design, construction or procurement to ensure that the *Client*'s vision is delivered and compliance achieved with health and safety legislation;

h) comprehensive occupational health management scheme;

i) regular meetings to discuss health and safety performance;

j) *Contractor's* workers are work ready through inductions, toolbox talks and briefings;

k) "One Team" culture, honesty, openness and engagement; and

l) rewarding good performance and challenging poor performance.

1.4. The *Contractor* responds promptly if the *Client* requests a meeting with a senior representative from the *Contractor* (typically a Director) to discuss any reportable event, adverse trends or other evidence of a serious non-conformity with the legislation or health and safety requirements.

1.5. The *Contractor* shall take all necessary precautions to prevent danger, nuisance or inconvenience to the owners, tenants or occupiers of adjacent properties and to the public generally.

1.6. The *Contractor* shall inform the *Client* as soon as becoming aware of any visits from Enforcing Authorities (Health and Safety Executive (HSE), Office of Rail and Road (ORR) or Local Authority Environmental Health (EH) Department), prosecution or pending or likely prosecution of the *Contractor* for any offence pertaining to the health and safety of his employees or of other persons, or of any conviction on such prosecution, and shall provide the *Client* with such further information and documents as the *Client* may require.

1.7. The *Contractor* ensures that all employees and SubContractors and suppliers of any tier are made aware of their responsibility for their own safety and the safety of Others and for ensuring that the activities they undertake are safe and do not place Others at risk.

1.8. The *Contractor* ensures that his employees participate in the health and safety initiatives that the *Contractor* and *Client* use to review and improve health and safety performance collectively with their supply chains. This includes the requirement to attend routine health and safety meetings, briefings and SubContractor forums.

1.9. The *Contractor* produces, cascades, communicates and circulates health and safety alerts and communications to all levels of the workforce and shares these with the *Client*. The *Contractor* retains records of these being briefed.

2 *Contractor's* Health and Safety Management Arrangements

2.1 The *Contractor* has a health and safety management system that, as a minimum, meets the requirements contained in ISO 45001.

2.2 The *Contractor* shall produce an annual Health and Safety Action Plan at the start of each financial year. The Plan shall:

a) list and support a set of Health and Safety Objectives;

b) have realistic target dates assigned and be challenging but achievable;

c) be presented to, and agreed by, the *Client* during mobilisation to commence delivery from 1 April in Year 1, and then in subsequent years be presented to, and agreed by, the *Client* during March to commence delivery on 1 April each year;

d) be completed, evidenced and approved by the *Client* before the end of the financial year; and

e) consist of at least one action per financial year relating to collaborative working to deliver a pan-London health and safety benefit or initiative.

3 Health and Safety Advice

3.1. The *Contractor* employs at all times suitably competent health and safety resources to oversee and direct a sufficiently sized and competent team of health and safety professionals, to fully implement all the applicable health and safety requirements.

3.2. The *Client* shall be informed if the resources available to fulfil this change, and the measures that shall be taken to ensure health and safety are not compromised.

4 Procurement and Supply Chain Management

4.1. Prior to and after the appointment of SubContractors, the *Contractor* is responsible for ensuring that SubContractors are aware of and understand the health and safety requirements stated within the Contract. The *Contractor* coordinates and manages the interface between his SubContractors to ensure compliance with the health and safety requirements and monitors and reports health and safety performance periodically to the *Client*.

5 Health and Safety Training

5.1. The *Contractor* ensures the delivery of health and safety training for all persons (including Sub*Contractor*s and suppliers of any tier) engaged on the *contract*. In particular, training is provided to raise awareness of how health and safety initiatives can be incorporated in to the work activities to maximise performance and assist with mitigating any associated impacts. The *Contractor* provides specific training to maintenance staff to ensure that they are aware of the required mitigation measures detailed in the risk assessments and method statements. The *Contractor* meets all training, assessment and associated costs.

5.2. The *Contractor* ensures that all employees, visitors, SubContractors and suppliers of any tier and others working on Site attend an induction and any other training appropriate to the work taking place before the person starts work on the Site.

5.3. The *Contractor* puts in place systems to implement all inductions/training effectively. The persons providing inductions have received adequate training to do so. The *Contractor* ensures that these are carried out in a suitable place with appropriate visual aids.

5.4. The *Contractor* has a procedure in place that assists those personnel with learning, reading and language difficulties.

5.5. The *Contractor* maintains a written record of attendance for inductions and safety briefings. This record is available to the *Client* on request.

6 Construction Skills Certification Scheme (CSCS)

6.1. The *Contractor* ensures that all employees, SubContractors and suppliers of any tier and other *Contractor*s entering construction sites are in possession of a valid CSCS card. The *Contractor* ensures that the CSCS card held by any individual is appropriate to their specific job task(s).

6.2. An exception to this requirement is granted where the individual holds a valid card from a CSCS affiliated or amalgamated scheme or other accepted scheme which has been assessed as meeting similar standards. Special dispensation shall be given by the *Contractor* to provide access to visitors when on an accompanied site visit.

7 Management of Site Hazards

7.1. The *Contractor* takes appropriate action with regards to the site hazards in association with the *works* contained in any Pre Construction Information. The *Contractor* also considers the hazards identified in the development of their detailed design using the Design Risk Management process of the Construction (Design and Management) Regulations 2015 (CDM Regulations). The *Contractor* ensures that they properly communicate the hazards on drawings or through risk registers, and controls the residual risks via risk assessments, method statements and activity plans as part of their safe system of work so that they are understood by the workforce. Any Pre Construction Information provided is treated as a live document and updated with any new site health and safety critical information.

7.2. The *Contractor* also considers the hazards that are normally associated with working on the Affected Property and on the public highway. These include, but are not limited to, confined spaces, working at heights, asbestos containing materials, buried services, overhead utilities, hazardous materials, contaminated land, uneven surfaces, high and low voltage

cables, moving machinery, moving vehicles and pedestrians. The *Contractor* undertakes his own site hazard survey prior to starting works to verify and identify any other risks that may affect the *works*.

8 The Construction (Design and Management) Regulations 2015

8.1. The *Client* is the *Client* for the purposes of the Construction (Design and Management) Regulations 2015 (the CDM regulations).

8.2. To the extent that the CDM Regulations apply to this Contract, the Company appoints the *Contractor* to act as Principal Designer and Principal *Contractor* pursuant to Regulation 5 (1) of the CDM regulations, but reserves the right to appoint alternative suppliers to fulfil these roles.

8.3. The *Contractor* shall accept any such appointment made under clause 8.2 and agree to carry out all associated obligations imposed by the CDM Regulations. The *Contractor* and *Client* shall provide each other with all the necessary assistance which they may reasonably require in order to fulfil their respective obligations under the CDM regulations.

8.4. The *Contractor* warrants to the *Client* that it:

(a) is competent to perform such of the duties allocated to it under 8.3

(b) Shall allocate adequate resources to enable it to comply with its obligations under the CDM regulations

8.5. The information contained within this and other supporting documentation for the Contract shall be considered as generic Pre Construction Information applicable across all works, and shall be supplemented with additional site/project specific PCI where available.

8.6. The *Contractor* shall be responsible for developing and implementing a Construction Phase Plan and for providing information as is necessary to maintain and develop the Health and Safety File in accordance with the CDM regulations.

8.7. The *Contractor* shall be provided with access to, and user rights to enable the use and amendment of all information required for the *Client*'s Health & Safety File Management System.

8.8. The *Contractor* shall be responsible for coordination of health and safety on site and all works, including those by other *Contractor*s working under direct orders from the *Client,* under other statutory powers, or where no contractual agreement exists with the *Contractor*.

8.9. Where the contract requires design input by the *Contractor*, the *Contractor* shall undertake the duties and responsibilities of the Designer under the Regulations for that design function for which the *Contractor* is responsible. The *Contractor*, in exercising this role, shall liaise as necessary with other designers involved in the project and where appointed the Principal Designer provide such information as is necessary to maintain and develop the Health and Safety File.

8.10. Where applicable, the *Client* shall submit the F10 Notification informing the Health & Safety Executive (HSE)/Office of the Rail and Road (ORR) of planned construction works in accordance with the Regulations. The *Client* requests that the *Contractor* displays the F10 Notification on site or in its site office in accordance with Regulation 6(3)(b) of the CDM Regulations 2015.

9 Incident Reporting, Investigation, Performance Monitoring

9.1. The *Contractor* shall ensure that appropriate measures are taken to protect his employees, road users, *Client*'s staff and others from the risks that are associated with the site and activities undertaken thereupon. If, in the opinion of a member of the *Client*'s staff, possessing the necessary identification, the *Contractor* is causing danger to the public, that officer has the authority to require immediate remedial action. Upon compliance with the instruction, the *Contractor* shall then contact the *Client* to report the instructions given and the actions taken.

9.2. The *Contractor* reports all health, safety and environment incidents, accidents and near miss events which occur during the contract via the *Client*'s agreed electronic reporting mechanism.

9.3. Where fatal or serious accidents occur – Major injuries and Dangerous Occurrence (as defined in the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations - RIDDOR) - these are reported by the *Contractor* to the *Client* immediately (by phone), entered on to the *Client*'s agreed electronic reporting system within 24 hours, and are subject to a thorough formal investigation.

9.4. The *Contractor* shall also provide the *Client* with a summary of all fatal and serious accidents every 3 months.

9.5. An injury is defined as fatal when death occurs in less than 30 days as a result of the accident. 'Fatal' does not include death from natural causes or suicide. A serious Injury is defined as an injury for which a person is detained in hospital as an in-patient, or any of the following injuries whether or not they are detained in hospital: fractures, concussion, internal injuries, crushing, burns (excluding friction burns), severe cuts, severe general shock requiring hospital treatment, injuries causing death 30 or more days after the accident.

9.6. The *Contractor* shall provide the *Client* with copies of RIDDOR returns and full details of all fatal and serious accidents. Such details shall include number of people involved, severity of injuries, date and time of the accident, precise location, nature of the accident (e.g. road traffic collision, failure of temporary works, fall from height), contributory factors, and weather conditions.

9.7. For incidents reportable under RIDDOR, Lost Time Injuries and Utility Strikes, the *Contractor*, within fourteen (14) days uploads a final written report (investigation) to the *Client*'s electronic reporting system detailing as a minimum the following:

a) description of the incident;

b) immediate actions taken;

c) immediate causes;

d) root causes;

e) actions taken to prevent a recurrence;

f) skills, knowledge and experience of those involved – supervisors and operatives; and

g) details of plant/equipment used including calibration and maintenance

h) for utility strikes - eastings/northings and depth of affected service

9.8. For all other incidents, the *Contractor*, within fourteen (14) days submits an initial written report (investigation) and after twenty-eight (28) days a final report detailing, as a minimum the same items listed above.

9.9. With the agreement of the *Client* a longer timescale to complete the final report may be agreed.

9.10. All investigation reports shall be completed to establish root causes and to a level of detail acceptable at the time to the *Client*. Any comments provided by the *Client* are addressed by the *Contractor* and an updated report submitted if required.

9.11. Nothing in this document supersedes the *Contractor*'s responsibility for statutory reporting of incidents/accidents.

9.12. To support the analysis of health and safety performance, the *Contractor* provides the *Client* with the details of the number of hours worked by the *Contractor* and his SubContractors during the last reporting period and a corresponding list of personnel working during the period. This data is to be submitted within the periodic report using the agreed format, and includes all the *Contractor*'s staff and personnel employed to provide the Works since the last report. The *Contractor* also reports the cumulative number of hours worked since the *starting date,* categorised into management, site level supervision and operatives.

10 Non English Speaking Workers

10.1. The *Contractor* describes within the Construction Phase Plan his arrangements to ensure that health and safety information is effectively communicated and understood by all non-fluent English speaking staff and SubContractors. This information includes but is not limited to:

a) Site emergency procedures;

b) First aid arrangements; and

c) Risk assessments/method statements.

11 Personal Protective Equipment (PPE)

11.1. The *Contractor* assesses and provides appropriate PPE for use of his employees and SubContractors as follows:

a) Adopt a hierarchy of control reducing the need for protective equipment/clothing other than where such equipment/clothing is stipulated by legislation or other authoritative guidance

b) PPE provided is free of charge to all personnel, as required and appropriate, for the job task; and

c) PPE fits the individual and is cleaned, maintained and/or replaced to ensure that it remains effective at all time

11.2. The *Contractor* ensures that all personnel wear PPE appropriate to the risks of each task and demonstrate that risk control systems are in place. The *Contractor* shall ensure that protective clothing is effectively worn.

11.3. The *Client'*s minimum requirements are:

a) hard hat with company branding;

b) eye protection (safety glasses or other suitable eye protection);

c) hand protection (gloves) (subject to a task specific risk assessment agreed by the *Contractor*, gloves may be omitted);

d) safety boots with ankle protection/support; and

e) high visibility jacket (Class 3 – EN 471) and trousers with reflective strips for all *works* undertaken on the highway or in tunnels with company branding.

11.4. Dependant on the job task function and site conditions, personnel are also to be provided with:

a) respiratory protection equipment;

b) hearing protection; and

c) hot, wet or inclement weather protection.

11.5. The *Contractor*'s PPE and clothing requirements are provided for use on Site to the *Client*, the *Client's* staff, visitors and other agents involved in the contract. The *Client* confirms to the *Contractor* what branding and logos are acceptable for all PPE.

12 First Aid, Occupational Health, Drugs and Alcohol

12.1. The *Contractor* makes suitable and sufficient arrangements for first aid based on the:

a) nature and size of the *works*;

b) size and distribution of the workforce;

c) needs of traveling, remote and lone workers;

d) hours of work; and

e) multi-occupied work sites.

12.2. The *Contractor* ensures access to an occupational health services provider. The occupational health service shall be active at all times when work is being undertaken.

12.3. The *Contractor* uses and consults specialist providers, where necessary, to promote health surveillance, health awareness and general occupational health arrangements.

12.4. The *Contractor* operates a drugs and alcohol policy and implements suitable arrangements to verify compliance with that policy including undertaking the necessary alcohol and drug testing. In addition the *Contractor* co-operates with the *Client* regarding the execution of random testing and/or for cause alcohol and drug tests where required. The *Contractor* provides records of testing if requested by the *Client*.

12.5. The following occupational health services shall be available for each individual engaged by the *Contractor* (including the employees of site-based SubContractors and suppliers of any tier including labour only supply):

a) testing for drugs and alcohol in individuals in accordance with the *Contractor's* policy;

b) providing pre-employment medicals;

c) providing health questionnaires on commencement for all individuals including site and office-based staff;

d) providing specific health appraisals for those referred following evaluation of questionnaires;

e) providing specific health surveillance for those requiring it where identified under regulations and/or risk assessment;

f) providing occupational hygiene services to support and assess ill health prevention management;

g) contributing to the effectiveness of attendance management, rehabilitation and return-to-work programmes and support for ill health incidence investigation where necessary; and

h) providing health promotion programmes applicable to maintenance and construction operatives' workplace, lifestyle and wellbeing.

12.6. The *Contractor* shall implement occupational health protocols for the following health surveillance:

a) Hand Arm Vibration syndrome surveillance;

b) Fatigue management;

c) Stress management;

d) Respiratory health.

13 Welfare Arrangements

13.1. The *Contractor* provides welfare facilities to support the overall occupational health programme. Welfare facilities are established and maintained in working order. All toilet, washing, changing, personal storage and rest areas are easily accessible and have adequate heating, lighting and ventilation. Facilities may need to be provided at more than one location to ensure workers have easy access.

13.2. The *Contractor* ensures good hygiene standards are provided throughout the welfare and office facilities. As a minimum the *Contractor* ensures that welfare facilities for construction sites fulfil the requirements set out in Schedule 2 of the CDM regulations.

13.3. The *Contractor* shall provide an outline of their arrangements regarding provisions for transient work, including reactive and planned short term works.

14 Equipment, Materials or Substances Hazardous to Health

14.1. The *Contractor* shall ensure that the *Client* is notified of any substances hazardous to health which may be used in connection with the contract. Full information, including manufacturers' hazard data sheets and the *Contractor*'s own Control of Substances Hazardous to Health (COSHH) assessment, shall be provided by the *Contractor* to the *Client* for approval 28 calendar days prior to the use of any substance hazardous to health under the COSHH Regulations 2002.

14.2. The *Contractor* shall take all necessary steps to avoid creating a dust nuisance, and shall ensure the works are carried out in accordance with the GLA and London Councils publication "The Control of Dust and Emissions from Construction and Demolition; (2014) and any revisions. If, in the opinion of the *Client*, the *Contractor* is not dealing adequately with the control of dust, the *Client* may instruct the *Contractor* to carry out such additional measures as the *Client* considers are necessary, at the *Contractor*'s expense.

14.3. Live carriageways and footways shall be protected from dust or spray arising from any works which might otherwise reduce visibility. The *Contractor* shall take measures to prevent debris, dust, spray or other materials from affecting any live carriageway or footway.

14.4. The *Contractor* shall ensure that the protective measures stated in Highways Agency Advice Note SA 8/94 'Use of Substances Hazardous to Health in Highway Construction', incorporating subsequent amendments are enforced.

14.5. Storage of hazardous materials, including compressed gas cylinders, may be contained within commercial, retail, residential or public buildings adjacent to/or on the road networks that are not under the control of/or known to the *Client*. The *Contractor* shall remove all hazardous materials they are responsible for at the end of each working day and shall ensure that any used in conjunction with works are stored and secured appropriately when in use.

15 Asbestos

15.1. The *Client* supplies all information in his possession in respect of the presence of asbestos containing materials within the Site/structure. The information is included in the Pre-Construction Information/asbestos register. Based on this information, the *Contractor* liaises with the *Client* to determine where additional surveys are required and the type of survey to be undertaken.

15.2. Where no surveys exist the *Contractor* consults the *Client* on the requirement for, number and type of any asbestos survey before the start of the *works*.

15.3. The *Contractor* shall have in place a procedure for ensuring that, if asbestos is encountered or suspected, the 'Control of Asbestos Regulations' and all other mandatory Regulations are complied with. If asbestos is encountered or suspected, the *Contractor* shall stop all works in the immediate vicinity of the suspect material and isolate the area.

15.4. The *Contractor* shall notify the *Client* (or his site representative) who shall instruct the appropriate action to be taken. Such action may include testing of the suspect material (using a UKAS accredited laboratory) and arrangements for the removal of the material, if necessary, using a licensed *Contractor*.

15.5. The *Contractor* shall also report a Near Miss via the agreed reporting process. The *Contractor* prepares a report of the incident and provides it to the *Client* in accordance with the requirements described under Incident Reporting, Performance Monitoring, and arranges for the location and condition of the asbestos containing material and all relevant information to be included in the Health and Safety File.

15.6. The *Contractor* shall liaise with the *Client* ensuring that all relevant information on the asbestos containing material, location, condition, type, remedial action, etc. is provided in order for the *Client's* asbestos register to be updated.

16 Emergency Plan and Fire Safety

16.1. The *Contractor*'s Emergency Preparedness Plan (EPP) is submitted to the *Client* for review prior to commencement of work. In addition to describing the emergency arrangements for the *works* and activities on Site i.e. entry to confined spaces, striking utilities during excavations, the plan considers potential impacts beyond the *boundaries of the site*, especially where there are interfaces with the road network, operational assets and neighbours etc. Any existing site specific EPPs shall be provided as part of the Pre-Construction Information, and are incorporated in to the *Contractor*'s EPP as appropriate. The emergency arrangements for the *works* may be included in the Construction Phase Plan if preferred by the *Contractor*.

16.2. The *Contractor* provides fire prevention and fire precautions training to all employees, particularly fire wardens/marshals and training for key emergency management personnel as required for the effective implementation of the procedures.

16.3. The *Contractor* in consultation with the *Client* arranges simulated emergency exercises at an agreed frequency following the commencement of the contract, and as appropriate for site and office locations.

16.4. Immediately following an emergency or following a simulated emergency exercise, the *Contractor* reviews the actions taken against the requirements set out in the EPP and revises the EPP accordingly. The output of these reviews are provided to the *Client*.

16.5. The *Contractor*'s EPP includes emergency pollution control measures compliant with Environment Agency (EA) guidelines including emergency phone numbers and the method of notifying local authorities and statutory authorities.

16.6. The *Contractor* ensures that all *works* are compliant with the relevant legislation, standards and guidance on fire safety.

16.7. Combustible materials shall not be inappropriately stored beneath or within any structure.

16.8. The *Contractor* ensures that regular site inspections include those of the *Contractor*'s fire safety arrangements, are recorded and the completed forms are maintained as appropriate.

16.9. In accordance with the Regulatory Reform (Fire Safety Order) and Fire Safety on Construction Sites (HSG168) published by the Health and Safety Executive, as appropriate, the *Contractor* produces fire risk assessments identifying the nature and level of risk for the scope of *works*.

16.10. In the event of a fire emergency the *Contractor* complies with the requirements of the EPP in order to ensure a timely evacuation of the Site and to account for all personnel.

16.11. The *Contractor* complies with the requirements of the LFEPA or other relevant fire authority for the provision of the Site access points. Where appropriate, the accesses are designed to the requirements of LFEPA Publication: Fire Safety Guidance Note Number 29 Access for Fire Appliances. The access points shall also be suitable for access for ambulances.

17 Behavioural Safety

17.1. The *Contractor* implements a behavioural based safety programme aiming to:

a) lead by example;

b) increase awareness of behaviours;

c) develop a no name/no blame culture with the workforce;

d) recognise safe behaviour, challenge and manage unsafe behaviour;

e) identify and remove hazards;

f) provide positive observations and feedback;

g) reduce at risk behaviours/conditions; and

h) increase immediate corrective action.

17.2. The *Contractor* appoints behavioural safety leaders from within their workforce. The behavioural safety leaders are required to:

a) attend behavioural safety briefings;

b) manage behavioural safety logs;

c) lead by example and embody the values of behavioural safety;

d) walk the Site and raise all safety concerns;

e) raise awareness and brief teams on behavioural safety and encourage all *Contractor* personnel to raise safety concerns, remove hazards as they find them and record and report them as required;

f) liaise with the *Client* and escalate any issues that may need resolving; and

g) attend behavioural safety leader meetings.

17.3. The *Contractor* undertakes a safety culture survey programme of the workforce and staff and includes the *Client*. The survey is based on an industry recognised survey tool. The *Contractor* reports on the progress towards a world class safety culture based upon the findings of the survey at appropriate forums.

18 Health and Safety Innovation, Best Practice and Campaigns

18.1. The *Contractor* identifies, trials and implements health and safety innovations in consultation with the *Client*.

18.2. During the contract it is anticipated that a number of industry best practices shall be developed and rolled out. Where identified the *Contractor* adopts such industry best practice to improve health and safety performance. Such industry best practice may comprise of health and safety standards and behavioural techniques and processes along with general site safety ‘best practices’ adopted from specific *Contractor*s.

19 Site Mobilisation and Start of Works

19.1. The *Contractor* does not start construction *works* until he has fulfilled all of his obligations under the CDM Regulations and the *Contractor* has received formal notification from the *Client* to proceed with the *works*.

19.2. A pre-commencement readiness assessment is undertaken by the *Client* to ensure that the *Contractor* has in place the documentation, consents, processes and controls to allow *works* to proceed. The *Contractor* supplies all necessary information and/or access to information that the *Client* requires to support this process.

19.3. Due to the nature of the works under the contract, the *Contractor* shall expect to engage with other specialist and/or *Client* nominated *Contractor*'s i.e. Utility Companies. The *Contractor* shall ensure that site boundaries are established to ensure construction sites between other *Contractor*s do not clash.

19.4. At times works shall be undertaken close to or affecting London Underground, London Rail, London Trams, London Buses or Network Rail sites, the river Thames and other watercourses, schools, care homes, other public buildings, commercial and residential areas. Where such works take place, the *Contractor* shall liaise with the appropriate authorities ensuring that any specific works requirements are met.

20 Site Security Arrangements

20.1. All sites shall be secured so as to provide protection of the public and workforce during works and prevent unauthorised access, particularly during hours when the site is unoccupied.

20.2. Additional or enhanced security arrangements may be required in areas that pose a high security risk. The security arrangements shall be reviewed prior to works commencing on each site and the *Contractor* shall notify the *Client* representative of the specific arrangements being proposed.

20.3. Information on specific security risks, where known, shall be made available to the *Contractor* before works commence on site. The *Contractor* shall make security arrangements for protection of the works, workforce and equipment according to the particular risks posed by the location of each site.

21 Information

21.1. The *Contractor* ensures that:

a) health and safety records relevant to the *works*, including induction, training and equipment inspection and testing records, are available for inspection on request;

b) copies of all relevant health and safety information to particular site activities is held by the team carrying out the work including method statements, risk assessments, written briefings, permits to work and safety alerts/bulletins;

c) safety briefings are provided to all persons carrying out work tasks subject to method statement, risk assessments and permit controls and written records maintained of briefings signed by all persons carrying out the tasks (these briefings are completed when the task or condition changes);

d) the *works* are suitably supervised and that operatives are aware of the person supervising their work activities and their whereabouts at all times;

e) supervisors receive induction on the health and safety requirements and of their specific responsibilities for health and safety aspects.

22 Site Supervision

22.1. The *Contractor* ensures that competent persons supervise and manage the *works* and that there are arrangements in place to specifically address the supervision of new personnel and any others at particular risk. The arrangements also include those for addressing

foreseeable emergencies. The supervisory arrangements are reviewed for adequacy and suitability in connection with any lone or isolated work.

22.2. Before commencement of works, the *Contractor* shall provide the *Client* with a written procedure setting out their monitoring arrangements, identifying the person(s) with responsibility for undertaking the monitoring. This may be incorporated or appended to the contract level Construction Phase Plan (CPP).

22.3. The *Contractor* ensures that persons appointed to supervisory and management positions have the necessary skills, knowledge and experience for the role, and are regularly assessed. Training and induction includes demonstration by example of good practice and the impact of poor practice.

23 Confined Spaces

23.1. The *Contractor* evaluates the workplace to determine which spaces (if any) are confined spaces and develops a written risk assessment and method statement identifying the controls required for the safe operation of a safe system of work in accordance with the Confined Space Regulations and INDG258: Safe Work in Confined Spaces. The risk assessment and method statement include the confined space entry permit and the control systems required for working in confined spaces including communication, evacuation and rescue.

23.2. The *Contractor* eliminates the need to enter confined spaces wherever possible. Where entry to a confined space is necessary the *Contractor* ensures that a safe system of work is identified that documents all hazards, safety precautions and safe working practices associated with all confined space activities performed by employees.

23.3. The *Contractor* ensures his safe system of work includes:

a) checks that employees have the necessary skills, knowledge and experience to enter a confined space, are appropriately healthy (e.g. lung function for use of breathing apparatus) and have received adequate training;

b) an adequate communication system to enable clear communication between those inside and outside of the confined space;

c) testing and monitoring of the atmosphere within a confined space for hazardous gas, fume or vapour and checks on the concentration of oxygen prior to entry; and

d) a requirement for emergency arrangements to be in place before any person enters or works in a confined space and contingency plans appropriate to the nature of the confined space, the risks identified and consequently the likely nature of an emergency rescue.

24 Working at Height

24.1. The *Contractor* complies with the Working at Height Regulations and eliminates the need to work at height wherever possible. Where working at height is necessary the *Contractor* ensures that a safe system of work is identified that documents all hazards, safety precautions and safe working practices associated with all working at height activities performed by employees.

24.2. The *Contractor* ensures that the work is properly planned, appropriately supervised and that employees have the skills, knowledge and experience to work at height. The *Contractor* ensures that collective measures take precedence over personal protective measures i.e. fall prevention equipment.

24.3. The *Contractor* implements an inspection and testing regime for all equipment identified as assisting in any working at height operation to ensure that it is compliant with statutory regulations, maintaining records of all inspections and tests.

25 Lifting Operations

25.1. The *Contractor* complies with the Lifting Operations and Lifting Equipment Regulations (LOLER), producing a risk assessment and lifting plan identifying the nature and level of risks associated with a proposed lifting operation. The *Contractor* briefs the content of the risk assessment and lifting plan to all employees involved in lifting operations.

25.2. The *Contractor* ensures that all employees involved in lifting operations have the required skills, knowledge and experience.

25.3. The *Contractor* implements or sources adequate training for employees who operate or test/examine lifting equipment. Training records are kept and where lifting operations are planned, copies of these records are available to the *Client*.

25.4. The *Contractor* ensures that any persons who operate lifting equipment or conduct inspections, examinations or tests have the required skills, knowledge and experience to ensure that the safe system of work is compliant with statutory regulations and the approved code of practice for safe use of lifting equipment published by the Health and Safety Executive.

25.5. The *Contractor* ensures that there are adequate competent persons to approve all lift plans on the worksite in accordance with LOLER. No lifts are carried out without this prior acceptance.

26 Excavation

26.1. The *Contractor* ensures that all excavations are planned before construction works commence, taking reasonable steps to obtain and review up to date survey drawings, as-built drawings, utility records and ground penetrating radar and other appropriate survey information when planning *works*.

26.2. In conjunction with suitable detection methods, sufficient trial holes are undertaken by the *Contractor* to confirm the location of all buried utilities. The *Contractor* employs a permit to dig process and ensure that all employees undertaking excavations have the necessary skills, knowledge and experience.

26.3. The *Contractor* ensures that reference is made to the Health and Safety Executives Guidance Note HSG 47 Avoiding Danger from Underground Services.

26.4. Some sites shall be located close to a range of public transport infrastructures i.e. Underground, Train and Bus stations and may encounter properties with basements or cellars that may have an impact on any excavations required. The *Contractor* shall make all

necessary preparations prior to commencing work including but not limited to, liaison with the Local Authority, the Highway Authority and infrastructure owners.

26.5. There shall be a requirement for excavation works in the footways and carriageways and therefore traffic and/or pedestrian management shall be required on sites and the *Contractor* shall expect in some circumstances to close pedestrian crossings, close traffic lanes and install pedestrian and traffic diversions.

26.6. All excavations, works and materials in the highway shall be adequately guarded, signed and lit so as to create the minimum inconvenience to pedestrians, especially mobility impaired persons and those with impaired vision. All water pumped from trenches or other excavations shall be confined to proper channels and shall not be permitted to flow across roads or footways.

26.7. Consideration shall be given to maintaining access to priority areas such as hospitals, fire stations, schools, care homes, commercial premises, residential properties etc. It is unlikely that 'site hoarding' shall be required for maintenance works on the highway. However, if required, its use shall be identified to the *Contractor* by the *Client* through the project specific Pre-Construction Information.

27 Overhead Power Lines

27.1. The *Contractor* shall become familiar with and follow the guidance contained in the HSE publication "Avoiding danger from overhead power lines" Guidance Note GS6.

27.2. The *Contractor* shall prepare a suitable and sufficient risk assessment before any works below overhead power lines are undertaken, particularly where the use of plant/equipment is required to perform the works.

28 Hot Works

28.1. All hot works (welding, soldering, flame cutting, disc cutting of metal, etc.) shall be subject to a written risk assessment, method statement and permit to work system. The *Contractor* shall maintain suitable first aid and fire fighting equipment on site whist hot works are taking place and staff shall be trained in its use. Members of the public shall be protected from all hot works operations and from UV rays generated from welding operations.

28.2. On transient sites, as a minimum a fire extinguisher of the suitable type shall be available on vehicles used to transport staff/materials. On fixed sites, arrangements for fire protection shall be detailed in the Construction Phase Plan (CPP) and shall include arrangements for protecting facilities on and adjacent to the site.

28.3. All compressed gas cylinders used during hot works shall be adequately secured and all regulators/hoses shall be subject to regular inspection. The *Contractor* shall maintain records of inspection and make these available to the *Client* upon request.

29 Construction Plant and Equipment

29.1. The *Contractor* ensures that all plant and equipment operators have the skills, knowledge and experience for the plant/equipment they are required to operate and that they have been assessed as competent.

29.2. The *Contractor* ensures that all plant and equipment, including hired plant/equipment, is maintained, inspected and tested in accordance with manufacturers instruction and/or requirements within legislation. The *Contractor* ensures that all plant/equipment is only maintained (including changing cutting blades) by personnel qualified to do so and that the results from all maintenance, inspection and testing are recorded.

30 Traffic Management and Pedestrian Segregation

30.1. The *Contractor* ensures that they follow the guidance set out in Transport for London's Temporary Traffic Management Handbook when working on the TLRN, and that adequate provision is made for traffic management to either the Safety at Street Works and Road Works Code of Practice or Chapter 8 of the Traffic Signs Manual, which ever is the most appropriate for the risks and type of works. All Traffic Management are only installed and maintained by employees with the necessary skills, knowledge and experience and hold an appropriate valid competence scheme card.

30.2. The *Contractor* provides all traffic management plans to the *Client* for agreement prior to the start of the *works* as part of the Traffic Management Act Notification (TMAN).

30.3. The *Contractor* ensures that adequate pedestrian management/segregation is included within traffic management arrangements and consults with the *Client* before implementation.

30.4. Subject to the degree of risk and location, the *Contractor* implements such arrangements as are necessary up to and including permanent Traffic Management employees to inspect and maintain traffic management and pedestrian segregation arrangements.

30.5. A banksman/signaller is used for all loading, unloading and lifting operations, for all vehicle movements across the public footway notwithstanding the presence of a dropped kerb and for all vehicle movements where the vehicle is reversing or the driver's view is restricted. All vehicle entry and exit movements to site are managed using a banksman. The *Contractor* ensures that employees do not enter any areas where they are putting themselves or Others at risk in doing so.

30.6. Vehicle movements on and around site shall be planned and managed by the *Contractor* as specified in Series 0100. The arrangements agreed at scheme Traffic Management meetings shall form part of the *Contractor*'s Construction Phase Plan submission.

30.7. It is anticipated that variation to parking controls may be required at some sites to allow the safe execution of works. The *Contractor* shall take particular care to ensure that the works do not interfere with access to facilities provided for vulnerable sections of the community, such as hospitals, clinics, surgeries, care homes and schools, etc.

31 Site Inspections and Assurance

31.1. The *Contractor* agrees with the *Client* a programme of active assurance activities including Site inspection and audits, and takes account of the nature of the work, previous results and any other relevant factors. The *Contractor* provides for information a copy of the completed audit/inspection report to the *Client* no later than five (5) business days after the audit inspection.

31.2. The *Contractor* shall accommodate the gathering of assurance and monitoring of health, safety and environmental performance by the *Client* using the Supplier HSE Assessment

Tool. The default frequency for assessment against the criteria is quarterly, though this may be varied by the *Client* in light of the level of activity or performance. The *Contractor* participates in the assessment through the provision of information and evidence requested by the *Client* in respect of the criteria. The results of the assessment shall be discussed with the *Contractor* upon completion. If required, the *Contractor* shall be asked to prepare an Action Plan in response; progress against which is monitored as part of subsequent assessments. The full assessment criteria in place at the time shall be shared with the *Contractor* ahead of the assessment.

31.3. Inspections and audits are undertaken by the *Contractor*'s health and safety support, supervisors and other management staff. SubContractors carry out regular health and safety inspections of their own workforce and provide information to the *Contractor*.

31.4. The inspections are performed in coordination with the *Client*'s own inspection schedule to avoid duplication and to maximise the use of resources and effectiveness of the inspection system.

31.5. The *Contractor* addresses all actions and recommendations arising from inspections within the agreed timescales, regardless of who has undertaken the inspection.

31.6. The *Contractor* holds a regular Health and Safety Supplier Meeting. The *Contractor*, SubContractors and members of the workforce attend the meetings. The *Client* is invited to attend.

31.7. The *Contractor* shall, where suitable, participate in the *Client*'s site recognition scheme. The site recognition initiative is about establishing a guiding light on what work sites should look and feel like from a health, safety and environmental perspective. To achieve the expected standard, a site team shall go beyond basic compliance with health, safety and environmental requirements and achieve industry recognised best practice. More detail about the site recognition scheme process and assessment is available in G1365 'Beacon site/team – achieving best practice guidance' and checklist F5389. Where suitable, the *Contractor* shall undertake a joint assessment with the *Client* and be formally assessed with the aim to achieve 'Beacon' status (team or site award) within an agreed timescale with the *Client*.

32 Senior Management Tours

32.1. Senior managers from the *Contractor* and the *Client* complete heath, safety and environment (HSE) tours in accordance with the programme expectations. The frequency of HSE tours is agreed with the *Client* but is at least quarterly. The *Contractor*'s senior managers and those of his SubContractors contribute actively in these tours as part of the joint commitment to deliver health and safety excellence.

32.2. Representatives from the workforce are engaged in tours to build relationships between management and the workforce in the drive to world class health and safety performance.

32.3. The basis of any tour is to engage with the workforce, address the criteria listed below, provide an opportunity for employees and the *Contractor* to raise any health, safety or environment concerns, and to seek assurance that health, safety and environment systems across the project are understood and followed.

32.4. The *Contractor* ensures that senior management tours focus on:

a) acknowledgement/engagement of all persons involved in an activity;

b) management of any particular issues, problems or risks;

c) identification and addressing of the health, safety and environment concerns found during the tour;

d) seeking assurance that health, safety and environment systems are understood and being followed by ensuring that standards and expectations for best practice are realised in all work areas and practices;

e) culture (safety culture and behaviours);

f) health, safety and environment performance data;

g) changes, either organisational or activity;

h) project activity;

i) incident or accident data; and

j) review of methods of work, quality of briefings, site documentation.

33 Works in the Vicinity of the Tidal Thames

General

32.1 When work has to be carried out on or in the vicinity of water several additional hazards are introduced and shall be carefully evaluated and controlled.

32.2 Consequently all aspects of the work shall need to be considered during the risk assessment process, including the hazards presented by working on or near water.

32.3 The Construction (Design and Management) Regulations 2015 require *Client*s engaged in construction work to take all reasonably practical measures to prevent persons falling into water; to minimise the risk of drowning in the event of a fall into water; and to provide suitable rescue equipment (rescue boat) and training in the use of it. Also, the transportation by water to or from work sites shall be done safely; and any vessels used shall be suitable, properly maintained, under the control of a competent person and not overcrowded or overloaded.

32.4 In addition to the above, the Merchant Shipping Acts, and related Regulations and Codes of Practice apply to passenger carrying crafts, workboats, pontoons, lifebuoys etc. Merchant Shipping Legislation is administered by the Maritime and Coastguard Agency (MCA).

Hazards when working on or near water

32.5 Any workplace over, on or near water presents a danger that persons might slip or fall into the water, be swept off their feet by wave action, tide action, strong currents or swell from passing water traffic. Adverse weather is also a factor that can increase the danger, and work conditions can change quickly. Whether or not a person is injured by falling in the water, there is an immediate risk of drowning and/or being carried away by water currents.

32.6 Precautions shall be taken, firstly to prevent persons entering the water and, secondly, to ensure that anyone who inadvertently enters the water shall float and are rescued in the shortest possible time. A standby rescue boat allows in water rescue in the shortest possible

time. When working on or near water the *Contractor* shall establish safe systems of work based on a thorough risk assessment and that staff are properly trained and instructed.

32.7 When working on or near water consideration shall also be given to the health implications of falls into the water. The water may be polluted, for example when working near sewage discharge points, and there is the ever-present risk of contracting leptospirosis (or Weil's disease) from water contaminated by rat urine.

Causes of Entry into water

32.8 These include:

a. Falls from height

b. Trips, slips, stumbles from low level

c. Persons being knocked over by moving objects (e.g. crane loads, vehicles, etc.)

d. Loss of balance (e.g. by high winds, sudden boat movements, etc.)

e. Failure or absence of edge barriers

f. Failure or absence of fall prevention equipment, ropes, lines.

g. Floating platforms or vessels sinking.

h. Tide action, waves or swell from passing waterborne traffic.

Hazards of Falling into Water

32.9 The most immediate danger is of drowning. Factors that can contribute to this are:

a. Shock from sudden immersion in cold water

b. Weight of waterlogged clothing

c. Life jacket not being worn (or not inflating)

d. Incapacity following injury – caused by striking an object during a fall, or whilst in the water.

e. Fatigue or hypothermia where rescue is not immediate.

Precautions for working on or near water

32.10 Whenever reasonably practicable fixed edge protection shall be provided to prevent people falling into water.

32.11 Where edge barriers are not reasonably practicable at exposed edges, e.g. quay edges, appropriate warning signs and/or edge markings shall be displayed to highlight the danger.

Work Outside Of Edge Barriers

32.12 Safety boat required at all times. Safety Nets can provide good fall protection for those carrying out occasional work outside edge barriers though are not 100% fail proof. e.g. maintenance activities. An alternative is the use of a full body harness attached by lanyard

to a suitable anchorage point or proprietary fall prevention anchorage system. Such equipment needs to be selected by a competent person to ensure it is suitable for the task, checked and maintained to ensure it is kept in good order and the users instructed and trained in its use. Emergency rescue arrangements also need to be in place. These shall include the provision of a safety boat as a safe means of recovering persons being lowered down after being suspended from a fall

Work from Mobile Elevating Work Platforms

32.13 Safety Boat Required. When working next to water, a harness shall not be worn due to the risk of drowning if the work platform falls into the water. Life jackets shall be worn.

Workplace Tidiness

32.14 This is of special importance when working on or near water. Tools, equipment, ropes and other materials not in use shall be stored away. Waste shall be cleared up promptly, and materials stacked or positioned with care.

32.15 Slippery surfaces increase the risk of people falling into water and shall be properly treated to ensure good grip. Water weed, slime, bird droppings etc. shall be cleaned off. Oily or greasy surfaces shall have absorbent granules or grit spread on them, and icy or frosty surfaces shall be treated with salt or grit.

Weather Conditions

32.16 The prevailing conditions and local weather forecast shall be taken into account at the beginning of each shift. Rain, rising winds, fog, mist, etc. are all potential dangers.

Protective Clothing and Equipment

32.17 As per section 11 (Personal Protective Equipment) hard hats are part of the *Client*'s minimum requirement. The risk of people being struck on the head prior to falling into water is a significant risk. Footwear with good, non-slip soles shall be worn when working on or near water. Rubber boots shall not be worn as, once filled, they act as a weight and could drag the wearer under water.

Life Jacket

32.18 This is a personal safety device which, when fully inflated (if inflatable), shall provide sufficient buoyancy to turn and support even an unconscious person face upwards. These shall be worn at all times whilst working on boats and where there is a foreseeable risk of drowning when working near to water. Those using life jackets need to be trained and instructed in their proper use and storage, and the equipment regularly inspected and maintained.

Rescue Equipment and Procedures

32.19 Planning of works shall include the need for rescue equipment, such as Maritime and Coastguard Agency (MCA) coded Standby rescue boat including SOLAS (Safety of life at sea) safety equipment. MCA approved lifebuoys or rescue lines shall be positioned at intervals along the work area. Daily checks shall be made to ensure that lifebuoys and lines are in their proper place.

32.20 It is important that:

a) Lone working is avoided to ensure there is always someone to raise the alarm.

b) Each person is trained in what to do in the event of an emergency.

c) An emergency rescue plan is in place for the work activity. As a minimum, the elements of a rescue procedure consists of:

i. A routine for raising the alarm.

ii. A drill to provide the rescue boat facilities.

iii. A routine for getting the rescued person(s) appropriate medical assistance. i.e. all rescue boat skippers to hold HSE first aid at work.

32.21 Rescue procedures need to be practised at regular intervals involving all persons who would be required to participate in a rescue.

Work Boats and Vessels

32.22 These shall meet MCA requirements in terms of their construction, use, equipment, (including safety, communication and rescue equipment) and the competence of the operator. In most circumstances it will be necessary to provide a rescue boat standing by during work activities on or near water. For example work near tidal water or fast flowing rivers. Practice exercises in respect of rescuing people from the water shall need to be carried out.

Appendix 1/60 – Design Staff

1 Minimum requirements for design staff are set out below.

2 For the purposes of the contract and time charge rates, the definitions of staff grades shall be as follows:-

a) Principal: member of a firm generally in overall charge of the management, policy and conduct of the firm's business who is able to commit the firm to undertake commissions;

b) Specialist/Expert A: person who has recognised expertise in a particular field, generally with an appropriate professional qualification and substantial experience in the field of expertise;

c) Specialist/Expert B: person who has recognised expertise in a particular field, generally with an appropriate professional qualification and experience in the field of expertise spanning several projects or programmes;

d) Senior Professional A: person holding chartership of a professional body recognised by the *Client* and having substantial experience of working in that profession;

e) Senior Professional B: person holding chartership of a professional body recognised by the *Client* and having experience working in that profession spanning several projects or programmes;

f) Engineer A: person not holding chartership but having a relevant degree and substantial experience of working in a relevant profession;

g) Engineer B: person not holding chartership but having a relevant degree and been practising in a relevant profession on several projects or programmes;

h) Incorporated Engineer: person holding incorporated membership of a professional body and having experience working in that profession spanning several projects or programmes;

i) Graduate Engineer: person with a relevant degree and capable of working on some aspects of the delivery of the required commission;

j) Senior Technician: person not holding chartership nor a relevant degree, but with substantial relevant work experience;

k) Technician: person not holding chartership nor a relevant degree, but with relevant experience spanning several projects or programmes;

l) CAD Technician: person with relevant work experience and a competent user of AutoCAD 2016 or later;

m) Technical Administrator: person with NVQ level 2 in administration related skills, able to maintain administrative systems to support a technical service, and experience in effective communication with people in writing, by telephone, and face-to-face;

n) Junior: person with some relevant work experience and capable of working on some aspects of provision of the service;

4. Where a Principal is specifically required by the *Client* to perform a particular function, then the time shall be reimbursed at the rate quoted for Principals. Where a Principal performs duties that would normally be done by a lower graded member of staff, then the relevant rate quoted for that lower graded officer shall be used.

5. The *Contractor* shall maintain records of time spent on services performed on a time charge basis, and such records shall be made available to the *Client* in accordance with the Conditions of the Contract.

Numbered Appendices

Series 0150 Preliminaries

Appendix 1/51 - Maintenance Compounds/Depots

1. Any Compounds/Depots that the *Client* may make available for use by the *Contractor* are detailed in the *Client's* Scope.

2. The *Contractor* shall provide operational premises suitable and sufficient for the servicing of the contract and enabling full compliance with the response times set out within the contract at all times during the contract period. The premises shall include:

    a) The *Contractor*'s offices for the administration of the contract, which shall be located within his operational premises. These offices shall provide sufficient accommodation to house the *Contractor*'s staff, office equipment, filing and record systems and all other equipment the *Client* requires the *Contractor* to use for the satisfactory execution and management of the contract. For the Transport for London (TfL) contract in each Contract Area, these offices shall be located within the Greater London Authority boundary, be within one hours total travel time of Southwark underground station via public transport, be easily accessible from that network by a pedestrian route which is well lit, well maintained, well used and with appropriate pedestrian crossings, and shall include additional provision for the Client's personnel as set out in the *Client's* Scope. The offices shall then be within the Contract Area, or strategically sited to serve the Contract Area efficiently. For Borough contracts, these offices may be an integral part of the above or separately located within the Contract Area.

    b) Internal and external stores to facilitate the safe keeping of plant, materials and equipment provided by the *Contractor* or the *Client*, for which the *Contractor* shall be responsible.

    c) Garaging and parking areas for the *Contractor*'s and visitor's vehicles.

    d) Workshops and any other facilities required by the *Contractor* in order to fulfil the contract.

Series 0400 Road Restraint Systems (Vehicle and Pedestrian)

Numbered Appendices

Appendix 4/1	General Requirements
Scheme-Specific Appendix 4/1	Scheme-Specific Information to be provided by the *Contractor*.
Scheme-Specific Appendix 4/2	Scheme-Specific Appendix 4/2 template Scheme-Specific Information to be provided by the *Contractor* to demonstrate compliance of transitions and terminals to Clause 401
Scheme-Specific Appendix 4/3	Scheme-Specific Appendix 4/3 template Schedule detailing road restraint systems' posts and foundations

APPENDIX 4/1

General Requirements

1 Vehicle Restraint Systems (VRS)

a) VRS shall be steel or concrete barrier compliant with BS EN 1317.

b) Steel barrier posts shall be either socketed concrete foundations, driven, surface mounted detachable fixings or surface mounted studded fixings as appropriate and as agreed with the *Employer*.

c) The Containment Performance Class shall be N1, N2, H1, H2 or H4A as required by the design.

d) The Working Width Class shall be W1 to W5 as required by the design.

e) The Impact Severity Level (ISL) class shall not exceed Class B, unless otherwise agreed with the *Employer.*

f) VRS shall be single sided or double sided as required by the design.

g) For the purpose of this specification VRS shall not be installed on shear posts. Videos of the test carried out to BS EN 1317 must show that the system is installed on bending posts.

h) All the above must be specified on the Scheme-Specific Appendix 4/1 and submitted for assurance to the *Employer*.

2 Parapets

a) Vehicle Parapets shall comply with BS EN 1317.

b) Pedestrian Parapets shall comply with PD CEN/TR 16949

c) Steel parapet shall be galvanized after manufacture by the hot-dip process in accordance with BS EN ISO 1461.

d) The Containment Performance Class of vehicle parapets shall be N1, N2, H2 or H4a as required by the design.

e) The Working Width Class shall be W1 to W4 as required by the design.

f) The Impact Severity Level (ISL) class shall not exceed Class B, unless otherwise agreed with the *Employer.*

g) For the purpose of this specification, parapets shall not be installed on shear posts. Videos of the test carried out to BS EN 1317 must show that the system is installed on bending posts.

h) All the above must be specified on the Scheme-Specific Appendix 4/1 and submitted for assurance to the *Employer*.

3 Terminals

a) Terminals shall be steel compliant with BS EN 1317.

b) Terminals shall have a containment class of P1, P2 or P4 as per the requirements of BS EN 1317.

c) Terminals shall comply to a minimum Permanent Lateral Displacement Zone Class of D1.1.

d) The Exit Box Class shall be Z1

e) All the above must be specified on the scheme-specific Appendix 4/1 and submitted for assurance to the *Employer*.

4 Connections, Transitions and Full Height Anchors

a) For the purpose of this specification, 'Transition' shall be the transition between two types of VRS including Steel Parapets. Transitions must comply with the requirements of BS EN 1317.

b) For the purpose of this specification, 'Connection' shall be the connection between a road restraint system and a rigid structure such as a concrete parapet, abutment or a wall.

c) For the purpose of this specification, 'Full Height Anchor' shall be an anchor used to end a VRS to within 50mm of a concrete parapet, abutment, wall or bridge joint where a connection or a transition is not feasible.

d) All the above must be specified on the scheme-specific Appendix 4/2 and submitted for assurance to the *Employer*.

5 Crash Cushions

a) Crash Cushions shall comply with the requirements of BS EN 1317.

b) The Velocity Class, Lateral Displacement Zone Class and Redirection Zone Class for crash cushions shall be: performance class 110 kph; re-direction zone class Z1 or Z2; lateral displacement zone class D1; re-directional or non-directive.

c) Crash cushions shall be defined as re-useable or sacrificial depending on the maintenance requirement post-collision.

d) All the above must be specified on the scheme-specific Appendix 4/1 and submitted for assurance to the *Employer*.

6 Pedestrian Guard Rail (PGR)

a) PGR shall be manufactured from steel and conform to BS 7818.

b) PGR and all component parts shall be galvanized after manufacture by the hot-dip process in accordance with BS EN ISO 1461.

c) New PGR shall be 1.50 high, Type 1, 2 or 3 as illustrated below and supplied with through visibility options V2, V4 or V8 or 'in line' verticals as follows:

i) V2 - visibility PGR providing a transparency of 75% at a sight angle of 2.5° to 5°;

ii) V4 - visibility PGR providing a transparency of 75% at a sight angle of 5° to 14°;

iii) V8 - visibility PGR providing a transparency of 80% at a sight angle of more than 14°;

iv) S - Standard 'in line' bars.

d) Type 1 & 2 PGR posts shall be integral to the panels.

e) Foundations to PGR posts shall be ST4 to Clause 2602, 300mm x 300mm in the plan of variable depth. The excavation depth shall be 50mm below the bottom of the post which shall be set on a precast concrete slab.

f) The concrete shall be brought to surface level and smoothed off, or to the bottom of the footway construction, as required by the *Employer*.

g) For PGR repairs or infill the design shall match the immediately adjacent section existing or as described in the Task Order. The height of new panels installed into an existing arrangement meet the adjacent panels unless otherwise stated in the Task Order.

Figure 4/1: PGR Type 1

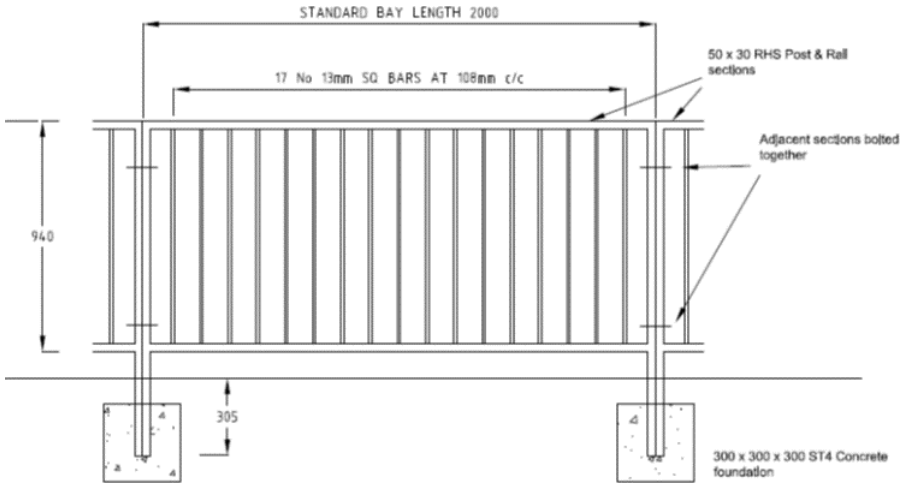


Figure 4/2: PGR Type 2

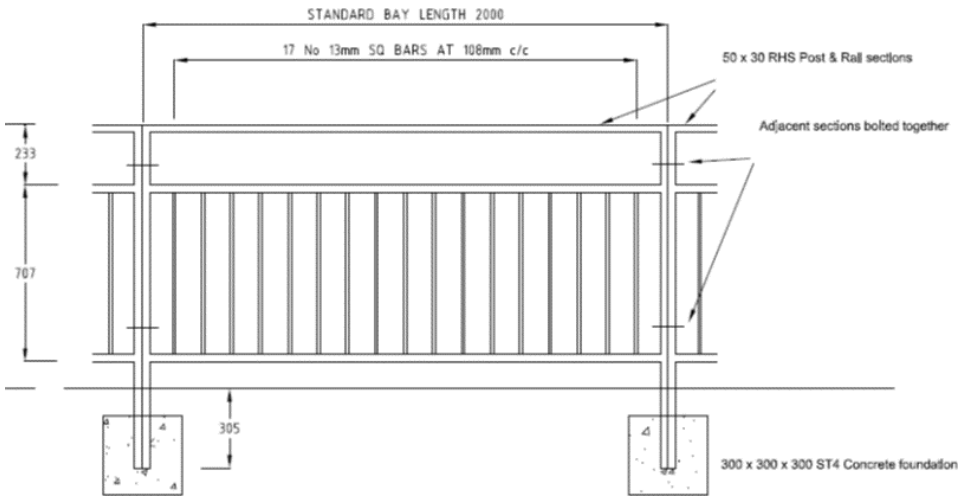
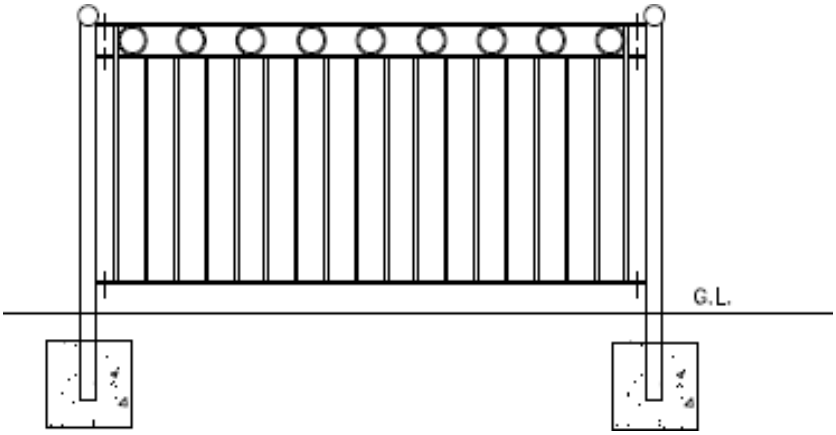


Figure 4/3: PGR Type 3



SCHEME-SPECIFIC APPENDIX 4/1 – SCHEDULE OF ROAD RESTRAINT SYSTEM (VEHICLE AND PEDESTRIAN)

The detail required from the contractor on a Scheme-Specific basis and to be submitted with the design shall be as detailed in the Specification for Highway Works, Volume 2, Notes for Guidance Series 0400, Appendix 4/1.

SCHEME-SPECIFIC APPENDIX 4/2 TEMPLATE – INFORMATION REQUIRED TO DEMONSTRATE COMPLIANCE AND TERMINALS TO CLAUSE 401

The detail required from the contractor on a Scheme-Specific basis and to be submitted with the design to demonstrate compliance of transitions and terminals to clause 401 shall be as detailed in the Specification for Highway Works, Volume 2, Notes for Guidance Series 0400, Appendix 4/2.

SCHEME-SPECIFIC APPENDIX 4/3 TEMPLATE – SCHEDULE DETAILING ROAD RESTRAINT SYSTEMS' POSTS AND FOUNDATIONS

Posts and Foundation types must be specified in Appendix 4/3 as shown below:

[Note to Compiler: Complete the schedule below and include in Appendix 4/3. Incorporate in the schedule all the Road Restraint Systems (i.e. safety barriers, terminals, transitions, vehicle parapets, crash cushions, pedestrian parapets and pedestrian guardrails) highlighting all associated post types and foundations. Cross-reference shall be made to the drawings where appropriate. The Road Restraint Systems (RRS) shall be listed in order of occurrence, irrespective of type, and the respective start and end chainages of the proposed systems listed.

The difference between the Finish and Start Chainages shall be at least the Length of Need of the Road Restraint System as defined in TD 19.]

[Col 0	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8]
RRS Ref	**Location & Start Chainage (m)**	**Finish Chainage (m)**	**Position on Highway Cross-Section**	**Type of Road Restraint System**	**Post Type**	**Foundation Type**	**Foundation Volume in m3 (if Concrete)**	**Volumetric Difference to standard foundation of ($0.216m^3$)**

Col 0 - Give unique alpha or numeric reference for use in cross-referencing.

Col 1 - Give chainage and location, for example, road name, verge, central reserve, slip road etc.

Col 2 - Give chainage and location, for example, road name, verge, central reserve, slip road etc.

Col 3 - For example, south verge, central reserve, north verge etc.

Col 4 - Give barrier type: Safety barriers, vehicle parapets, vehicle/pedestrian parapets, transitions, RBS, terminals, crash cushions, pedestrian parapets, pedestrian guardrails). Enter temporary safety barrier where required.

Col 5 – Give post type to Clause 0413AR.

Col 6 - Give foundation type to Clause 0414AR.

Col 7 - Give volume of concrete used in foundation (if applicable).

Col 8 - Subtract the foundation volume in Col 7 from 0.216 m^3.

Series 0500 Drainage and Service Ducts

Numbered Appendices

Appendix 5/1 Drainage, Manholes, Chambers

Appendix 5/2 Service Duct Requirements

Appendix 5/4 Fin Drains and Narrow Filter Drains

Appendix 5/5 Combined Drainage and Kerb Systems

Appendix 5/6 Linear Drainage Channel Systems

Appendix 5/1 Drainage, Manholes, Chambers

Pipes and Bedding

1 The permitted options for pipes and bedding for specified groups are given in Table 5/1. Trench and bedding details shall be in accordance with Highway Construction Detail F1.

2 Filter drain design groups are indicated on scheme-specific drawings. The permitted alternative pipe/bedding options for specified groups are given in Table 5/2. Trench and bedding details shall be in accordance with Highway Construction Detail F2.

3 Fin drains and narrow filter drains shall be types 5, 6, 7, 8 or 9 to Highway Construction Details F18 and F19, as indicated on scheme specific drawings. Backfill to filter drains shall be Type A to Clause 0505 unless otherwise indicated.

Table 5/1: Surface Water Drainage Schedule (developed from HA40/01)

Pipe Dia (mm)	Pipe Group	Vitrified Clay			Precast Concrete			Ductile Iron	GRP	Thermoplastic
		120	160	200	L	M	H			PP/PE
150	6		ASBFN	ASBFN	ASBN	ASBFN		S	S	ST
150	12		ASBFN	ASBFN	ASB	ASBF		S	S	S
150	16		Z	Z	Z	Z		Z	Z	Z
225(1)	6		ASBF	ASBFN	AS	ASB		S	S	ST
225(1)	12		ASBF	ASBF	AS	ASB		S	S	S
225(1)	16		Z	Z	Z	Z		Z	Z	Z
300	6		ASBFN	ASBFN	AS	ASB		S	S	ST
300	12		ASBF	ASBF		A		S	S	S
300	16		Z	Z	Z	Z		Z	Z	Z
375(1)	6		ASBFN	ASBFN	A	ASB	ASBF	S	S	ST
375(1)	12		ASBF	ASBF		AS	ASB	S	S	S
375(1)	16		Z	Z	Z	Z	Z	Z	Z	Z
450(1)	6	ASBF	ASBFN			ASB	ASB	S	S	ST
450(1)	12	ASBF	ASBF			A	AS	S	S	S
450(1)	16	Z	Z			Z	Z	Z	Z	Z

(1) - For Ductile Iron, GRP and Thermoplastic, 250 mm dia pipe equates to 225 mm, 400 mm dia pipe equates to 375 mm, and 500 mm dia pipe equates to 450 mm.

Table 5/2: Filter Drain Schedule

Drain Type (Lower Trench)	Drain Type (Surface Level)	Pipe Dia (mm)	Pipe Group	Vitrified Clay		Precast Concrete		Thermoplastic	
				160	200	L	M	Structured Wall	SDR 41
GHIJKLM	VWXY	150	4	✓	✓	✓	✓	✓	
GHIJKLM	VWXY	225	4	✓	✓	✓	✓		✓

For Lower Trench, refer to HCD Drawing F2

For Surface Level, refer to HCD Drawing B15

Testing

Pipes and Joints

4 All new watertight joints in surface and foul water sewers and drains shall be tested for water tightness upon completion to Clause 0509 sub-Clause 2.

Permeability

5 Permeability tests shall be proposed by the *Contractor*.

Manholes and Chambers

6 Manholes and chambers shall comply with Highway Construction Details F3 (Type 1 brick or in situ concrete construction) or F5 (Type 3a or 3b, precast concrete ring construction), except that 1050 mm diameter precast concrete chamber ring construction shall be acceptable for manholes not exceeding 1.2 m in depth with a pipe diameter not exceeding 225 mm. All precast concrete manholes and chambers shall be surrounded by 150 mm Class ST2 sulphate resisting concrete.

Catchpits

7 Catchpits shall comply with Highway Construction Details F11 and F12 for Type 7 and Type 8 catchpits. All precast concrete catchpits shall be surrounded by 150 mm Class ST2 sulphate resisting concrete. Connections to communicated gullies shall, as a minimum, be to a self-cleansing gradient.

Drawpits

8 Drawpits shall comply with Clause 0507MR in brickwork or modular twin walled thermoplastic units.

Gullies

9 In situ and precast concrete gullies shall comply with Highway Construction Detail F13. Gullies shall be surrounded by 150 mm Class ST2 sulphate resisting concrete.

10 450 mm diameter x 750 mm deep gullies shall be used in carriageways unless otherwise specified by the *Employer*. 300 mm diameter x 600 mm deep gullies shall be used in footways unless otherwise specified by the *Employer*. All gullies shall be trapped.

11 Chute gullies are not permitted.

Covers to Manholes, Chambers and Gullies

12 Covers to manholes, chambers and gullies shall comply with Clause 0507 and one of the designations below:

a) B125 (on footways and cycleways).

   i) Standard

   ii) Recessed

b) C250 (on footways and cycleways with vehicular access).

c) D400 (on carriageways outside of vehicular wheel paths).

d) E600 (on carriageways within vehicular wheel paths).

13 Gully covers shall be of the following types:

a) Type A.1 - 450 x 450 ductile iron 100 mm deep with a minimum waterway area of 900 cm^2.

b) Type A.2 - 450 x 450 ductile iron 150 mm deep with a minimum waterway area of 900 cm^2.

c) Type B.1 – 430 x 370 ductile iron 100 mm deep with a minimum waterway area of 1000 cm^2.

d) Type B.2 – 430 x 370 ductile iron 150 mm deep with a minimum waterway area of 1000 cm^2.

e) Type C – 560 x 400 ductile iron kerb inlet type gulley with a minimum depth of 150 mm.

f) Type D – 505 x 345 ductile iron 150 mm deep with a minimum waterway area of 690 cm^2.

g) Type E – 600 x 600 ductile iron 150 mm deep with a minimum waterway of 2000 cm^2.

14 All gully covers shall be captive hinged type and have a bar pattern which is “cycle friendly”.

Brickwork to Chambers and Gullies

15 Brickwork for chambers and gullies shall be built in English Bond unless otherwise specified.

Appendix 5/2 Service Duct Requirements

1 Duct layout shall be any configuration as determined by the design.

2 Options for service ducts shall be as follows:

Way	No of pipes	Nominal Dia in mm	Material
1	1	50	UPVC
	1	100	UPVC
	1	150	UPVC
2	2	50	UPVC
	2	100	UPVC
	2	150	UPVC
3	3	50	UPVC
	3	100	UPVC
	3	150	UPVC
4	4	50	UPVC
	4	100	UPVC
	4	150	UPVC
6	6	50	UPVC
	6	100	UPVC
	6	150	UPVC

Options for Traffic Signal Ducts shall be varied to include polyethylene and split ducts.

Drawpit Chambers and Access Boxes

3 Drawpit chambers shall be one of the following types. All dimensions are internal:

a) Footway chamber (standard or inset cover)

i) 450 mm x 450 mm

ii) 600 mm x 450 mm

iii) 600 mm x 600 mm

iv) 900 mm x 600 mm

v) 1200 mm x 600 mm

b) Carriageway chamber

i) 450 mm x 450 mm

ii) 600 mm x 450 mm

iii) 600 mm x 600 mm

iv) 900 mm x 600 mm

v) 1200 mm x 600 mm

4 Access boxes shall be as follows:

a) 4-way ducts: 600 mm (length) x 450 mm (width)

b) 3-way ducts: 450 mm (length) x 450 mm (width)

c) 1-way ducts: 450 mm (length) x 300 mm (width)

d) signal pole pits: 300 mm x 300 mm (CAB 115/600 units)

e) lighting/bollard drawpits: 300 mm (length) x 300 mm (width)

(Note: 4-way duct means that there is a maximum of 4 ducts that enter into any one side).

Appendix 5/4 Fin Drains and Narrow Filter Drains

1 Fin drains and narrow filter drains shall be types 5, 6, 7, 8 or 9 and shall be constructed in accordance with Highway Construction Details F18, F19 and F20.

2 The maximum permissible O90 size of the geotextile shall be 400 microns. The permeability of the geotextile shall be no less than 30 L/m^2/sec.

3 The minimum long term in-plane flow rates shall be:

a) Type 5 200

b) Type 6 100.

4 Internal pipe diameter shall be 100 mm.

5 D15 particle size for granular material in narrow filter drain Type 8 shall be as indicated in scheme-specific drawings.

Appendix 5/5 Combined Drainage and Kerb Systems

1 Locations of combined drainage and kerb systems are shown on scheme specific drawings. The following requirements shall be met unless otherwise specified by the Employer.

2 Limiting Dimensions:

a) Maximum width of unit – 450 mm.

b) Maximum depth of unit – 600 mm.

c) Kerb upstand – 130 mm ± 5 mm.

d) Kerb profile - kerb face batter to be 15º.

3 All components shall meet the D 400 load classification requirements of BS EN 1433.

4 Hydraulic Design Parameters:

a) Water inlets slots shall be either continuous slots or discrete apertures with entry areas (measured in the vertical plane) of not less than 0.0075 m^2 and totalling not greater than 0.015 m^2/m length.

b) Minimum waterway areas shall be 0.075 m² for one-part blocks or the combined parts of two-part blocks and shall be 0.04 m² for the lower part of two-part blocks.

c) Discharge openings shall be circular and of 225 mm minimum diameter or shall be elliptical of minimum area of 0.05 m².

5 Construction materials and workmanship shall be in accordance with the manufacturer's recommendations.

Appendix 5/6 Linear Drainage Channel Systems

1 Locations of linear drainage channel systems are shown on scheme-specific drawings.

2 Linear drainage systems shall comply generally with Clause 0517, subject to the following requirements.

3 Units shall be constructed of concrete to the load classes indicated below. The channels shall be installed to the manufacturer's specification with the manufacturer's gratings, where installed, appropriate to the specified load class. Gratings shall be locked securely in place using the manufacturer's locking system.

4 The system shall be constructed with constant inverts unless otherwise indicated on scheme specific drawings.

5 Endcaps and connections to outfalls shall be made via the manufacturer's proprietary units.

Type	Load Class	Width	Depth	Bore Width	Grating
1	A15	135	150	100	Pedestrian friendly
2	C250	135	150	100	Slotted
3	C250	135	250	100	Slotted
4	D400	160	250	100	Slotted
5	D400	260	400	150	Slotted

Series 0700 Road Pavements - General

Numbered Appendices

Appendix 7/1 - Permitted Pavement Options

Appendix 7/3 - Surface Dressing

Appendix 7/4 - Bond Coats and Other Bituminous Sprays

Appendix 7/7 - Slurry Surfacing/Micro-Surfacing/Micro-Asphalt

Appendix 7/11 – Crack Sealing Systems

Appendix 7/1 - Permitted Pavement Options

Permitted Hard Paving Grade Bitumen – BS EN 13924

Grade 10/20 (Class 3)

Penetration 25° C (BS EN 1426): 10 - 20

Softening point in °C (min) (BS EN 1427): 58

Grade 15/25 (Class 2)

Penetration 25° C (BS EN 1426): 15 - 25

Softening point in °C (min) (BS EN 1427): 55

Permitted Paving Grade Bitumen - BS EN 12591

Grade 40/60

Penetration 25° C (BS EN 1426): 40 – 60

Softening point in °C (min) (BS EN 1427): 48

Grade 50/70

Penetration 25° C (BS EN 1426): 50 - 70

Softening point in °C (min) (BS EN 1427): 46

Grade 70/100

Penetration 25° C (BS EN 1426): 70 - 100

Softening point in °C (min) (BS EN 1427): 43

Grade 100/150

Penetration 25° C (BS EN 1426): 100 - 150

Softening point in °C (min) (BS EN 1427): 39

Permitted Polymer Modified Bitumen – BS EN 14023

PMB 1

Penetration 25° C (BS EN 1426): Class 3 (maximum)

Softening point: R&B (BS EN 1427): Class 3 (maximum)

Resistance to hardening Retained Penetration (EN12607-1): Class 5 (minimum)

Resistance to hardening Increase in Softening Point (BS EN 12607-1): Class 2 (maximum)

Resistance to hardening Change in Mass (BS EN 12607-1): Class 2 (maximum)

Fraass breaking point (BS EN 12593): Class 3 (minimum)

Elastic recovery at 25° C (BS EN 13398): Class 5 (maximum)

Elastic recovery at 10^{o} C (BS EN 13398): Class 3 (maximum)

Cohesion Force-ductility (BS EN 13398 followed by BS EN 13703): Class 9 (maximum)

PMB 2

Penetration 25 °C (BS EN 1426): Class 5 (minimum)

Softening point: R&B (BS EN 1427): Class 5 (maximum)

Resistance to hardening Retained Penetration (BS EN 12607-1): Class 7 (minimum)

Resistance to hardening Increase in Softening Point (BS EN 12607-1): Class 2 (maximum)

Resistance to hardening Change in Mass (BS EN 12607-1): Class 2 (maximum)

Fraass breaking point (BS EN 12593): Class 6 (minimum)

Elastic recovery at 25°C (BS EN 13398): Class 4 (maximum)

Elastic recovery at 10ºC (BS EN 13398): Class 3 (maximum)

Cohesion Force-ductility (BS EN 13398 followed by BS EN 13703): Class 3 (maximum)

PMB 3

Penetration 25° C (BS EN 1426): Class 7 (minimum)

Softening point: R&B (BS EN 1427): Class 3 (maximum)

Resistance to hardening Retained Penetration (BS EN 12607-1): Class 7 (minimum)

Resistance to hardening Increase in Softening Point (BS EN 12607-1): Class 2 (maximum)

Resistance to hardening Change in Mass (BS EN 12607-1): Class 2 (maximum)

Fraass breaking point (BS EN 12593): Class 9 (minimum)

Elastic recovery at 25° C (BS EN 13398): Class 2 (maximum)

Elastic recovery at 10º C (BS EN 13398): Class 2 (maximum)

Cohesion Force-ductility (BS EN 13398 followed by BS EN 13703): Class 2 (maximum)

Permitted Hot and Warm Mix Asphalt Pavement Materials

Surface Course Materials			
Materials Reference	**Clause**	**Requirements**	
TSCS14	0942	Thickness (mm)	35 – 50
		Minimum compacted layer Thickness (mm)	30
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0942.19
		Performance Guarantee Period	5 years
TSCS10	0942	Thickness (mm)	25 – 40
		Minimum compacted layer Thickness (mm)	20
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0942.19
		Performance Guarantee Period	5 years
AC14 Close	0912	Thickness (mm)	40 – 55
		Minimum compacted layer Thickness (mm)	35
		Noise Level	No Requirement
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category A / B
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years
AC10 Close	0912	Thickness (mm)	30 – 40
		Minimum compacted layer Thickness (mm)	25
		Noise Level	No Requirement
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category A / B
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years

Surface Course Materials			
Materials Reference	**Clause**	**Requirements**	
HRA 30/10 F + 14/20mm Coated Chippings	911+ 0915	Thickness (mm)	35
		Minimum compacted layer Thickness (mm)	30
		Noise Level	1
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 10 / 12
		Performance Category	Clause 0967 – Category A / B / D
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years
HRA 30/14 F + 14/20mm Coated Chippings	911+ 0915	Thickness (mm)	40
		Minimum compacted layer Thickness (mm)	35
		Noise Level	1
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 10 / 12
		Performance Category	Clause 0967 – Category A / B / D
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years
HRA 35/14 F + 14/20mm Coated Chippings	0943 + 0915	Thickness (mm)	45 – 50
		Minimum compacted layer Thickness (mm)	40
		Noise Level	1
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 10 / 12
		Performance Category	Clause 0967 – Category A / B / D
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years
HRA 55/14F	911	Thickness (mm)	45
		Minimum compacted layer Thickness (mm)	40
		Noise Level	1
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category A / B / D
		Texture Depth	Clause 0921.2 for all other asphalts.
		Performance Guarantee Period	5 years

Surface Course Materials			
Materials Reference	**Clause**	**Requirements**	
HRA 55/10F	911	Thickness (mm)	40
		Minimum compacted layer Thickness (mm)	35
		Noise Level	1
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category A / B / D
		Texture Depth	Clause 0921.2 for all other asphalts.
		Performance Guarantee Period	5 years
SMA 14	0968AR	Thickness (mm)	Clause 0968AR.6
		Minimum compacted layer Thickness (mm)	Clause 0968AR.6
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0921.2
		Bitumen Content	Standard / Heavy Duty
		Performance Guarantee Period	5 years
SMA 10	0968AR	Thickness (mm)	Clause 0968AR.6
		Minimum compacted layer Thickness (mm)	Clause 0968AR.6
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0921.2
		Bitumen Content	Standard / Heavy Duty
		Performance Guarantee Period	5 years

Surface Course Materials			
Materials Reference	**Clause**	**Requirements**	
AC20 EME	0969AR	Thickness (mm)	Clause 0969AR.5
		Minimum compacted layer Thickness (mm)	Clause 0969AR.5
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0921.2
		Bitumen Content	Standard / Heavy Duty
		Performance Guarantee Period	5 years
AC14 EME	0969AR	Thickness (mm)	Clause 0969AR.5
		Minimum compacted layer Thickness (mm)	Clause 0969AR.5
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0921.2
		Bitumen Content	Standard / Heavy Duty
		Performance Guarantee Period	5 years
AC10 EME	0969AR	Thickness (mm)	Clause 0969AR.5
		Minimum compacted layer Thickness (mm)	Clause 0969AR.5
		Noise Level	2
		Polished Stone Value	PSV 55 / 60 / 65 / 68+
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0921.2
		Bitumen Content	Standard / Heavy Duty
		Performance Guarantee Period	5 years

Binder Course Materials			
Materials Reference	**Clause**	**Requirements**	
AC20 dense / HDM	0929	Thickness (mm)	50 - 100
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A / B / D
AC32 dense / HDM	0929	Thickness (mm)	70 - 150
		Minimum compacted layer Thickness (mm)	55
		Performance Category	A / B / D
HRA 60/20	0905	Thickness (mm)	45 - 80
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A / B / D
HRA 50/20	0905	Thickness (mm)	45 - 80
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A / B / D
HRA 50/14	0905	Thickness (mm)	35 - 65
		Minimum compacted layer Thickness (mm)	30
		Performance Category	A / B / D
HRA 50/10	0905	Thickness (mm)	25 - 50
		Minimum compacted layer Thickness (mm)	20
		Performance Category	A / B / D
HRA 35/14	0905	Thickness (mm)	45 – 50
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A / B / D
HRA 30/14	0905	Thickness (mm)	40
		Minimum compacted layer Thickness (mm)	35
		Performance Category	A / B / D
SMA 20	0937	Thickness (mm)	50 - 100
		Minimum compacted layer Thickness (mm)	40
		Performance Category	B / C / D / E
SMA 14	0937	Thickness (mm)	30 - 60
		Minimum compacted layer Thickness (mm)	25
		Performance Category	B / C / D / E
AC20 EME2	0930	Thickness (mm)	90 – 150
		Minimum compacted layer Thickness (mm)	80
		Performance Category	B / C / D / E
AC14 EME2	0930	Thickness (mm)	70 - 130
		Minimum compacted layer Thickness (mm)	60
		Performance Category	B / C / D / E

Binder Course Materials			
Materials Reference	**Clause**	**Requirements**	
AC10 EME2	0930	Thickness (mm)	60 - 100
		Minimum compacted layer Thickness (mm)	50
		Performance Category	B / C / D / E

Base Course Materials			
Materials Reference	**Clause**	**Requirements**	
AC32 dense / HDM	0929	Thickness (mm)	70 - 150
		Minimum compacted layer Thickness (mm)	55
		Performance Category	A / B
HRA 60/20	0904	Thickness (mm)	45 - 80
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A / B
HRA 60/32	0904	Thickness (mm)	60 - 150
		Minimum compacted layer Thickness (mm)	55
		Performance Category	A / B
SMA 20	0930	Thickness (mm)	50 - 100
		Minimum compacted layer Thickness (mm)	40
		Performance Category	B / C / D / E
AC20 EME2	0930	Thickness (mm)	90 – 150
		Minimum compacted layer Thickness (mm)	80
		Performance Category	B / C / D / E
AC14 EME2	0930	Thickness (mm)	70 - 130
		Minimum compacted layer Thickness (mm)	60
		Performance Category	B / C / D / E
AC10 EME2	0930	Thickness (mm)	60 - 100
		Minimum compacted layer Thickness (mm)	50
		Performance Category	B / C / D / E

Regulating Materials			
Materials Reference	**Clause**	**Requirements**	
AC14 Close	0912	Thickness (mm)	40 - 55
		Minimum compacted layer Thickness (mm)	35
		Performance Category	A / B

Regulating Materials			
Materials Reference	**Clause**	**Requirements**	
HRA 50/14	0905	Thickness (mm)	35 - 65
		Minimum compacted layer Thickness (mm)	30
		Performance Category	A / B
HRA 50/10	0904	Thickness (mm)	25 - 50
		Minimum compacted layer Thickness (mm)	20
		Performance Category	A / B
SMA 14	0937	Thickness (mm)	30 - 60
		Minimum compacted layer Thickness (mm)	25
		Performance Category	B
SMA 10	0937	Thickness (mm)	20 - 50
		Minimum compacted layer Thickness (mm)	15
		Performance Category	B
SMA 6	0937	Thickness (mm)	15 - 40
		Minimum compacted layer Thickness (mm)	10
		Performance Category	B

Permitted Cold Mix Asphalt Pavement Materials

Cold Mix Asphalt for Carriageways			
Materials Reference	**Clause**	**Requirements**	
Cold Mix Family QVE and SVE Category B3 (min)	0947 & 0948 & 0963AR	Thickness (mm)	50 - 150
		Performance Category	A / B

Permitted Porous Asphalt

Porous Asphalt Materials			
Materials Reference	**Clause**	**Requirements**	
AC20 Open	0938	Thickness (mm)	45 - 75
		Performance Category	A / B
		ITSRmin	80
		PSV	No Requirement / 55 / 60 / 65 / 68+
		Vmin	20%
		Kvmin (m/s)	$1x10^{-3}$
		Maximum binder drainage	BDmax 0,3

Porous Asphalt Materials			
Materials Reference	**Clause**	**Requirements**	
AC10 Open	0938	Thickness (mm)	30 - 35
		Performance Category	A / B
		ITSRmin	80
		PSV	No Requirement / 55 / 60 / 65 / 68+
		Vmin	16%
		Kvmin (m/s)	$1x10^{-3}$
		Maximum binder drainage	BDmax 0,3

Permitted Concrete Pavement Slabs

Materials Reference	**Clause**	**Requirements**	
URC – CC37	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
JRC – CC37	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
CRCP	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
CRCB	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10° C / 75% humidity index in 1 days @10° C

Permitted Sub-Base Materials for Asphalt and Concrete Pavements

Sub-Base Materials			
Materials Reference	**Clause**	**Requirements**	
Type 1	0803	Thickness (mm)	100+
		CBR	15
Type 3	0805	Thickness (mm)	100+
Type 4	0807	Thickness (mm)	100+
		CBR	15
4/20	0808	Thickness (mm)	50 - 400
4/40	0808	Thickness (mm)	50 - 400
CBGM A C5/6	0821	Thickness (mm)	50 - 400
CBGM A C8/10	0821	Thickness (mm)	50 - 400
CBGM B C8/10	0822	Thickness (mm)	50 - 400
CBGM B C12/15	0822	Thickness (mm)	50 - 400
CBGM B C16/20	0822	Thickness (mm)	50 - 400
CBGM B C20/25	0822	Thickness (mm)	50 - 400
GEN 3	1030	Thickness (mm)	50 - 400
ST4	1030	Thickness (mm)	50 - 400
GEN 2	1030	Thickness (mm)	50 - 400
ST3	1030	Thickness (mm)	50 - 400
GEN 1	1030	Thickness (mm)	50 - 400
ST2	1030	Thickness (mm)	50 - 400
GEN 0	1030	Thickness (mm)	50 - 400
Foamed Concrete	1043	Volume (m^3)	0+

Other Permissible Concrete

Materials Reference	**Clause**	**Requirements**	
RC20/25	1001 to 1039 & 1044	Thickness (mm)	150 - 300
RC25/30	1001 to 1039 & 1044	Thickness (mm)	150 - 300
RC28/35	1001 to 1039 & 1044	Thickness (mm)	150 - 300

Materials Reference	Clause	Requirements	
RC30/37	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / fcm1 / fcm2
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
RC32/40	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / fcm1 / fcm2
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
RC35/40	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
RC40/50	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
PAV1	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
PAV2	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
CC20	1001 to 1039 & 1044	Thickness (mm)	150 - 300
CC25	1001 to 1039 & 1044	Thickness (mm)	150 - 300
CC30	1001 to 1039 & 1044	Thickness (mm)	150 - 300
CC35	1001 to 1039 & 1044	Thickness (mm)	150 - 300

Materials Reference	Clause	Requirements	
CC40	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
CC45	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5 days @10°C / 75% humidity index in 1 days @10°C
CC50	1001 to 1039 & 1044	Thickness (mm)	150 - 300
		Strength (Clause 1049AR)	Standard / $f_{cm}1$ / $f_{cm}2$
		Dryness (Clause 1050AR)	Standard / 75% humidity index in 0.5days / 75% humidity index in 1 days

Permitted High Friction Surfacing

Materials Reference	Clause	Requirements	
HFS	0924	Category	Type1
		Tensile Adhesion to substrate (TRL176 Appendix J)	≥ 1.0MPa
		Colour	RAL 3001 – Signal Red RAL 5015 – Sky Blue RAL 6020 – Chrome Green RAL 7043 – Traffic Grey RAL 9017 – Traffic Black CLEAR SEAL
		AAV	4
		PSV	70

Permitted Colour Cold Applied Surface Treatment

Materials Reference	Clause	Requirements	
CCAST	0959AR	Colour	RAL 1003 – Signal Yellow RAL 3001 – Signal Red RAL 5015 – Sky Blue RAL 6020 – Chrome Green RAL 7043 – Traffic Grey RAL 9017 – Traffic Black CLEAR SEAL
		AAV	4
		PSV	70
		Minimum Spread Rate	≥ 6 kg/m^2

Permitted Composite Geosynthetic for Asphalt Overlay

Materials Reference	Clause	Requirements	
Composite Geosynthetic	0960AR	Tensile Strength	50kN x 50kN 100kN x 100kN 200kN x 200kN

Permitted Self-Adhesive Geosynthetic for Trench Repair or Widening

Materials Reference	Clause	Requirements	
Self-Adhesive Geosynthetic	0961AR	Tensile Strength	100kN x 100kN

Permitted Grouted Macadam

Materials Reference	Clause	Requirements	
Grouted Macadam	0965AR	Thickness (mm)	50 - 100

Permitted SAMI Membrane

Materials Reference	Clause	Requirements	
SAMI Membrane	0968AR	Thickness (mm)	≤3
SAMI Asphalt	0968AR	Binder	PMB3
		Thickness	25mm

Appendix 7/3 - Surface Dressing

Permitted Surface Dressings – Clause 0922

Requirements	
Binder	Cohesion by pendulum test BS EN 13588 ≥ 1.2J/cm^2 (Class 3 minimum) ≥ 0.7J/cm^2 (Class 5 minimum)
PSV	55 / 60 / 65 / 68+
Maximum AAV	14
Surface Dressing Types	**Single Coat** – A single coat is a single sprayed application of sealing binder followed immediately with a single application of aggregate which is spread and rolled into place. **Two Coat** – A two coat is a surface dressing with two applications of binder and two applications of aggregate, applied in the following sequence: An application of sprayed binder is followed immediately with an application of large size aggregate. Then a second application of sprayed binder, and a second application of smaller aggregates. Both coats are applied one after the other with little or no time delay between coats. **Rack-in** – A racked-in surface dressing consists of one application of binder and two applications of chip, applied in the following sequence: A single application of binder is applied, followed by the application of a large chip which is widely spaced (with 'windows' between the aggregates. This is followed by a further application of smaller aggregate. The smaller aggregates fall into the windows between the large aggregates of the first application and adhere to the layer of binder below. **Sandwich** – A sandwich surface dressing is applied in the following sequence: A layer of large aggregates is spread directly on the existing surface. This is followed by a relatively light application of binder. A smaller aggregate is then spread directly onto the sprayed binder. The surface is rolled to compact the seal. **Lock Seal** – A lock seal is a layer of surface dressing sealed with an additional spray of bitumen coating that sits in the macrotexture and seals the surface dressing.

Appendix 7/4 - Bond Coats and Other Bituminous Sprays

Permitted Bond Coats – Clause 0920

Requirements	
Binder	C50BP or CP60BP with residual binder of 0.2kg/m^2 for newly laid and overlaid asphalts C50BP or CP60BP with residual binder of 0.35kg/m^2 for planed substrate C50BP or CP60BP with residual binder of 0.7kg/m^2 for planed substrate

Appendix 7/7 - Slurry Surfacing/Micro-Surfacing/Micro-Asphalt

Permitted Slurry Surfacing – Clause 0918

	Slurry Surfacing	**Micro-Surfacing**	**Micro-Asphalt**
Binder	Cohesion by pendulum test BS EN 13588 ≥ 0.7J/cm^2 (Class 5 minimum)	Cohesion by pendulum test BS EN 13588 ≥ 1.2J/cm^2 (Class 3 minimum)	Cohesion by pendulum test BS EN 13588 ≥ 1.2J/cm^2 (Class 3 minimum)
Spread Rate	4 to 10 kg/m²	12 kg/m²	24 kg/m²
Nominal Thickness (mm)	3 to 6	8 to 10	15
PSV	55 / 60	60	60

Appendix 7/11 – Crack Sealing Systems

Permitted Overband and Inlaid Crack Sealing Systems – Clause 0711

System Type	Clause	Grade F-Flexible H-High Modulus	Use for crack widths	Application type	Elongation Requirement or Flexibility	Illustration
Simple overband	0711	Not applicable	Up to 5mm	Surface applied	None	
Fill & overband	0711	Not applicable	5mm to 40mm	Surface applied	Only required for fill component and not the overband	
Inlaid single crack	0711	Grade H	Unlimited crack width	Rebated into surface	None	
Inlaid single crack	0711	Grade F	Unlimited crack width	Rebated into surface	Yes requirement +30%	
Inlaid multiple cracks	0711	Grade H	Unlimited crack width	Rebated into surface	None	
Inlaid multiple cracks	0711	Grade F	Unlimited crack width	Rebated into surface	Yes requirement +30%	

Series 0900 Road Pavements – Bituminous Bound Materials

Numbered Appendices

Appendix 9/64 Letter Of Approval

[Date]

[Address]

This letter confirms the acceptance of additional reclaimed asphalt pavement in compliance with clause 0964 submitted by..... *[name of contractor].*

The Acceptance note expires on the.....*[date]* so it has to be reviewed in 3 / 6 / 12 months.

The Contractor is reminded of this acceptance, so a resubmission must be completed by ……*[date].*

……*[Signature]*

Information supplied by the Contractor is attached.

Series 1100 Kerbs, Footways and Paved Areas

Numbered Appendices

Appendix 11/1 Permitted Materials

1 Precast Concrete Kerbs, Channels, Edging and Quadrants – Clause 1101
2 Natural Stone Kerbs, Channels, Edging and Quadrants – Clause 1112AR
3 Mastic Asphalt – Clause 1124AR
4 Resin Bound Surfacing - Clause 1120AR
5 Resin Bonded Surfacing – Clause 1121AR
6 Resin Bound Tree Pits – Clause 1122AR
7 Imprinted Thermoplastic Surfacing – Clause 1119AR
8 In-situ Concrete (Footways) and Granolithic Concrete – Clause 1125AR
9 Precast Concrete Paving Flags – Clause 1113
10 Precast Concrete Block Paving (PCB) – Clause 1107
11 Clay Pavers – Clause 1108
12 Natural Stone Slabs, Setts & Blocks – Clause 1112AR
13 Laying & Bedding Courses – Clauses 1116AR and 1117AR
14 Asphalt Footway and Cycleway Pavement Options

Appendix 11/1 Permitted Materials

1 Precast Concrete Kerbs, Channels, Edging and Quadrants – Clause 1101

Precast concrete Kerbs and channels to BS EN 1340.

The breaking strength measured as bending strength (BS EN 1340 table 3) shall be a minimum of Class 2.

Precast Concrete Kerb Sizes to BS EN 1340:

a) 125 x 150 mm [SP 1 / HB 1 / BN 1]

b) 125 x 255 mm [SP 2 / HB 2 / BN 2]

c) 150 x 305 mm [SP 3 / HB 3 / BN 3]

d) 125 x 178 mm Chamfered Centre Stone [CN1]

e) Transition [TL / TR]:

  i) 1:9

  ii) 1:18

f) Dropper 1 [DL 1 / DR 1]:

  i) 1:9

  ii) 1:18

g) Dropper 2 [DL 2 / DR 2]:

  i) 1:9

  ii) 1:18

Precast Concrete Quadrant / Angles to BS EN 1340:

a) Quadrant 455 x 255 mm [QBN / QHB / QSP]

b) Quadrant 305 x 255 mm [QBN / QHB / QSP]

c) Quadrant 455 x 150 mm [QBN / QHB / QSP]

d) Quadrant 305 x 255 mm [QBN / QHB / QSP]

e) Channel Square 255 x 125 mm [CS1]

f) Channel Square 150 x 125 mm [CS2]

g) Edging 50 x 150 mm [ER, EF, EBN]

h) Edging 50 x 200 mm [ER, EF, EBN]

Other Kerbs:

a) High Containment Kerb

b) High Containment Dropper

c) High Containment Quadrant

d) Bus Stop Boarder Kerb 435 x 314 mm [± 20 mm]

e) Bus Stop Boarder Kerb 291 x 235 mm [± 20 mm]

f) Bus Stop Boarder Dropper

g) Bus Stop Boarder Quadrant

h) Bus Stop Boarder Kerb 100/240 x 380 mm [± 20 mm]

i) Bus Stop Boarder Channel kerb 350/385 x 100 mm [± 20 mm]

j) Bus Stop boarder Dropper

2 Natural Stone Kerbs, Channels, Edging and Quadrants – Clause 1112AR

Natural Stone Kerb Performance Classes

Class	Description	Water absorption	Compressive strength
Class 2	City and town centres, where long-term performance and visual appearance are essential	0.2% max	170 MPa min LEV
Class 1	Less onerous street or domestic situations	0.4% max	130 MPa min LEV

Source:

a) Europe

b) Outside of Europe

Natural Stone kerb sizes:

a) edge kerb 150 x 300 mm

b) edge kerb 200 x 300 mm

c) flat kerb 300 x 150 mm

d) flat kerb 300 x 200 mm

e) flat drop transition kerb 300 x 200 mm:

  i) 1:9

  ii) 1:18

f) flat drop transition kerb 300 x 150 mm:

  i) 1:9

  ii) 1:18

g) edge drop transition kerb 150 x 300 mm:

  i) 1:9

  ii) 1:18

h) centre kerb 150 x 150 mm

Natural Stone quadrant sizes:

a) Quadrant 305 x 255 mm

b) Quadrant 450 x 255 mm

Natural Stone channel sizes:

a) channel 150 x 150 mm

b) channel 300 x 150 mm

c) channel 300 x 200 mm

3 Mastic Asphalt – Clause 1124AR

Mastic Asphalt Surface Course:

a) Mastic Asphalt – 30 mm Type B Grade S

b) Mastic Asphalt – 30 mm Type T50 Grade S

c) Mastic Asphalt – 30 mm Type T50 Grade H

d) Mastic Asphalt – 30 mm Polymer Modified

e) Mastic Asphalt – 40 mm Type T50 Grade H

f) Mastic Asphalt – 40 mm Polymer Modified

4 Resin Bound Surfacing - Clause 1120AR

a) 12 mm thick Resin bound 3 mm gravel aggregate

b) 12 mm thick Resin bound 3 mm crushed rock aggregate

c) 16 mm thick Resin bound 6 mm gravel aggregate

d) 16 mm thick Resin bound 6 mm crushed rock aggregate

e) 25 mm thick Resin bound 10 mm gravel aggregate

f) 25 mm thick Resin bound 10 mm crushed rock aggregate

5 Resin Bonded Surfacing – Clause 1121AR

a) 1-5mm gravel aggregate Resin bonded surface

b) 1-5mm crushed rock aggregate Resin bonded surface

6 Resin Bound Tree Pits – Clause 1122AR

a) 12 mm thick Resin bound tree pit 3 mm gravel aggregate

b) 12 mm thick Resin bound tree pit 3 mm crushed rock aggregate

c) 16 mm thick Resin bound tree pit 6 mm gravel aggregate

d) 16 mm thick Resin bound tree pit 6 mm crushed rock aggregate

e) 25 mm thick Resin bound tree pit 10 mm gravel aggregate

f) 25 mm thick Resin bound tree pit 10 mm crushed rock aggregate

7 Imprinted Thermoplastic Surfacing – Clause 1119AR

15 mm thick Imprinted Thermoplastic Surfacing

8 In-situ Concrete (Footways) and Granolithic Concrete – Clause 1125AR

a) ST4 (C16/20) concrete surfacing, 100 mm compacted thickness with brushed finish

b) ST4 (C16/20) concrete surfacing, 150 mm compacted thickness with brushed finish

c) ST4 (C16/20) concrete surfacing, 200 mm compacted thickness with brushed finish

d) Granolithic concrete surfacing, 40 mm thick, indent roller finish

9 Precast Concrete Paving Flags – Clause 1113

Precast concrete Flags to BS EN 1339:

a) The breaking strength measured as bending strength (BS EN 1339 Annex F) shall be a minimum of Class 3.

b) The weathering resistance measured as water absorption (BS EN 1339 Annex E) shall be a minimum of Class 3.

c) The weathering resistance measured as Freeze/thaw in presence of de-icing salts (BS EN 1339 Annex D) shall be a minimum of Class 3.

Precast concrete flag sizes (width x length x thickness):

a) 300 x 300 x 50 mm
b) 300 x 300 x 60 mm
c) 400 x 400 x 50 mm
d) 400 x 400 x 65 mm
e) 400 x 400 x 50 mm (Embossed) Ladder paving
f) 400 x 400 x 65 mm (Embossed) Ladder paving
g) 400 x 400 x 50 mm (Embossed) Tramline paving
h) 400 x 400 x 65 mm (Embossed) Tramline paving
i) 400 x 400 x 50 mm (Embossed) Corduroy paving
j) 400 x 400 x 65 mm (Embossed) Corduroy paving
k) 400 x 400 x 50 mm (Embossed) Blister paving
l) 400 x 400 x 65 mm (Embossed) Blister paving
m) 450 x 450 x 50 mm
n) 450 x 450 x 70 mm
o) 600 x 450 x 50 mm
p) 600 x 450 x 63 mm
q) 600 x 600 x 50 mm
r) 600 x 600 x 63 mm
s) 600 x 750 x 50 mm
t) 600 x 750 x 63 mm
u) 600 x 900 x 50 mm
v) 600 x 900 x 63 mm

10 Precast Concrete Block Paving (PCB) – Clause 1107

Precast concrete blocks to BS EN 1338

a) The water absorption measured as Resistance to freeze-thaw with de-icing salts (BS EN 1338 Annex E) shall be a minimum of Class 3

Precast concrete blocks Sizes (Cuboid):

a) 200 x 100 x 50 mm
b) 200 x 100 x 60 mm
c) 200 x 100 x 80 mm

11 Clay Pavers – Clause 1108

Clay pavers to BS EN 1344:

a) The Breaking Strength measured as the mean transverse breaking load (BS EN 1344 Annex D) shall be a minimum of T4.

b) The Slip resistance measured in accordance with EN1344 shall be a minimum of Class U3.

c) The durability measured as resistance to freeze-thaw (BS EN 1344 Annex C) shall be a minimum of FP100.

Clay Paver Sizes (Cuboid):

a) 200 x 100 x (60 mm - 65 mm)

b) 200 x 100 x 80 mm

12 Natural Stone Slabs, Setts & Blocks – Clause 1112AR

Natural stone products shall have a dimensional tolerance of Class 1 to BS EN 1341, BS EN 1342 and BS EN 1343 respectively

Natural Stone Slab sizes (width x length x thickness):

a) 600 x varying length x 50 mm

b) 600 x varying length x 63 mm

c) 600 x varying length x 75 mm

d) 600 x 900 x 50 mm

e) 600 x 900 x 63 mm

f) 600 x 900 x 75 mm

Natural Stone Sett and Block sizes (cuboid):

a) 200 x 100 x 100 mm

b) 100 x 100 x 100 mm

Blue / Grey sandstone to BS EN 1341:

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 20 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 70.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 2.5%.

Source:

i) Lancashire or Yorkshire

ii) Elsewhere in Europe

iii) Outside of Europe

Photo(s):

Blue / Grey Sandstone 1

Blue / Grey Sandstone 2

Buff sandstone to BS EN 1341:

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 10 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 70.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 2.8%.

Source:

i) UK

ii) Elsewhere in Europe

iii) Outside of Europe

Photo(s):

Dark Grey sandstone to BS EN 1341:

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 28 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 70.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 2.0%.

Source:

i) Scottish Highlands UK

ii) Elsewhere in Europe

iii) Outside of Europe

Photo(s):

Silver Grey Granite to BS EN 1341

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 12 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 50.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 0.5%.

Source

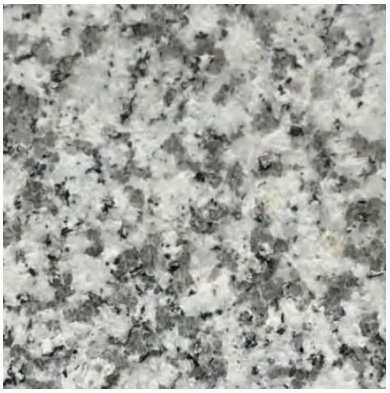
i) Europe

ii) Outside of Europe

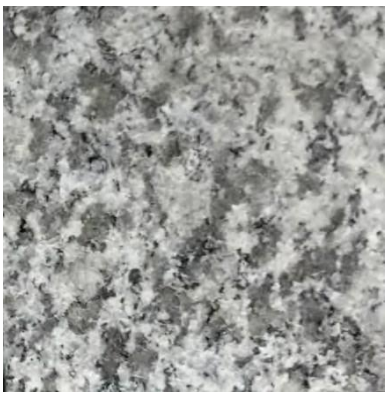
Photo(s):

Silver Grey Granite 1

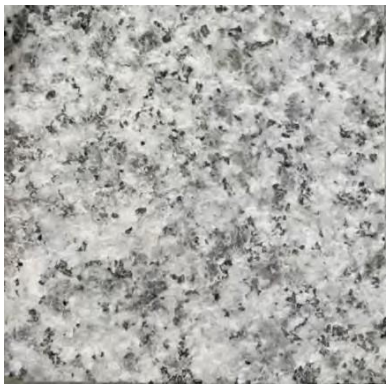
Silver Grey Granite 2



Silver Grey Granite 3



Silver Grey Granite 4



Silver Grey Granite 5

Silver Grey Granite 6

Mid Grey Granite to BS EN 1341

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 12 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 50.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 0.5%.

Source:

i) Europe

ii) Outside of Europe

Photo(s):

Mid Grey Granite 1

Mid Grey Granite 2

Mid Grey Granite 3

Dark Grey Granite to BS EN 1341

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 14 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 50.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 0.3%.

Source:

i) Europe

ii) Outside of Europe

Photo(s):

Dark Grey Granite 1

Dark Grey Granite 2

Pink Granite to BS EN 1341

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 14 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 50.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 0.5%.

Source:

i) Europe

ii) Outside of Europe

Photo(s):

Buff Granite to BS EN 1341

a) The breaking strength measured as flexural strength (BS EN 12372), as lower expected value ≥ 10 MPa.

b) Slip Resistance measured as slip resistance (BS EN 14231), as wet slip resistance > 50.

c) Water Absorption measures as water absorption (BS EN 13755), as higher expected value < 0.7%.

Source:

i) Europe

ii) Outside of Europe

Photo(s):

13 Laying & Bedding Courses – Clauses 1116AR and 1117AR

40 mm Sharp Sand / Crushed Glass GF85 0/4 (MP) - Clause 1116.1

50mm Crushed Rock - Clause 1116.2

30 mm M12 mortar - Sharp Sand:Cement Mortar (3:1) - Clause 1117.1

50 mm M12 mortar - Sharp Sand:Cement Mortar (3:1) - Clause 1117.1

30 mm Mortar - Clause 1117.3

50 mm Mortar - Clause 1117.3

14 Asphalt Footway and Cycleway Pavement Options

For permitted binders refer to Appendix 7/1

For permitted Bond Coats and Other Bituminous Sprays refer to appendix 7/4

For Slurry Surfacing/Micro-Surfacing/Micro-Asphalts refer to appendix 7/7

Permitted Hot and Warm Mix Asphalt Pavement Materials

Surface Course Materials			
Materials Reference	**Clause**	**Requirements**	
TSCS10	0942	Thickness (mm)	25 – 40
		Minimum compacted layer Thickness (mm)	20
		Noise Level	2
		Polished Stone Value	PSV 55
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B
		Texture Depth	Clause 0942.19
		Performance Guarantee Period	5 years
TSCS6	0942	Thickness (mm)	20 – 30
		Minimum compacted layer Thickness (mm)	15
		Noise Level	2
		Polished Stone Value	PSV 55
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B / C / D / E
		Texture Depth	Clause 0942.19
		Performance Guarantee Period	5 years
AC14 Close	0912	Thickness (mm)	40 – 55
		Minimum compacted layer Thickness (mm)	35
		Noise Level	2
		Polished Stone Value	PSV 55
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category A / B
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years

Surface Course Materials			
Materials Reference	**Clause**	**Requirements**	
AC6 Dense	0909	Thickness (mm)	20 – 30
		Minimum compacted layer Thickness (mm)	15
		Noise Level	No Requirement
		Polished Stone Value	PSV 50
		Maximum Aggregate Abrasion Value	No Requirement
		Performance Category	No Requirement
		Texture Depth	No Requirement
		Performance Guarantee Period	5 years
HRA 30/10 F + 14/20mm Coated Chippings	0943 + 0915	Thickness (mm)	35
		Minimum compacted layer Thickness (mm)	30
		Noise Level	3
		Polished Stone Value	PSV 55
		Maximum Aggregate Abrasion Value	AAV 10 / 12
		Performance Category	Clause 0967 – Category A
		Texture Depth	Clause 0921.2
		Performance Guarantee Period	5 years
HRA 55/10F	0943	Thickness (mm)	40
		Minimum compacted layer Thickness (mm)	35
		Noise Level	2
		Polished Stone Value	PSV 55 / 60
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category A / B / D
		Texture Depth	Clause 0921.2 for all other asphalts.
		Performance Guarantee Period	5 years

Binder Course Materials			
Materials Reference	**Clause**	**Requirements**	
SMA 10	0968AR	Thickness (mm)	Clause 0968AR.6
		Minimum compacted layer Thickness (mm)	Clause 0968AR.6
		Noise Level	Clause 0968AR.7
		Polished Stone Value	PSV 55
		Maximum Aggregate Abrasion Value	AAV 12 / 14
		Performance Category	Clause 0967 – Category B
		Texture Depth	Clause 0921.2
		Bitumen Content	Standard / Heavy Duty
		Performance Guarantee Period	5 years
AC20 dense / HDM	0929	Thickness (mm)	50 - 100
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A / B
HRA 60/20	0905	Thickness (mm)	45 - 80
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A

Base Course Materials			
Materials Reference	**Clause**	**Requirements**	
HRA 60/20	0904	Thickness (mm)	45 - 80
		Minimum compacted layer Thickness (mm)	40
		Performance Category	A

Permitted Cold Mix Asphalt Pavement Materials

Cold Mix Asphalt for Footways			
Materials Reference	**Clause**	**Requirements**	
Cold Mix Family QVE and SVE Category B1	0947 & 0948 & 0963AR	Thickness (mm)	50 - 150
		Performance Category	No Requirement

Permitted Porous Asphalt Pavement Materials

Porous Asphalt Materials			
Materials Reference	**Clause**	**Requirements**	
AC10 Open	0938	Thickness (mm)	30 - 35
		Performance Category	A / B
		ITSRmin	80
		PSV	No Requirement / 55
		Vmin	16%
		Kvmin (m/s)	$1x10^{-3}$
		Maximum binder drainage	BDmax 0,3
AC6 Open	0938	Thickness (mm)	20 - 25
		Performance Category	Category B
		ITSRmin	70
		PSV	PSV60
		Vmin	16%
		Kvmin (m/s)	$1x10^{-3}$
		Maximum binder drainage	BDmax 0,3

Permitted Sub-Base Materials for Asphalt Pavements

Sub-Base Materials			
Materials Reference	**Clause**	**Requirements**	
Type 1	0803	Thickness (mm)	100+
		CBR	15
Type 3	0805	Thickness (mm)	100+
Type 4	0807	Thickness (mm)	100+
		CBR	15
4/20	0808	Thickness (mm)	50 - 400
4/40	0808	Thickness (mm)	50 - 400
CBGM A C5/6	0821	Thickness (mm)	50 - 400
CBGM A C8/10	0821	Thickness (mm)	50 - 400
CBGM B C8/10	0822	Thickness (mm)	50 - 400
CBGM B C12/15	0822	Thickness (mm)	50 - 400

Sub-Base Materials			
Materials Reference	**Clause**	**Requirements**	
CBGM B C16/20	0822	Thickness (mm)	50 - 400
CBGM B C20/25	0822	Thickness (mm)	50 - 400
ST1	1030	Thickness (mm)	50 - 400
ST4	1030	Thickness (mm)	50 - 400
Foamed Concrete	1043	Volume (m^3)	0+

Permitted Colour Cold Applied Surface Treatment

Materials Reference	**Clause**	**Requirements**	
CCAST	0959AR	Colour	RAL 1003 – Signal Yellow RAL 3001 – Signal Red RAL 5015 – Sky Blue RAL 6020 – Chrome Green RAL 7043 – Traffic Grey RAL 9017 – Traffic Black CLEAR SEAL
		AAV	4
		PSV	70
		Minimum Spread Rate	≥ 6 kg/m^2

Series 1200 Traffic Signs

Numbered Appendices

APPENDIX 12/1 Traffic Signs: General

Foundations for Traffic Sign Posts

1. It shall be the responsibility of the *Contractor* to ensure that the foundations for each sign assembly are adequate to withstand the loading conditions imposed on either face of the erected sign. Minimum foundation sizes are set out in Table 12/1.

Table 12/1 – Minimum foundation sizes

Post size (mm)	Excavation dia	Excavation depth	Planting depth
Under 100	300	675	600
100 -150	450	775	700
150 – 200	500	1075	1000
Over 200	500	1075	1000

Posts and bracket types for Permanent Traffic Signs

1. Posts shall be of the following types:

   Type 1 Straight Post
   Type 2 Large Base Post
   Type 3 Rectangular section straight post
   Type 4 Rectangular section straight post with base compartment

2. Signpost brackets shall be entirely compatible with the sign lighting units.

3. Signpost brackets shall be protected against corrosion in accordance with Clause 1221.

Permanent Traffic Sign Faces - Type classification

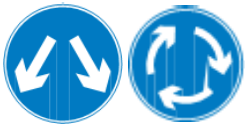
1 Sign Type 1 comprises those signs from TSRGD 2016 illustrated in Table 12/2, together with all authorised variants and alternative types. Sign Type 2 are all other traffic sign faces.

Table 12/2 – Type 1 Traffic Signs

TSRGD 2016 Sign diagram No	illustration
501	
504.1	
505.1	
506.1	
507.1	
508.1	
509.1	
510	
512, 512.1, 5.12.2, 512.3	
513	

516	
517	
520	
521	
522	
523.1	
524.1	
528	
529, 529.1	
530	
543	
544.1, 544.2	

545	
548	
549	
550, 550.1, 550.2	
551, 551.2	
552	
553.1	
554, 554.1, 554A, 554B, 554.C	
555, 551.1	
556, 556.1	
557, 557.1	
558, 558.1	

559	
562	
581	
582	
583	
584	
601.1	
602	
606	
609	
610	
611, 611.1	

612	
613	
614	
615	
616	
617	
618	
619.1, 619.2	
622.1 to 622.8	
625.1	
632	

642	
652	
664	
664.3	
667	
668	
670	
671	
672	
673	

675A, 675B	
676	
770	
771	
772	
779	
810	
811A & B	
816	
817	
950	

951	
952	
953 and variants	
955	
956, 956.1, 956.2	
957	
770	
771	
772	
779	
782	
801	

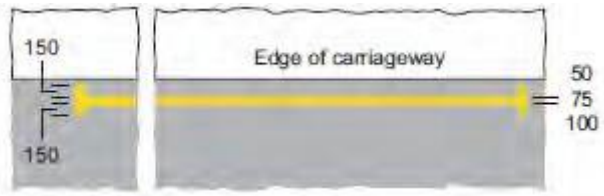
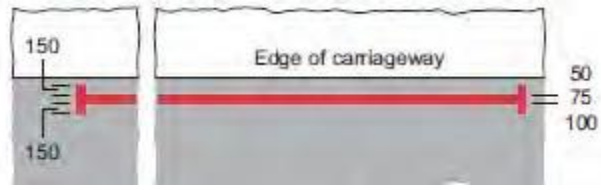
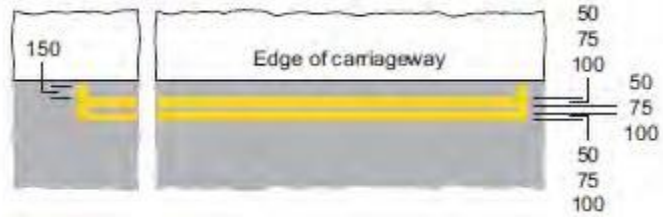
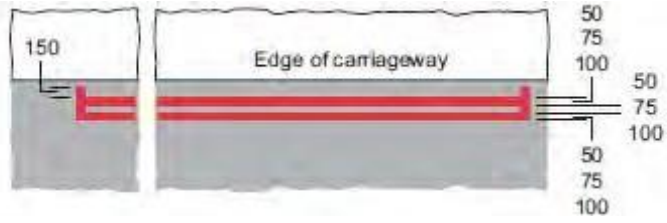
950	
968	
7001	

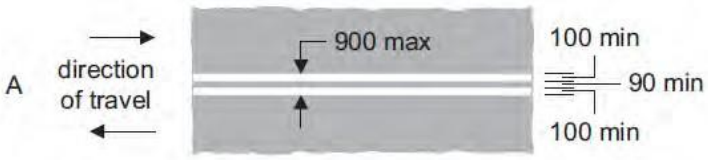
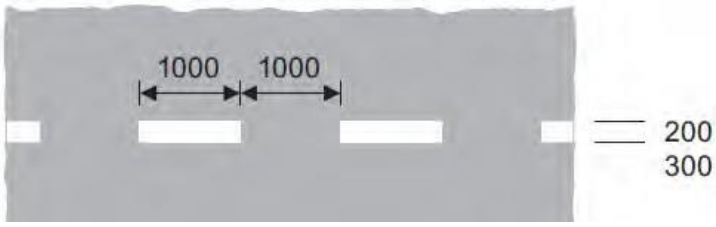
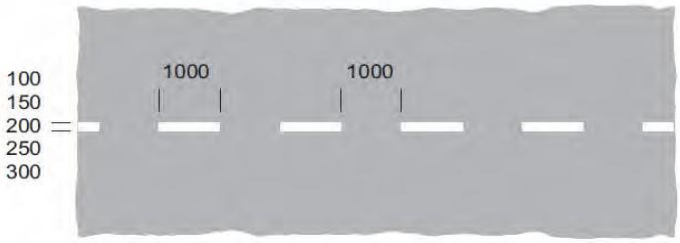
APPENDIX 12/3 Traffic Signs: Road Markings

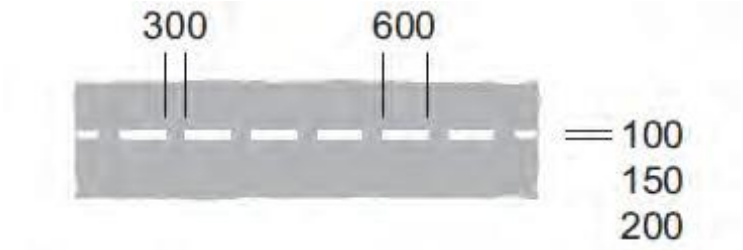
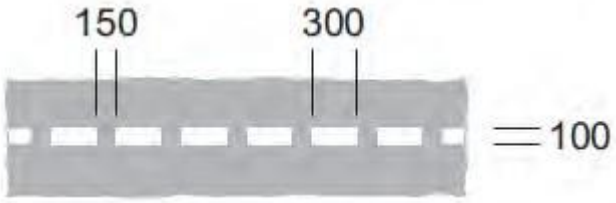
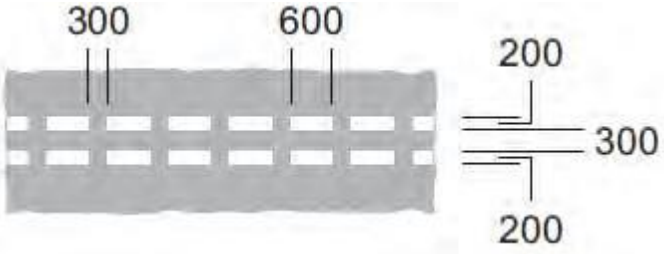
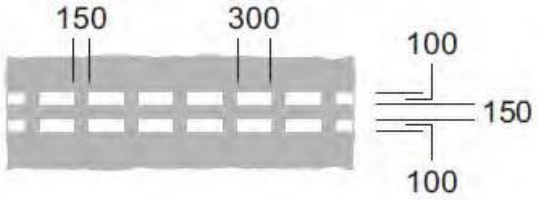
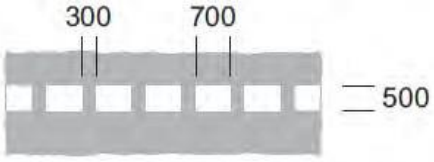
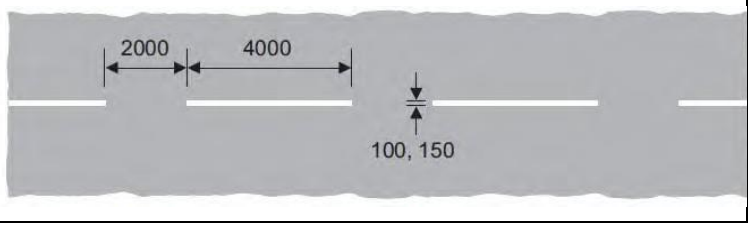
Road Markings Classification

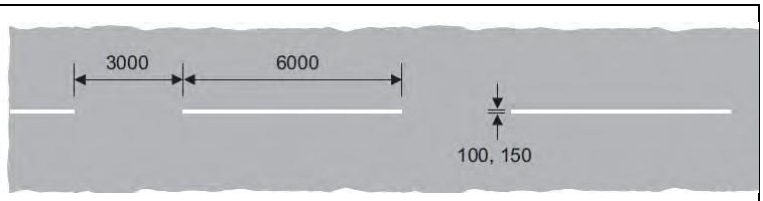
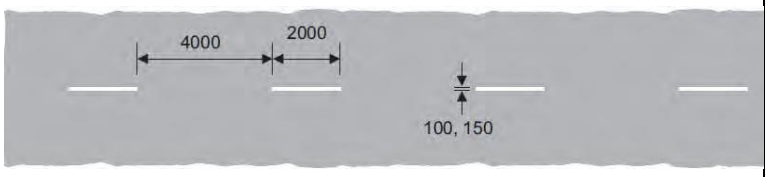
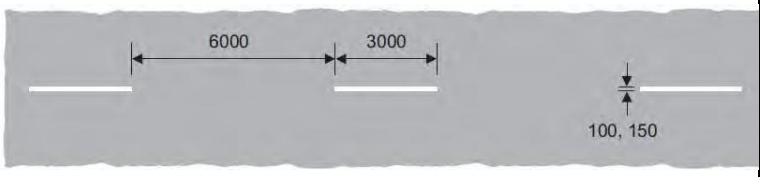
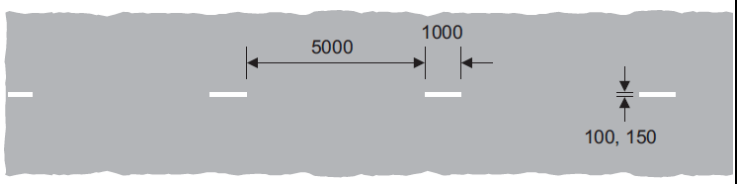
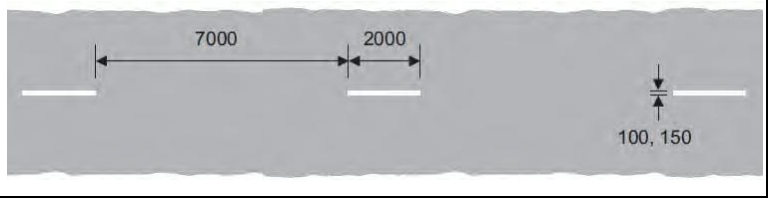
1 Road Markings shall be classified as shown in Table 12/3

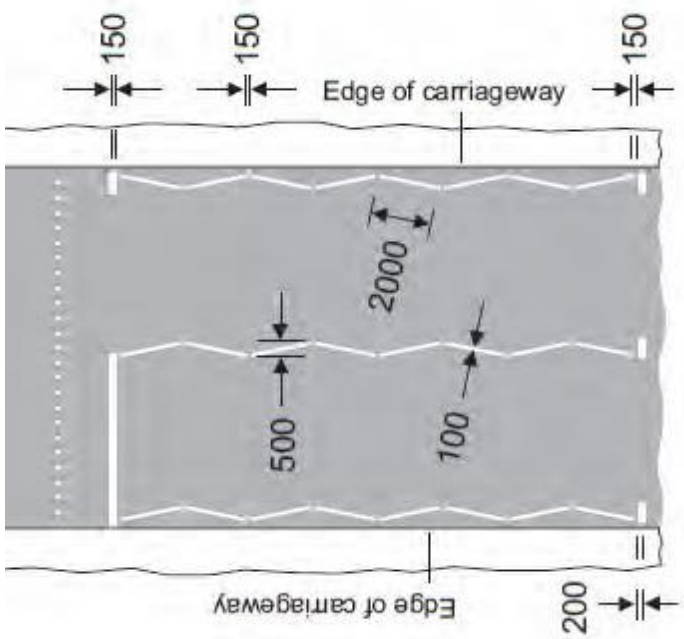
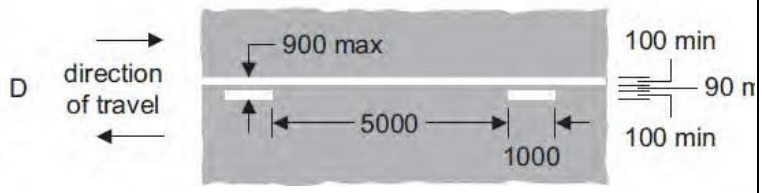
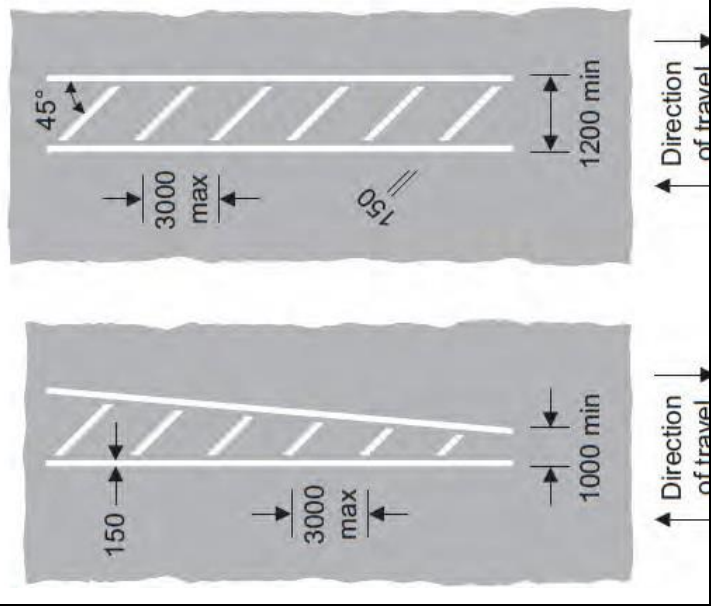
Table 12/3 – Road Marking Classification

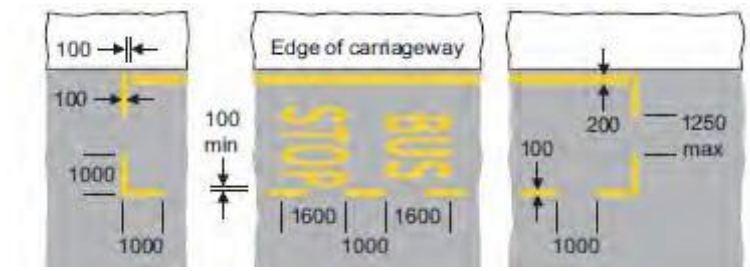
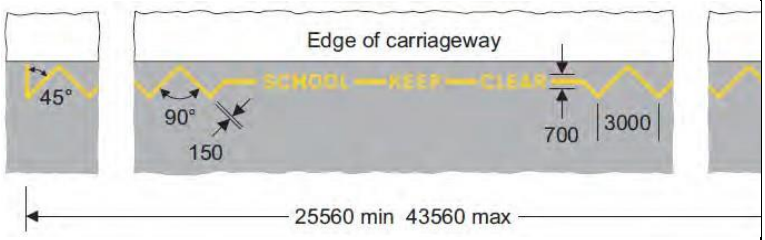
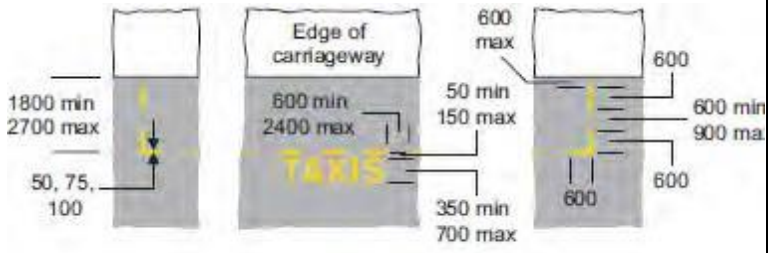
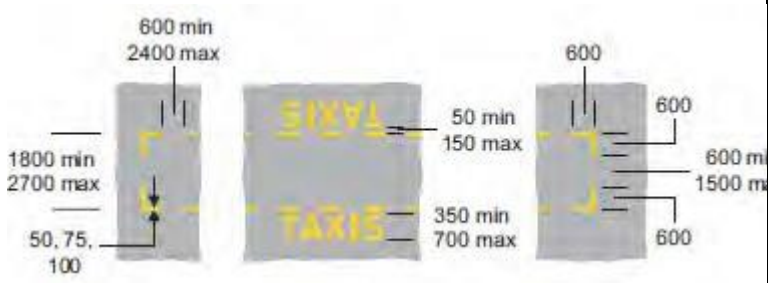
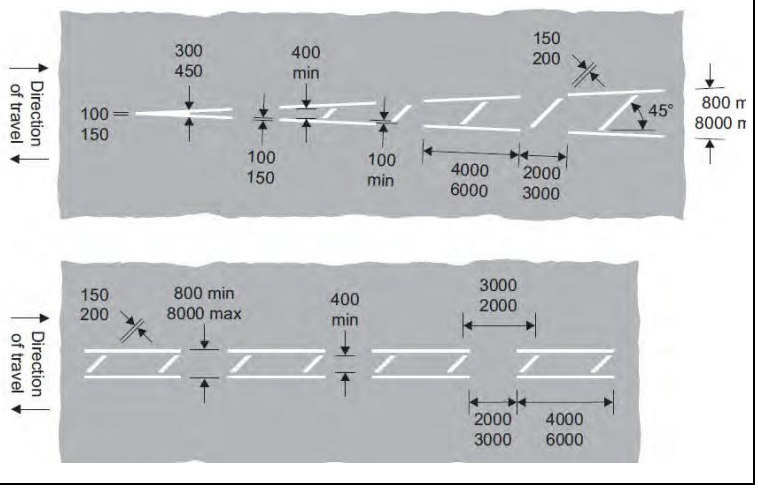
TSRGD 2016 Sign diagram No	illustration
	Continuous Lines
1017	
1017.1	
1018.1	
1018.2	
1002.1	
1049B	

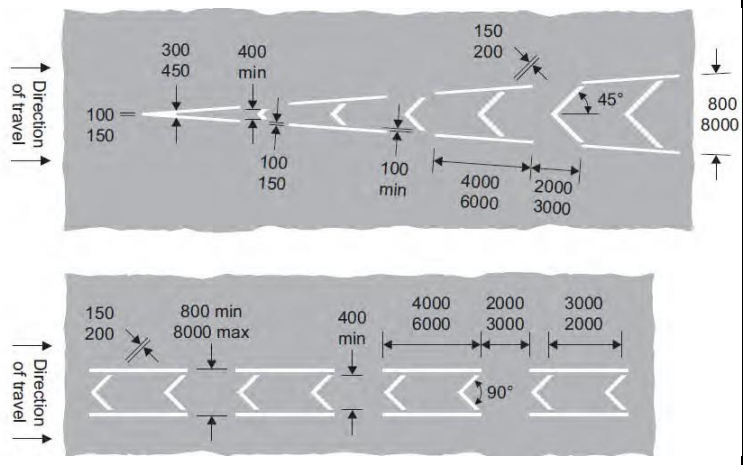
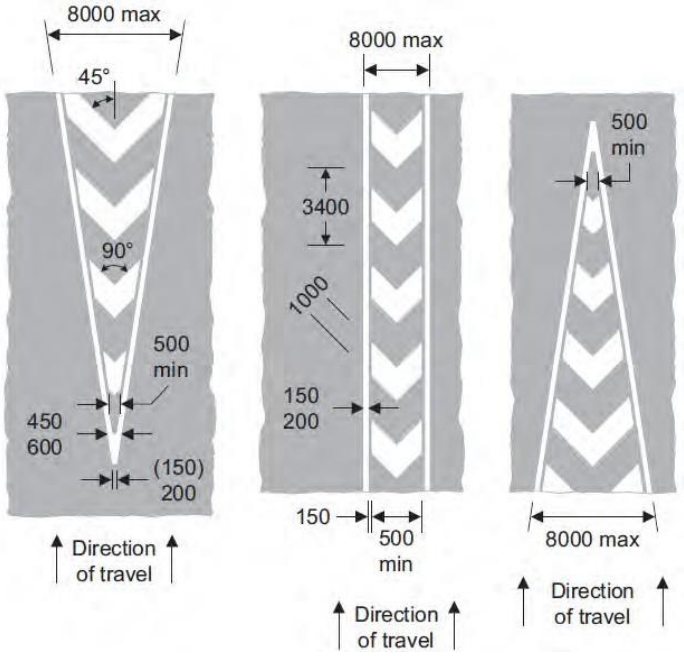
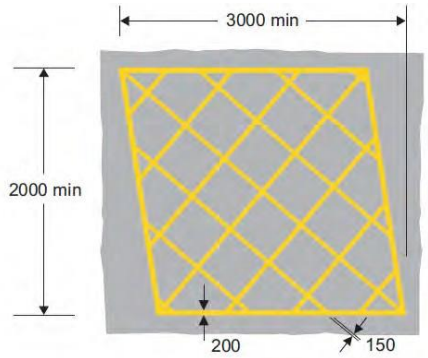
1049A	
1013.1	
1012.1	
1001	
	Intermittent Lines - Mark :Gap = 1:1
1003.1	
1010	

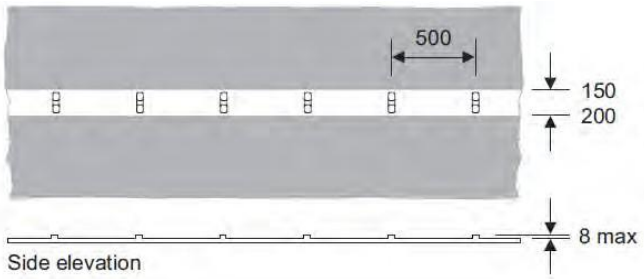
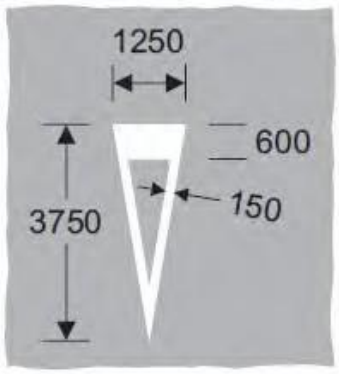
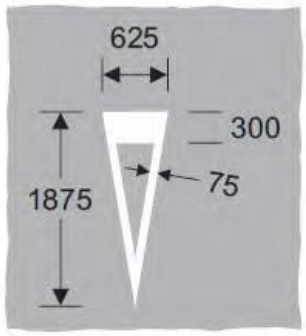
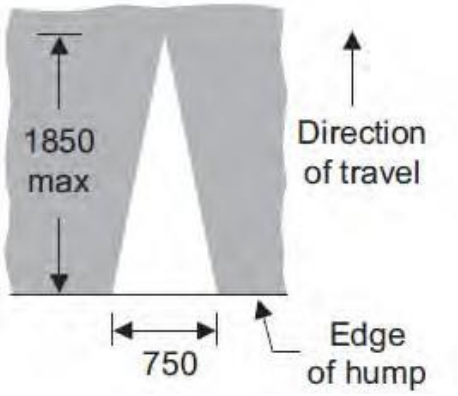
	Intermittent Mark **Mark :Gap = 2:1**
1009A	
1009B	
1003A	
1003B	
1003.3	
1004	

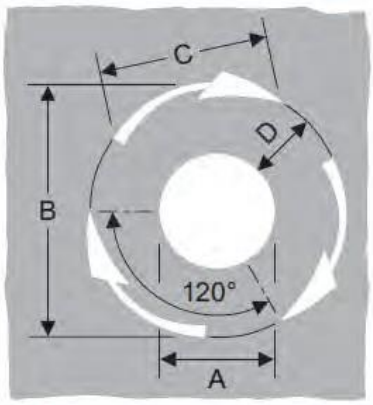
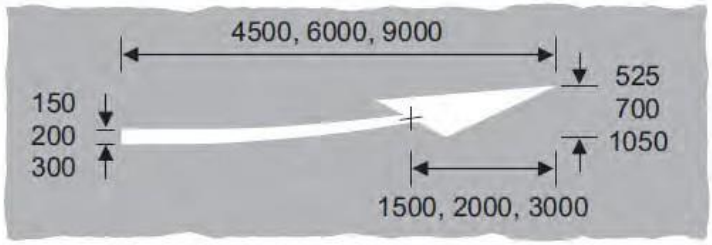
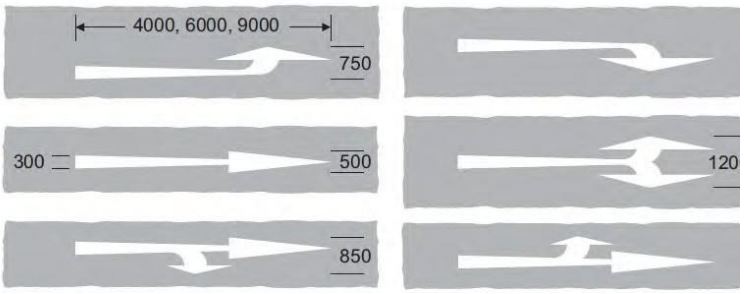
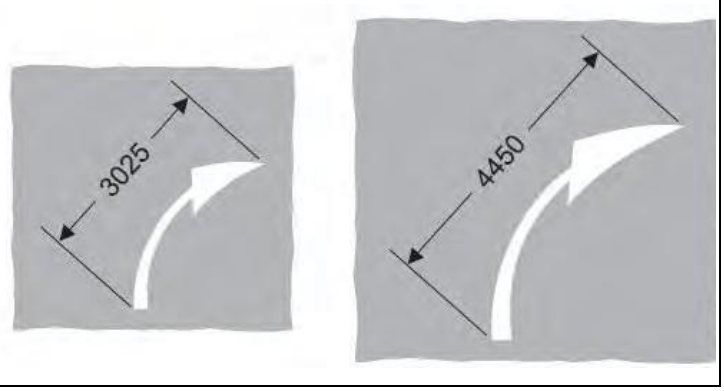
1004.1	
	Intermittent Mark **Mark :Gap = 1:2**
1008	
1008.1	
	Intermittent Mark **Mark :Gap = 1:5**
1005	
	Intermittent Mark **Mark :Gap = 2:7**
1005.1	

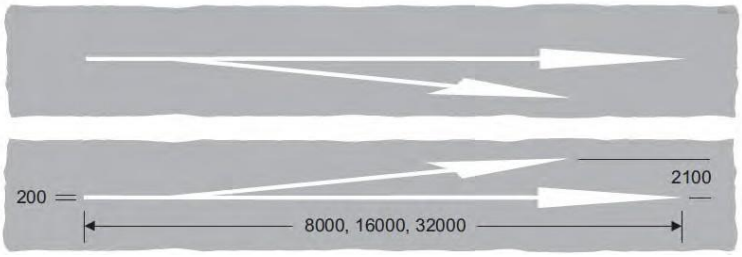
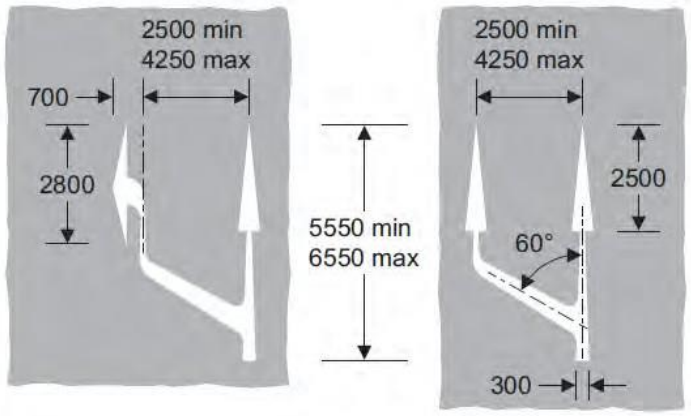
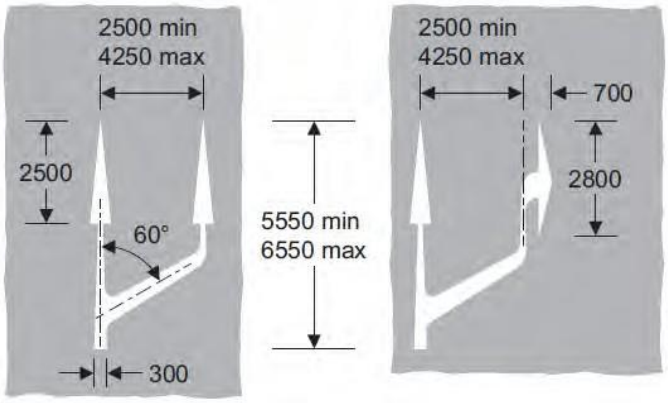
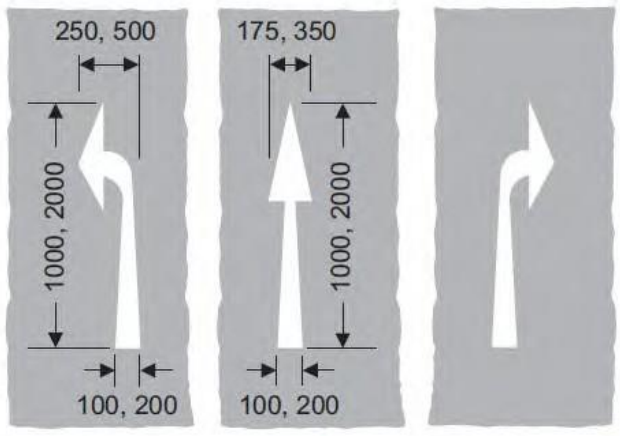
	Ancillary Lines
1001.3	
1013.1	
1013.5	

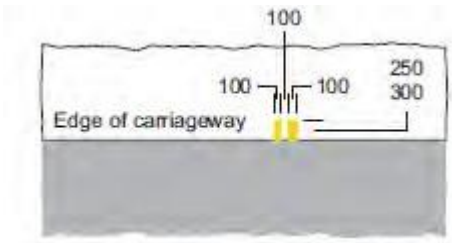
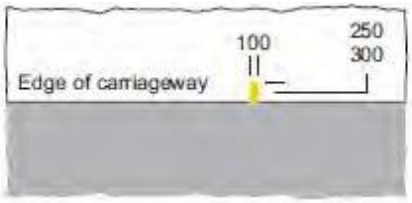
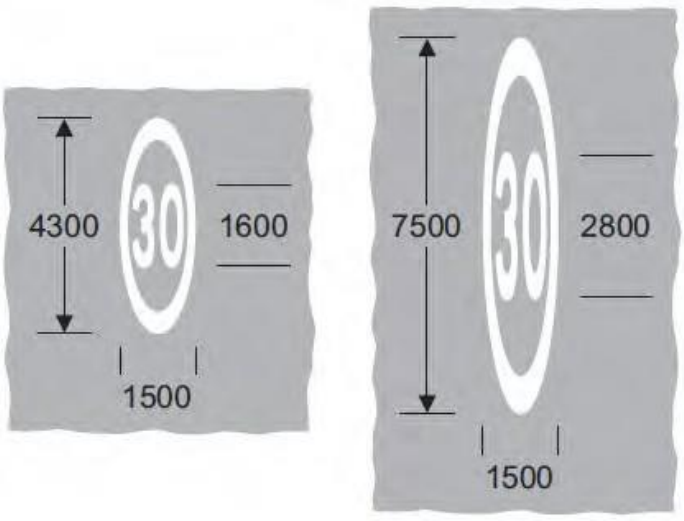
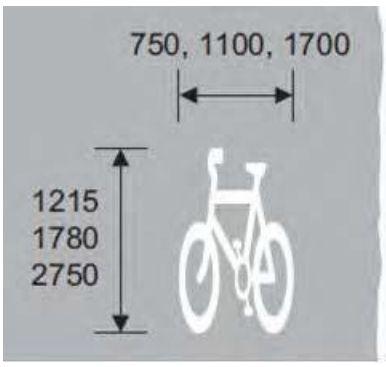
1025.1	
1027.1	
1028.2 (a)	
1028.2 (b)	
1040	

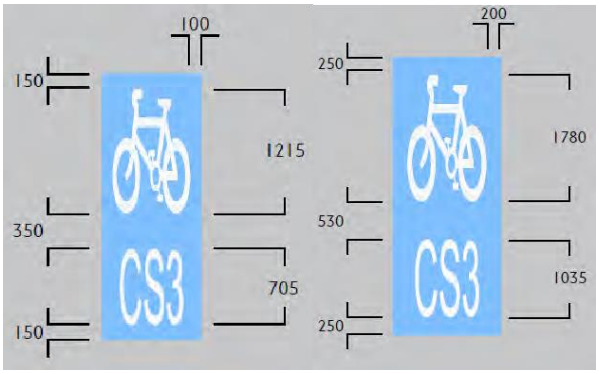
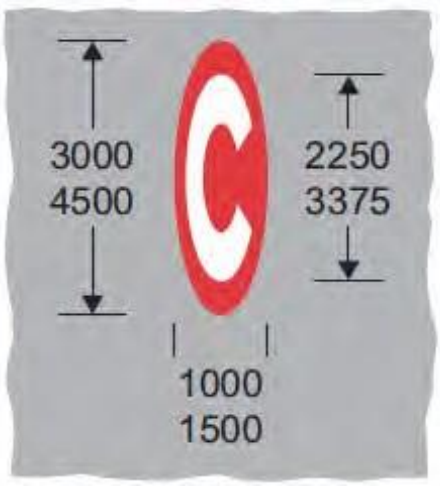
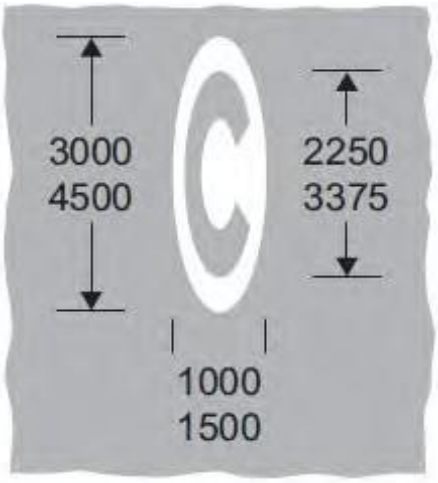
1041	
1042	
1043	

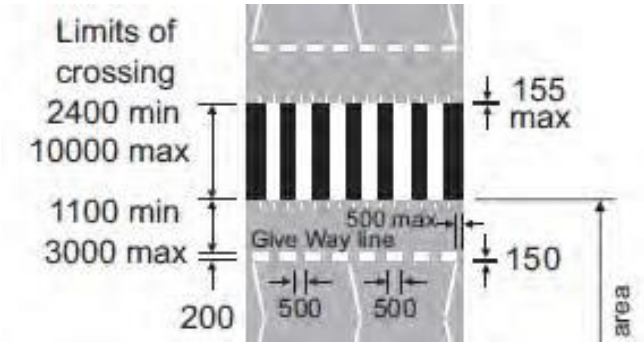
	Raised Rib Lines
1012.3	
	Triangles
1023A	
1023B	
1062	

	Circles with Enclosing Arrows
1003.4	 SIZE 1 A = 1000 min 2400 max B = 3500 min 7000 max C = 3025 D = 1250 min SIZE 2 A = 2500 min 4000 max B = 5000 min 10000 max C = 4450 D = 1250 min
	Arrows
1014	
1038	
1038.1	

1039	
1050	
1050.1	
1059	

	Kerb Markings
1020.1	
1019	
	Symbols
1065	
1057	

	Pre-formed thermoplastic symbols
1057 / 1057.1	 A B CS number varies according to route
1068	
1069	

	Zebra Crossing Markings
1001.4	 Black / white stripes not more than 715 mm or less than 500 mm deep

Road Marking Materials

2 Road Markings shall be formed of either:

a. Thermoplastic in accordance with BS EN 1871

b. Cold plastic in accordance with BS EN 1871

c. Paint in accordance with BS EN 1871

d. Permanent preformed road markings in accordance with BS EN 1790

Road Marking Performance

3 The performance of Road Markings shall be as described in Clause 1212SR and of one of the following types described in Table 12/4:

a. Type SR (Skid Resistance)

b. Type RR (Retroreflectivity)

Table 12/4 – Road Marking performance requirements

	Property	Colour	Requirement	Value	
All Road Markings	Colour	White		BS EN 1436	
		Yellow	(Class Y1, Y2)	BS EN 1436	
		Red		x	y
				0.580	0.300
				0.490	0.300
				0.460	0.330
				0.540	0.330
				0.570	0.340
	Luminance Factor	White	Class B2	0.3	
		Yellow	Class B1	0.2	
		Red	Class B1	0.2	
Type SR Road Markings	Skid Resistance		Class S3	55	
	Retroreflectivity (Dry)	White	Class R2	100	
		Yellow	Class R1	80	
		Red	Class R1	80	
	Retroreflectivity (Wet)	White	Class RW0 (symbols)	0	
			Class RW1 (non-structured)	25	
		Yellow	No requirement	-	
		Red	No requirement		
Type RR Road Markings	Skid Resistance		Class S1	45	
	Retroreflectivity (Dry)	White	Class R4	200	
	Retroreflectivity (Wet)	White	Class RW0 (symbols)	0	
			Class RW2 (non-structured)	35	
			Class RW3 (structured)	50	

4 Road Studs shall comply with Clause 1213MR and be one of the following types:

a. Bonded

b. Anchored

c. Embedded

APPENDIX 12/8 Variable Message Sign (VMS) Equipment

1. General

Permanent VMS installation shall usually comprise a sign mounted on a post or posts together with a means of communication from the installation to the Client's traffic control room.

Temporary VMS shall comprise a sign mounted on a portable trailer. The Contractor shall propose suitable positions for the sign and advise the Client for approval. The sign shall be battery and solar powered wherever possible. The Contractor shall attend to the sign for maintenance as required but at least once every 24 hours. The message displayed on the sign will be as agreed with or as instructed by the Client, but on no account shall scroll or page.

2. General Requirements

All VMS shall comply with the requirements of, TR 2516 and its appendices, TSRGD 2016 as amended over time and the general requirement of BS EN 12966-1.

For permanent VMS Isolation of the electrical supply to the sign shall be in the base of the post and the sign shall be controlled from the In-Station via the Paknet radio system.

3. Sign Display

The sign shall be capable of displaying a combination of text alone or text and pictogram. Text capability shall be 4 rows of 15 characters, Text and pictogram shall be capable of either 2 rows of 15 characters below the pictogram or as 4 rows of 8 characters to the side of the pictogram. Legends shall be displayed in yellow and pictograms in red and white.

The display of characters shall follow the common design rules for rectangular signs of chapter 7 of the Traffic Signs Manual, as regards character height, tile sizes and spacing of tiles

The sign display shall be capable of displaying the full range of characters shown in Schedule 17 Part 5 of TSRGD 2016.

The sign display to be produced by LEDs and meet the optical performance of BS EN 12966-1, and MCE 2214B, for:

i) Colour C2

ii) Luminance (La) L3

iii) Luminance ratio (LR) R3

iv) Beam Width 83

Four Conspicuity lanterns shall be integral to the sign face and shall be either red or amber as appropriate to the message being displayed. When the lamps are on, they shall operate in alternating flashing pairs, top and bottom. The lamp flash rate shall be not less than 60 or more than 90 flashes per minute.

Sign Type	Road speed	'x' Height	Aspect ratio	Nominal sign size	Conspicuity lantern size
A	30 mph	100mm	0.5	1500mm x 1000mm	125mm
B	40 mph	150mm	0.5	2000mm x 1300mm	125mm
C	60 mph	200mm	0.7	4000mm x 2400mm	125mm
D	70 mph	250mm	0.7	4500mm x 3250mm	125mm

Pictogram shall comply with the sign diagrams in TSRGD 2016. As a minimum, the following pictograms shall be supported:

i) Diagram 554.2 Risk of ice or packed snow ahead

ii) Diagram 557 Slippery road ahead

iii) Diagram 562 Other Danger ahead

iv) Diagram 581 Side winds likely ahead

v) Diagram 584 Queue ahead

vi) Diagram 7001 Roadworks or temporary obstruction ahead

The display modules of the signs shall be designed, constructed and installed in such a manner as to permit individual modules or groups of modules to be easily removed for maintenance. It shall also be possible to remove and replace easily the front transparent screen should this be damaged.

4. Sign Housing

The sign shall communicate with the controller to report the operational status of the LEDs, environmental controls and power supplies within the sign for their correct operation and provide indications of any faults.

All doors to the sign housing shall be permanently attached by means of hinges and they shall be held in the open position by fixed pneumatic or hydraulic stays. Each door or opening shall be lockable requiring a key to gain access.

All sign display, control and communications equipment shall be contained within the sign housing.

The sign enclosure shall protect against dust and water ingress to IP56.

5. VMS Controller

For permanent VMS the controller shall be as described at Appendix 12/5 section 2.9

Series 1300 Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts

Numbered Appendices

Appendix 13/1 Road Lighting Columns and Brackets

1. Lighting Columns

1.1. Lighting columns and brackets shall meet the requirements of BS EN 40-5 and be manufactured from tubular steel unless otherwise stated in the Task Order.

Lighting columns dimensions shall meet the general requirements of BS EN 40-2 and shall have a design life of 50 years. All lighting columns and brackets shall carry a unique identification mark, which indicates the name of the manufacturer, year of manufacture and an identification number to enable details of the column and bracket to be determined throughout the life of the column. This information shall be clearly visible after erection of the column.

All columns of a like height and for a like bracket arrangement shall be identical in construction. Cranked root columns shall carry a plate permanently fixed to the column shaft warning of danger when excavating due to a non-standard foundation.

Cable entry slots shall be 50, 60 or 70mm x 150mm.

The column base to shaft joint shall be of swaged and welded construction with an internal centralising washer.

1.2. Base Compartments and Door Openings

Base compartment shall have a minimum opening of:

500 mm x 100 mm for 5 m and 6 m columns.

600 mm x 115 mm for 8 m, 10 and 12 m columns.

Door openings shall be free from irregularities and burrs

A full-length baseboard at least equivalent to the door size of non-hygroscopic hardwood shall be provided and fixed in the base compartment The baseboard shall be positively secured to the column by two flush fitting stainless steel screws.

In the interest of safety the door opening shall be positioned parallel to the bracket on the side away from the direction of approaching traffic. (BS EN 40-2).

1.3. Doors

The door shall be pre-assembled at the factory and be [of a twin clamp fixing arrangement (top and bottom) flush fitting with welded weather-strips to the internal surface of the door aperture] or [of overlapping design to the door opening with a top locking mechanism and bottom door latch]. Key lock design as specified by the Employer.

1.4. Earthing

Earthing terminals shall be provided on all lighting columns.

The earthing terminal or the column or baseboard adjacent to the terminal shall be distinctly and durably marked with the 'earth' symbol ⏚

The attachment of the fixed part of the earthing terminal shall be designed and executed so as to prevent it from being rotated when the clamping part is tightened. The clamping part shall be designed so as to avoid any damage to the earth conductor or its insulation during tightening or loosening.

Door and column to be connected by a suitable length of 10 mm^2 multi-strand flexible tri-rated green/yellow insulated cable to BS 6231, lugged and double crimped at both ends and fixed by M8 brass earth bolts, 2 nuts and 2 washers. The earth wire shall be of a length to allow the door to seat easily on the ground.

Double door columns where specified shall require 2 backboards, with the earth terminal at the lower opening.

1.5. Brackets

Bracket arms shall be of tubular steel and have an incline of 5^o constant rise with a 100 mm spigot 42 mm Ø tube [where specified brackets shall incorporate a welded web and may be specified with alternative tilts]

The method of bracket attachment to the column shall prevent its rotation by wind and turbulent conditions and shall include a positive alignment device, with at least three stainless steel clamping screws which shall be flush with the outside wall of the column when tightened and capable of accurately lining up the bracket.

There shall be no sharp edges within the columns or bracket arms which could damage electrical cables either during installation or while in service and anti-chafing shall be welded where the cables change direction from the horizontal to vertical within the bracket.

Bracket sleeves providing side or post top entry shall fit over a reduced diameter spigot to maintain the smooth parallel line between the column and the bracket arm. The bracket arm will be held in position with M8 stainless steel screws allowing fixing in any one of four 90^o positions relative to the door.

1.6. Finishes

All columns shall be hot dipped galvanised to BS EN ISO 1461 and shall be free from imperfections including porosity. Galvanising shall be fettled and rasped to remove all spikes and sharp edges and leave a smooth finish prior to paint application.

Column roots and flange plates shall be glass flake based paint both internally and externally to a height of 250mm above ground level with primer and 2 pack epoxy glass flake thickness of 200 or 250 microns total thickness.

Each Employer may have its own specific protective coating specification which may be applied either at the factory or on site which will be specified at the time of ordering.

Columns supplied under this specification will be periodically checked for compliance with the specifications. Columns may be required to be inspected at works during manufacture.

1.7. Column Design and Fabrication

Designed to BS EN 40, BD94/07 & PD6547 2004 (Section 8 of BD94/07 not applicable)

The stress and deflection calculations for columns and brackets shall be based on the maximum bracket projection with a lantern, on each bracket arm, with projected area, length and weight as shown in Table 13/1.

Table 13/1

Nominal Height	Bracket Projection	Lantern Weight	Projected Area
5 m	post top	12 kg	0.12 m^2
6 m	post top	12 kg	0.12 m^2
8 m	post top	16 kg	0.16 m^2
10 m	post top	20 kg	0.20 m^2
12 m	post top	20 kg	0.20 m^2
5 m	0.5 m	12 kg	0.12 m^2
6 m	0.75 m	12 kg	0.12 m^2
8 m	1.00 m	16 kg	0.16 m^2
10 m	1.50 m	20 kg	0.20 m^2
12 m	1.50 m	20 kg	0.20 m^2

1.8. Column performance requirements for all columns, PD 6547.

Mean hourly wind speed V ref	22.0 m/s
Site altitude	132 m
Topography factor	1.0
Terrain category	II group A columns III group B columns
Rationalized wind loading	Extra Light
Partial safety factors	Class B
Deflection class	Class 3
Foundation data	good / average / poor
Road signs, if required	Class C
Fatigue requirements	BD94/07

Bracket(s), luminaire(s) details as Table 13/1 plus attachments as detailed below

1.9. Designing for Attachments

Columns with an 8m or greater nominal mounting height shall be designed to accept traffic sign(s) with a gross surface area of 0.3m^2 mounted with a clear headroom of 2.4m, in addition to the following:

a) A banner of windage no greater than 2.0m x 0.8m with shape coefficient of 1.8.

b) Festive decorations shall have a maximum solidity and shape coefficient of 30% and 1.2 maximum with a maximum windage of 1.0 m^2 and weight of 20 Kg located at a height of 7 metres above ground level (centre of decoration) with a maximum off-set (middle of column to middle of decoration) of 0.5 m.

c) Double 0.65m dia hanging baskets each offset by 0.525m having a windage of 0.3m^2 a weight of 70kg and mounted to provide a clear headroom of 2.5m.

Note:

Items a) and c) may be installed concurrently,

Item b) shall not be installed when items a) and c) are in place.

Where columns of 8m and above are specifically required to support CCTV cameras or Wi-Fi equipment, then the requirements for attachments in addition to traffic signs with a gross surface area of 0.3m^2 mounted with a clear headroom of 2.4m of shall be:

CCTV

d) a CCTV camera unit of maximum windage of 0.3 m^2, weight 5 kg, mounted up to 7m above ground level with a maximum off set of 0.3 m, where the column shall deflect no more than + or – 10mm under a 45km/h wind loading.

Wi-Fi Equipment

e) a Wi-Fi container, of maximum windage of 0.2 m^2, weight of 3kg mounted up to 7m above ground level, allowing for a 20mm hole in the column shaft to facilitate provision of electrical power.

Columns with a nominal mounting height less than 8m shall be designed to accept traffic sign(s) with a gross surface area of 0.3m^2 mounted with a clear headroom of 2.4m, in addition to the following:

f) A banner of windage no greater than 1.4m x 0.4m x 1.8 shape coefficient.

g) Double 0.45m dia hanging baskets each offset by 0.45m having a windage of 0.35m^2 a weight of 24kg and mounted to provide a clear headroom of 2.5m.

Note:

Items f) and g) may be installed concurrently

1.10. Foundations

Columns shall be planted, cranked root or flanged, designed and fabricated to BS EN 40 and Clause 1302.

1.11. General

Manufacturer's recommendations shall be adhered to regarding method of offloading, storing and assembling the columns and brackets and for securing the brackets to the columns

All components and brackets supplied shall be manufactured by a company accredited under the quality assurance scheme BS EN ISO 9001 and the *Contractor* shall, when requested to do so, supply to the *Employer* a copy of the appropriate accreditation documentation prior to any purchases or erection of lighting columns and brackets under the contract. CE certification shall be provided.

2. Retention Sockets

Retention sockets shall be available in the following options for all base diameters of street lighting columns, traffic signal poles, and sign posts:

a) Standard 90° bend (Variable depths)

b) T-section (Various depths)

c) Shallow foundation (≤300mm)

d) Non-cabled foundation (no duct entries)

Appendix 13/2 Instructions for Completion of Column and Bracket Data Sheets

1. General

1.1 When information is not required, a dash shall be inserted in the appropriate boxes.

1.2 Where a Data Sheet is amended it shall be given a new revision number with a date.

1.3 The revision number shall be consecutive letters of the alphabet, commencing with 'A'.

1.4 The date of the revision shall agree with the date of the *Contractor*'s signature.

1.5 Columns and brackets shall be steel or other acceptable material agreed by the *Employer*.

1.6 The material design strength shall be the minimum specified in the design. Where more than one material is used, values for all materials shall be given.

1.7 All relevant entries shall be made on the Data Sheet before the document is certified by the *Contractor*.

2. Column Data

2.1 The column nominal height shall be selected from those specified in BS EN 40-2, as appropriate, or otherwise as agreed with the *Employer*.

2.2 The number of door openings shall agree with the manufacturer's drawing.

2.3 The cross-section of the base compartment shall be stated.

2.4 The acceptable positions of bracket arms relative to the door position shall be indicated on the diagram. Where all positions are acceptable, the box 'ANY' shall be ticked.

2.5 Where concrete is required around the planted base to accord with sub-Clauses 1305.3 and 1305.4, the minimum diameter shall be entered.

2.6 For flange bases, all forces and moments necessary for the designing of the foundations shall be given.

2.7 The corrosion protection system used on the column when new shall be recorded. Where additional steel is provided for sacrificial purposes the amount shall be recorded.

2.8 The signs and attachments, surface area, eccentricity from the centre line of the column to the centre of area of the sign, and height above ground level to the centre of area of the sign shall be stated.

3. Bracket Data

3.1 The bracket arm reference, its length and maximum weight and windage area quoted shall be based on the most adverse loading on the bracket when it is attached to the column.

Data Sheet

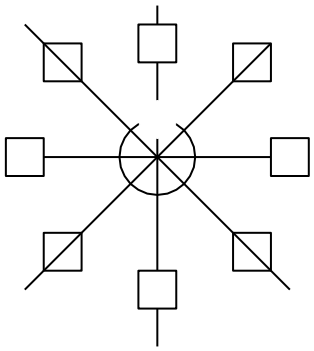
Name of Column Manufacturer	Data Sheet No	
	Revision No	
	Date	

Site Location	

Column Reference No	
Manufacturer's drawing N^{o}	
Nominal Height	
Material	
Material design strength N/mm^2	
N^{o} of door openings	
Door opening height	
Door opening width	
Base compartment height	
Base compartment width	
Base compartment depth	
Corrosion protection	

Acceptable positions of bracket arms relative to door positions

Door Opening



	Any

Foundation

Additional sacrificial steel thickness - 250mm above ground to bottom of column	

Planted base		Flanged base	
Planting depth		Size	
O/S diameter		No of bolts	
Cable entry slot size		Bolt hole diameter	
Concrete surround dimensions		Bolt spacing (mm)	
Crank root offset		Design load / bolt	

Bracket

Bracket reference		Max lantern windage	
Projection		Max lantern weight (kg)	

Series 1350 Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts

APPENDIX 13/50 – ROAD LIGHTING COLUMNS CONDITION ASSESSMENT

The *Contractor* shall record the visual assessment of the condition of the various elements of lighting columns in accordance with the descriptions of Excellent, good, Fair or Poor shown in table 13.50.

For the purposes of table 13.50 the ‘areas’ are

A. Column base compartment, door and flange plate
B. Shaft and any attachments
C. Bracket arm(s)
D. Fold down column mechanism

For clarity where embellishment kits are fitted the condition of the base compartment shall be assessed by reference to the condition of the column, not the embellishment kit.

The *Contractor* shall electronically transfer the assessment to the *Client’s* Asset Management Information System to build a picture of the current condition of the lighting stock, together with an assessment of its deterioration over time and a projected investment programme for asset renewal.

Table 13.50

Area	Code	Inspection	No	Excellent 1	Good 2	Fair 3	Poor 4
Date of Inspection							
A	B	Flange plate condition	XX	No indication of corrosion on root or bolts	Minor internal corrosion and signs of bolt corrosion	Layers of rust within parental metal or bolts corroded	Support leaning of structurally damaged
	C	Base compartment condition	XX	No indication of corrosion on base and protective root coating in tack	Minor internal corrosion on base and protective root coating fading	Layers of rust within parental metal on base and no root protective root coating or poor foundation	Layers of rust with parental metal, support leading or structurally damaged.
	D	Door opening condition	XX	Sound aperture	Minor signs of corrosion	Aperture showing signs of stress. splits	Aperture split
	E	Base compartment shoulder condition	XX	Sound weld no signs of corrosion or stress	Paint loss but sound metal work	Minor signs of corrosion	Welds showing signs of cracks and corrosion/ distortion.
	F	Internal compartment condition	XX	No indication of corrosion	Minor internal corrosion	Layers of rust within parental metal / below ground level	Layers of rust within parental metal thin walls
B	G	Shaft	XX	Sound external, no rust indication or paint in good condition	External rust spots or paint beginning to flake	25% external rust cover or paint flaking	60% external rust cover or structurally damaged.
	H	unauthorised attachment (yes / no)		XX	XX	XX	XX
C	J	Bracket / shaft interface	XX	Sound and sealed spigot attachment	Minor signs of corrosion or loose shaft joint	Missing grub screws or key way, bracket not aligned	Extensive cracking around grub screws or signs of corrosion from missing seals
	K	Elbow / web condition	XX	Sound	Minor signs of corrosion	Signs of stress / corrosion	Extensive stress, cracking
D	L	Fold down column Hinge point		Sound hinge point.	Minor signs of corrosion around the hinge point.	Layers of rust within parental metal, corroded attachment point.	Extensive cracking / corrosion around hinge point.

Series 1400 ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS

Numbered Appendices

Appendix 14/4 - Feeder Pillars

1 All feeder pillars shall be black (RAL 9005) or signal grey (RAL 7004), doors shall be secured with a tri-key cam lock.

2 Nominal sizes (mm) of feeder pillars shall be as follows

Type	Height	Width	Depth	Steel Thickness	Door
1	750	300	170	3	single
2	750	520	230	3	single
3	1200	650	300	3	single
4	1500	1500	450	5	double

Each supported by a 300mm planted root and manufactured from either

a) Powder coated CR304 / CR316 stainless steel; or

b) Glass Reinforced Plastic

3 Unless the accepted design provides an alternative solution complying with BS 7671, feeder pillars shall include the provision of an earth rod or lattice copper earth mat to BS EN 13601.

Series 2000 Waterproofing for Concrete Structures

Numbered Appendices

Appendix 20/1 Waterproofing for Concrete Structures

General

1 New waterproofing systems permitted for use on highway structures shall generally be a proprietary seamless liquid applied membrane system for concrete bridge deck waterproofing complying with Series 2000 and satisfying the requirements of DMRB Standard BD47 “Waterproofing and Surfacing of Concrete Bridge Decks” and IAN96/07r01 “Guidance on Implementing Results of Research on Bridge Deck Waterproofing”.

2 Prior to the *Client* accepting the proposed system, the *Contractor* shall supply to the *Client* the technical information on the product from the manufacturer. The product shall have BBA certification or equivalent.

3 Additional requirements for the repair and replacement of existing bridge deck waterproofing shall be as described in Clause 2008SR.

4 Additional requirements for non-destructive testing of waterproofing membranes shall be as described in Clause 2012AR.

5 Waterproofing shall only be applied when the ambient temperature is 4^{o} C and rising or above 4^{o} C. The *Contractor* shall allow for providing a temporary enclosure system to ensure the application of waterproofing membrane is not affected by inclement weather.

Protection Layers to Waterproofing

6 The permission of the *Client* shall be obtained before plant, equipment or traffic is permitted onto the waterproofing system.

7 Where it is necessary for plant, equipment or traffic to stand or travel on the waterproofing system, suitable temporary protection shall be provided to the satisfaction of the *Client*.

8 The minimum requirements the waterproofing system has to meet are as follow:

Adhesion Requirements	**Temp (°C)**	**App 20/1 Requirement In All Situations**
Shear bond test surfacing to waterproofing	-10	≥ 1.00 MPa
	23	≥ 0.50 MPa
	40	≥ 0.20 MPa
Tensile bond surfacing to waterproofing	23	≥ 0.50 MPa
Tensile adhesion test of waterproofing to concrete	23	≥ 1.0 MPa

Series 3000 Landscape & Ecology

Numbered Appendices

APPENDIX 30/2 Total Weed Control

1. The *Contractor* shall control all infestations of injurious weeds within the *Affected Property* The *Contractor* shall programme weed control measures such that there is a reduction in the occurrence and extent of injurious weed species each successive year.

APPENDIX 30/5 Grass Seeding, Wildflower Seeding and Turfing

Seed Mixtures

Seed Type 1 (Close Mown / Parkway / Amenity Areas) Rate of spread of 30 g/m^2	
Species	% by weight
Festuca rubra ssp. rubra	45%
Festuca rubra ssp. comutata	40%
Agrostis tenuis	15%

Seed Type 2 (General Grass Areas) Rate of spread of 10 g/m^2	
Species	% by weight
Agrostic tenuis	20%
Festuca rubra ssp. Rubra	15%
Festuca rubra ssp. Litoralis	15%
Festuca longfolia	15%
Cynosorus cristatus	10%
Alopecurus pratensis	10%
Poa pratensis	13%
Lotus corniculatus	2%

Seed Type 3 (Balancing Ponds / Ditches / Wetland areas) Rate of spread of 10 g/m^2	
Species	% by weight
British Seed Houses Mix WFG9	100%

Seed Type 4 (Conservation/Wildflower Mixture) Rate of spread of 5 g/m^2			
Species	% by weight	Species	% by weight
Cynosorus cristatus	20%	Crysanthemum leucanthenum	2%
Alopecurus pratensis	16%	Centaurea nigra	2%
Festuca rubra ssp. Litoralis	16%	Galium verum	2%
Festuca rubra ssp. commutata	12%	Achillea millefolium	2%
Agrostis castellana	12%	Silene alba	2%
Trisetum flavescens	4%	Anthyllis vulneraria	2%
Medicago lupulina	2%	Rhinanthus minor	2%
Ranunculus acris	2%	Vicia satira	2%

Hydraulic Seeding

The *Contractor* shall carry out grass seeding or reinstatement by hydraulic mulch application where instructed, the hydraulic much seeding mixture shall comprise:

Hydraulic Mulch Application /m^2	Constituents
Clean warm water	4 litres
Finely-shredded peat-free compost	120 g
Cellulose Wood Fibre	100 g
Alginure Soil Improver	50 g
Fertiliser (17:17:17)	40 g
slow-release fertiliser (11:29:9)	30 g
Soil stabiliser / tackifier	
Seed Mixture	15g

Seed Mixture Species	% by weight
Festuca rubra litoralis	25%
Festuca rubra commutate	15%
Poa pratensis	15%
Agrostis tenuis	10%
Agrostis castellana	10%
Cynosorus cristatus	10%
Westerwolds' Italian Ryegrass	7%
Lotus corniculatus	4%
Trifolium repens	2%
Medicago Lupulina	2%

Turf

Turf arising on site shall only be used when instructed by the *Client*.

No alternative to the method given in sub-Clause 3005.13 shall be used.

Turf shall be either good quality meadow turf free from pernicious weeds and rank grass or amenity grade turf with a maximum annual meadow grass content of 5% as required by the Task Order.

Establishment Cuts

The number of establishment cuts shall be sufficient to maintain a grass height of between 50mm and 100mm for a period of twelve months from completion of laying.

Grass cutting machinery shall be sharp and in good condition, sufficient to avoid pulling out young seedlings. All cuttings from the first cut shall be removed from site. When subsequent cutting takes place all cuttings shall be evenly spread to prevent damage to the growing grass. This applies particularly to grass cut during periods of dull or wet weather.

APPENDIX 30/6 Planting

Slow Release Granulated Fertiliser

Slow release granulated fertiliser with a nutrient status of N4: P18: K10: Mg 5.0 or N4: P19: K10: Mg 7.5, shall be incorporated as follows :-

Planting beds: 35 g / m^2 ;

Transplants/shrubs/climbers: 35 g / pit;

Feathered Trees, Standard Trees, Climbers: 60 g / pit;

Extra Heavy Standard Trees: 150 g / pit.

Anti-transpiration sprays, root dips, anti-desiccant soil additives

Anti-desiccants shall be used as a root dip for all bare root planting and incorporated into all hanging baskets. Any other anti-transpiration sprays, root dips or other form of anti-desiccants shall be instructed by the *Client*.

Time of Planting

The planting season for bare root and root balled plants shall be 1 November to 31 March.

No seasonal restrictions shall apply to the planting of cell and container grown plants although planting in summer months shall require frequent watering.

Bulbs shall be planted at the correct time of year for the species being planted.

Planting of Whips, Transplants and Shrubs into Pits or Trenches

For double hedges, plants shall be planted staggered diagonally opposite each other and each one quarter to one third in from the trench edge.

Plant Protector Guards

Strimmer guards shall allow growth of the tree without constriction. All other tubes and guards shall be instructed by the *Client* when required during or after planting and can comprise of:

Spiral Plastic Guard - Shall be a brown or green PVC cylinder, with a slit spiralling from top to bottom, and with a diameter of 38 mm and a height of 600 mm. Where spiral guards are used on forestry transplants or whips a 900 mm bamboo cane shall be inserted inside the guard.

Polythene Mesh Guard for Trees - Shall be circular brown or black extruded PVC with a mesh of 15 mm square, a height of 600 mm and a diameter of 75 mm, fixed with two releasable ratchet ties to a treated softwood stake 25 x 25 x 800 mm (pointed at one end), positioned within the shelter.

Polythene Mesh Guard for Shrubs - Shall be circular brown or black extruded PVC with a mesh size of 25 x 35 mm, a height of 600 mm and a diameter of 200 mm, fixed with four releasable ratchet ties to two treated softwood stakes 25 x 25 x 800 mm (pointed at one end) placed opposite each other, within the shelter.

Tubular Shelter for Trees - Shall be circular brown or green polypropylene (twin walled) with a perforated vertical line (to allow the shelter to burst). Shelters shall be 600 mm in height with a diameter of 120 mm, fixed with two releasable ratchet ties to a treated softwood stake 25 x 25 x 800 mm (pointed at one end), outside the shelter.

Tubular shelter for Shrubs - Shall be circular brown or green polypropylene (twin walled) with a perforated vertical line (to allow the shelter to burst). Shelters shall be 600 mm in height with a diameter of 200 mm, fixed with four releasable ratchet ties to two treated softwood stakes 25 x 25 x 800 mm (pointed at one end), positioned opposite each other, within a shelter.

Mulches: Ground Preparation

All planted areas shall be watered to field capacity before mulching.

Planting of Bulbs

Species	Bulbs / m^2	Planting depth
daffodils	50	100-150 mm
tulips	50	150 mm
anemone	50	50 mm
agapanthus	50	75 mm
crocus	100	50-75mm
bluebell	100	100-150mm
snowdrop	100	75 – 100 mm
large narcissus	50	150mm
small narcissus	100	100mm

Wildflower Plant Preparation and Planting

Wildflower planting shall not use mulch mats and may be undertaken on subsoil to reduce competition from weeds and grass.

Wildflower plants shall be grown for at least 6 months prior to delivery in P9 size pots. Wildflower plants shall be planted at a rate of up to 15 plants per square metre and the *Client* shall approve the layout before planting begins.

Replacement of Failed or Defective Plants

The period for which the *Contractor* shall maintain all planting in accordance with Clauses 3007, 3008, 3009 and 3010 is 12 months following certification by the *Client* that planting is complete.

The period for which the *Contractor* shall replace plants which are missing, have died or which in the opinion of the *Client* are failing to make satisfactory extension of growth shall be 36 months following certification by the *Client* that planting is complete.

APPENDIX 30/8 Establishment Watering

Sub-Clause	Location	Time Period / Frequency
3008.6	New Plants and planted areas	36 Months

APPENDIX 30/9 Establishment Maintenance for Planting

Sub-Clause	Location	Time Period / Frequency
3009.1	New Plants and planted areas	36 Months
3009.10	New Plants and planted areas	5 evenly spread through the growing season
3009.11	New Plants and planted areas	5 evenly spread through the growing season
3009.16	New Plants and planted areas	Every 28 days
3009.19	New Plants and planted areas	March, May, June and September
3009.20	New Plants and planted areas	Every 28 days
3009.23	New Plants and planted areas	Three years after planting

APPENDIX 30/10 Maintenance of Established Trees and Shrubs

Sub-Clause	Location	Time Period / Frequency
3010.1	As the Client's Scope	Duration of the contract
3010.2	As the Client's Scope	As the Client's Scope
3010.2	As the Client's Scope	As the Client's Scope
3010.2	As the Client's Scope	As the Client's Scope
3010.4(v)	As the Client's Scope	As the Client's Scope
3010.4(vi)	As the Client's Scope	As the Client's Scope
3010.8(x)	As the Client's Scope	As the Client's Scope
3010.12	As the Client's Scope	As the Client's Scope
3010.34	As the Client's Scope	As the Client's Scope

Hedge Maintenance

Growth is to be reduced to beyond the previously cut where it impairs safe use of the highway or where the hedge is causing nuisance or damage to third parties. In these situations, the extent of cutting and shape of the hedge shall be as instructed by the *Client*. Where there is little foliage at the base of the hedge, then the hedge shall be shaped with a taper to restrict dominant top growth and encourage regrowth at the base. To minimise browning of foliage, hedge cutting shall be avoided on hot sunny days.

Hedge laying operations shall be carried out only where instructed by the *Client*. The stakes used in hedge laying shall be hazel unless otherwise agreed with the *Client*.

Any gapping-up of laid hedges shall be instructed by the *Client*. If the gaps are a result of damage caused by the *Contractor*, then the *Contractor* shall undertake the planting and repair without reimbursement from the *Client*.

Tree Surgery

Tree size categories relate to the size and habit of the tree crown. Measurements shall be taken to the nearest whole metre.

Tree Height - shall be measured in metres from ground level to the apex of the crown.

Mean Crown Spread - shall be calculated by adding the measurements in metres of the spread of the tree's crown along the North-South and East-West axes and dividing the two, e.g. (10 + 14) ÷ 2 =12.

The branch density factor shall be 1.25 for species listed below and 1 for all other trees

Species with Heavy density factor

Carpinus species	Prunus cerasifera 'Nigra'
Crataegus species	Prunus padua and cultivars
Chamaecyparis species	Quercus ilex
Malus species	Quercus robur 'Fastigiata
Populus alba 'Fastigiata'	Sorbus species
Populus nigra 'Italica'	Tilia species
Prunus 'Armanagowa'	Taxus baccata

Tree Size Factor is calculated by:

Tree Height x Mean Crown Spread x Branch Density Factor = Tree Size Factor

Example: Tilia x europaea

18m x 12m x 1.25 Density Factor = Tree Size Factor 270

Tree size factors shall be used to determine the Tree Size Category as follows:

Tree Size Factor	Tree Size Category	Tree Size Factor	Tree Size Category
0-30	A	201-300	E
31-70	B	301-450	F
71-125	C	451 and over	G
126-200	D		

Trees to be crown lifted shall be instructed by the *Client*. The typical height to which trees shall be crown lifted is 5.5m over the carriageway, 3.0m over cycleways and 2.4m over footways. Crown lifting work shall allow for seasonal movement of branches and growth characteristics of the tree species to ensure sufficient clearance for 3 years. Variations of height for crown lifting may be instructed by the *Client* for site specific issues.

Trees to be crown thinned shall be instructed by the *Client* with the extent of pruning specified as a percentage volume of the crown to be removed.

Trees to be crown reduced and/or reshaped shall be instructed by the *Client* with the extent of pruning specified as a percentage of the crown size. Where pollarding is instructed by the *Client*, the pruning shall be back to the previous point of pruning and not remove the knuckles to ensure development of new shoots. When initial pollarding, the height of pruning shall be specified by the *Client*.

Tree Felling

When instructed by the *Client* to fell a tree, the *Contractor* shall use discretion to deploy either straight felling or sectional felling techniques. No tree shall be felled without instruction of the *Client*.

Treated stumps shall be cut to 1m in height unless the stump is to be immediately removed or otherwise agreed with the *Client*.

Untreated stumps shall be cut as close to ground level as possible, usually within 100mm of ground level.

Stumps shall be removed to timescales instructed by the *Client* and no later than 28 calendar days after felling, whichever is the sooner..

Thinning and Coppicing

Thinning works shall be instructed by the *Client* who shall confirm the location and extent of operations.

Thinning shall include all plants up to 250mm diameter measured at 1.3m above ground level. The quantity and species to be thinned shall be determined by the *Client*'s landscape management strategy for the plots.

For each plot, the *Client* shall instruct the percentage of thinning required, the species to be thinned/retained, coupe felling if appropriate, and any plot-specific measures required, eg edge treatment.

The *Contractor* shall not carry out any shrub clearance, formative pruning, crown lifting, brashing-up or single stemming to any plants to be retained, unless instructed by the *Client*.

The *Contractor* shall mark a representative sample of the plot or, where similar, a single plot of multiple plots, to be thinned of the plants proposed to be removed, in accordance with the percentage species, size and method(s) for disposal of arisings instructed by the *Client*. The *Contractor* shall then, where required by the *Client*, jointly inspect the plot prior to commencing operations, and agree any amendments considered necessary. Where considered necessary by the *Client*, the *Contractor* shall mark all plants in the plot to be removed, and allow 14 calendar days for these to be inspected and approved by the *Client* prior to commencement of works.

APPENDIX 30/11 Management of Water Bodies

Balancing Ponds

The Management of Waterbodies shall be undertaken at the locations described in the Client's Scope.

Series 3300 Inspections and Surveys

Numbered Appendices

Appendix 33/2 Trial Pit Log Template

Trial Pit Log Template

Project Name:			
Date:		Time:	
Weather:			
Supervisor:			

Trial Pit no : Trial Pit Dimension: Length x width x depth	Location (Chainage / reference): Carriageway Lane and offset (e.g. nearside lane edge) : Condition of surface : (Cracked/Defect) Reason of Excavation: Distance of nearest edge to Kerb Face: DCP testing : Yes/No PAK Marker Test : Yes/No		
Construction :	Material	Thickness (mm)	Comments
Layer 1:	E.g. ASP	65	
Layer 2:	E.g. Sand	30	Suitable*
Layer 3:	E.g. Concrete	100	
Layer 4:	E.g. Type 1 Subbase	150	Waterlogged**
Layer 5:	E.g. Made Ground		Clay/Silt/
SERVICES:	Yes/ No		
DEPTH AND TYPE OF SERVICES: (IF ANY)	Owner	Depth (mm)	Distance from Kerb Face
Service 1			
Service 2			
Service 3			
Service 4			
Service 5			
Remarks			

All text in red and examples *are for guidance and could be removed from the actual trial pit log.*

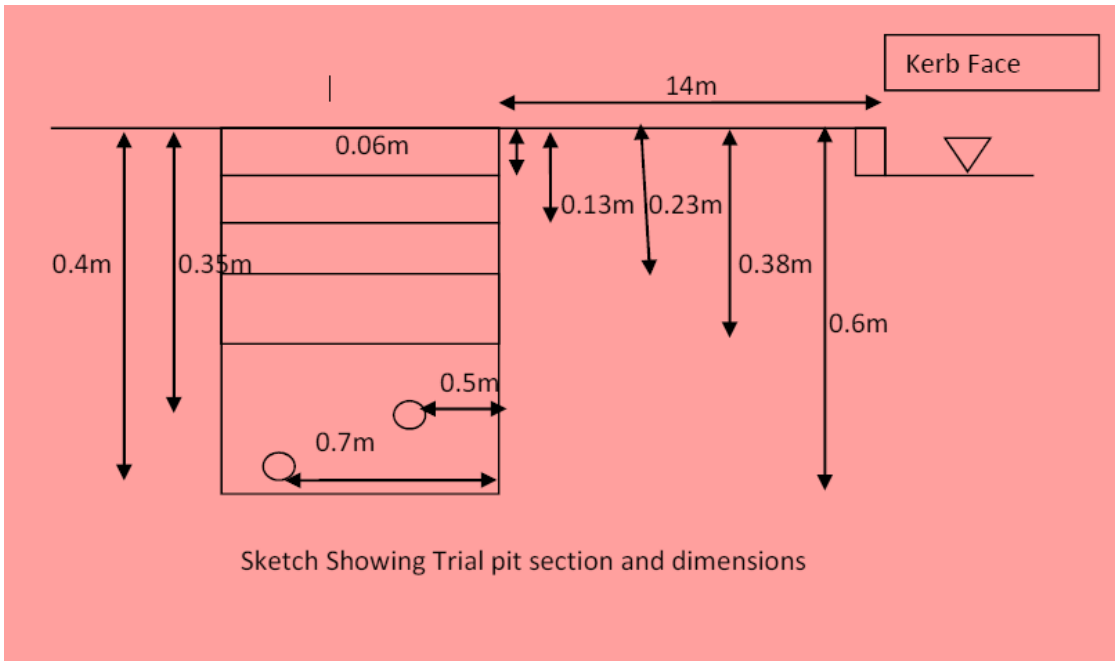
- **If a construction layer is suspected to be in poor condition, photographic evidence and explanation must be provided in the remarks section.*
- ***If the sub-base or subgrade is suspected to be in poor condition, a simple soil condition classification could be used by pressing the soil to estimate CBR using guidance given in DBMR HD 39/16 table 2.2 .See table below for guidance.*

Soil Condition	CBR
Very soft, exudes between fingers when squeezed	Less than 1%
Can be moulded by light finger pressure	Between 1 and 2%
Can be moulded by strong finger pressure	Between 2 and 3%
Can be indented by a thumbnail but not by a thumb	More than 6%

Table 2.2 Rough Guide to CBR

Example 1 – Trial pit construction close up showing legible measurement and construction layers

Figure 2 – Trial pit construction and stats services



Photos and Measurements

Insert Photograph

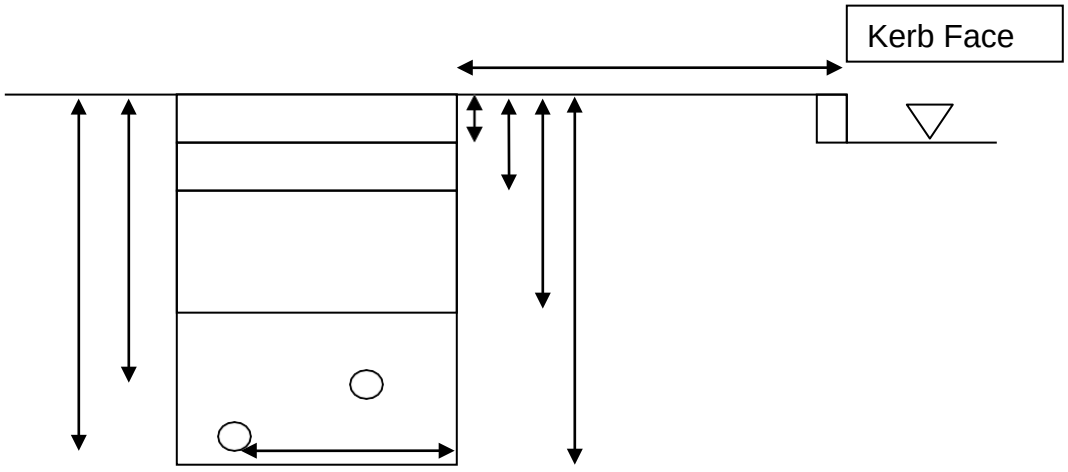
Photo 1: Trial pit Construction

Insert Photograph

Photo X: Trial Pit Construction

Insert Photograph

Photo X: Trial Pit Statutory Services



Sketch Showing Trial pit section and dimensions

Series 3350 - Investigations & Surveys

Numbered Appendices

Appendix 33/1A	Safety Inspection: Frequencies
Appendix 33/1B	Safety Inspection: Recording hazards and defects
Appendix 33/1C	Assessment of Risk
Appendix 33/7	Tree Defects
Appendix 33/8	Tree Condition Data Sheets

Appendix 33/1A Safety Inspection: Frequencies

The *Contractor* shall carry out safety inspections on the network lengths identified in the *Client's* Scope at the frequencies shown in table 33.1.

Table 33.1

	Risk Category / hierarchy		Frequency
Carriageways	R1	Very High Flows	1 week
	R2	High Flows	1 month
	R3	Medium Flows	1 month
	R4	Low Flows	1 month
Footways	F1	High Pedestrian Density	1 week
	F2	Medium Pedestrian Density	1 month
	F3	Low Pedestrian Density	3 months
Cycling Facilities	C1	High Cycle Flows	1 week
	C2	Medium Cycle Flows	1 month
	C3	Low Cycle Flows	3 months
Water Bodies	Balancing Ponds		1 month
	Culverts		6 months

Appendix 33/1B Safety Inspection: Recording hazards and defects

During safety inspections the inspector shall record hazards or defects which pose a risk to highway users. The following list of defects is provided for guidance and is not exhaustive. Such defects, including those of lesser significance than those listed below, shall be recorded if the inspector considers them to pose a risk or to be appropriate for recording and monitoring.

This information is used to inform defect risk assessment, to track defect progression, and where necessary, to flag defects for more regular inspection.

1. Carriageway

a) A pothole 20mm or deeper over 100cm^2 or more within 1.5m of the kerb or within a formally marked cycle lane
b) A pothole 30mm or deeper over 100cm^2 or more elsewhere
c) Spalling concrete 20mm or deeper over 400 cm^2 or more
d) Crowning of 40mm or more over a 3m length
e) A depression of 40mm or more within a 1m length or 25mm or more within a 300mm length
f) Rutting of 40mm or more
g) A longitudinal surface opening or crack 20mm or wider, 40mm or deeper and 500mm or longer
h) An oil or diesel spill over 1m^2

i) Missing or defective anti-skid surfacing over 1m^2
j) Standing water 10mm or deeper over 500mm in width adjacent to the kerb or 20mm or deeper over 1m^2 or more elsewhere
k) Debris, building materials, abandoned vehicles or other obstruction likely to create a hazard
l) Inadequate signing or guarding of works

2. Pedestrian Crossing

a) A trip of 20mm or more

3. Footway

a) A trip of 20mm or more
b) A pothole 20mm or deeper over 100cm^2 or more
c) A rocking slab or block with 20mm or more movement
d) A gap or crack 20mm or wider, 20mm or deeper and 200mm or longer
e) Damaged, misaligned or defective tactile paving likely to create a hazard
f) Standing water 10mm or deeper over 1sqm or more
g) Cellar flaps, access doors, vents or skylights likely to create a hazard
h) Damaged, misaligned or defective street furniture likely to create a hazard
i) Height clearance less than 2.1m to footway below signs or overhanging trees or vegetation
j) A tree base 20mm or more below footway level
k) A damaged or defective tree grid likely to create a hazard
l) Advertising, scaffolding, hoarding, building materials, vegetation or other obstruction likely to create a hazard
m) Inadequate signing or guarding of works
n) Missing riverside life preservers.

4. Shared Path/Cycle Track

As for footway but
a) Height clearance less than 2.5m to cycle path or cycle track below signs or overhanging trees or vegetation
b) A longitudinal surface opening or crack10mm or wider, 40mm or deeper and 500mm or longer
c) An oil or diesel spill over 300mm diameter
d) Gully grating unsuitable for cycling
e) Surface covered by slippery leaves

5. Kerbing

a) A unit dislodged by 50mm or more horizontally
b) A unit sunk by 20mm or more compared to an adjacent unit
c) A unit rocking with 20mm or more of movement
d) A missing unit

6. Ironwork

a) A broken or cracked cover likely to create a hazard
b) A worn or polished cover likely to create a hazard

c) A missing cover
d) A rocking cover or frame likely to cause a hazard or noise nuisance
e) Ironwork sunk or projecting by 20mm or more
f) Fluid discharging and likely to create a health or safety hazard
g) A missing gully grating
h) A blocked gully likely to create a hazard
i) A broken or cracked gully grate likely to create a hazard

7. Grass verge

a) Rutting of 75mm or more
b) Inadequate signing or guarding of works

8. Road Markings

a) 30% or more missing, faded or worn over a 1m length

9. Traffic Signals, Lighting, Bus Stops, Bus Shelters, Signs, Bollards, etc

a) A damaged, misaligned or defective item likely to create a hazard
b) A missing item likely to create a hazard
c) Obscured, dirty or faded items likely to create a hazard
d) Exposed wiring
e) An open or missing door protecting electrical apparatus
f) A traffic signal lamp failure
g) Soiled or malfunctioning drinking fountain

10. Fencing, Safety Fencing and Barriers

a) A damaged, misaligned or defective item likely to create a hazard
b) A missing item likely to create a hazard

11. Trees and Vegetation

a) Obstructing visibility of signs or sight lines
b) Obstructing passage in use of the highway
c) Dead, diseased or infected trees or branches

12. Highway Structures

a) A damaged, misaligned, loose or defective item likely to create a hazard (eg expansion joint)
b) Severe cracking or spalling of concrete
c) Missing items or any evidence of tampering with security features
d) Inadequate signing or guarding of works

13. Water Bodies

a) Culverts - An accumulation of rubbish, debris or any other material at the mouth of the culvert likely to create a flooding hazard
b) Balancing Ponds – Insecure or damaged fencing, missing or obscured hazard warning signs, fly tipping.

14. Pedestrian Subways

a) Lighting damaged or not functioning
b) Wall tiles missing or damaged
c) A trip of 20mm or more
d) A pothole 20mm or deeper over 100cm^2 or more
e) Damaged stair treads
f) A gap or crack in the floor 20mm or wider, 20mm or deeper and 200mm or longer
g) Standing water 10mm or deeper over 1sqm or more
h) A handrail loose or missing.

15 Obstructions, prevailing hazardous situations or activities introduced by third parties on, over or adjacent to the highway. Such circumstances may include, but are not limited to:-

a) Dead or diseased trees within falling distance of the highway
b) Vegetation blocking the footway or obstructing visibility at junctions or traffic signs etc.
c) Unlicensed building materials obstructing the highway
d) Obstruction of headroom or hazards from over-sailing awnings
e) Defective retaining walls
f) Defective building parapets,

Appendix 33/1C Assessment of Risk

The inspector shall assess defects using the risk based approached described in this appendix, supported by appropriate recognised guidance on risk based inspections for highways.

The inspector shall assess the risk a hazard or defect poses to highway users and determine the appropriate response category. A risk is assessed by evaluating the consequence rating and the likelihood rating where:

a) Consequence is the outcome (e.g. damage, injury or inconvenience) should a road user encounter a hazard or defect.

b) Likelihood is the probability (or chance) that a road user (e.g. pedestrian, cyclist or motorist) will encounter the hazard or defect.

Consequences

Consequences are evaluated by assessing the extent of damage, injury or inconvenience likely to be caused given the hazard or defect is encountered. Factors that shall be taken into account when assessing consequences include: speed, road alignment, adjacent facilities (e.g. schools, hospitals), traffic volume, and vulnerability of the road user, e.g. cyclists. It should be noted, that although some factors (e.g. traffic volume) are used to inform likelihood they may also influence consequence.

Consequence shall be rated using the scale in Table 33.2; examples of the consequence are provided; these shall be supplemented by appropriate national guidance and inspector training.

Table 33.2

rating	Assessment	Example
1	little or negligible consequence	No safety impact, minor aesthetic impact or minor inconvenience
2	minor or low consequence	Personal minor injury, poor aesthetics and causing some inconvenience
3	moderate consequence	Personal injury and/or moderate network disruption
4	major, high or serious consequence	Serious personal injury and/or fatalities and/or major network disruption

Likelihood

The likelihood is derived from the hierarchy category (Appendix 33/1A) which takes account of the type and number of users. This is adjusted by the safety inspector / person assessing the risk, to take account of the specific location of the defect and road user exposure to it.

Table 33.3 shows the highest likelihood rating that a defect will normally attract on different elements of the network. For example, the highest likelihood rating for a defect on a footway with Medium Pedestrian Density (F2) would be 3 (Medium likelihood). This is the highest likelihood rating normally attributed to the defect, but local location factors, when appropriate, shall be used by the safety inspector to adjust the likelihood rating.

Table 33.3

		Hierarchy		
Likelihood Rating	Assessment	Carriageway	Footway	Cycle Track
1	Very low likelihood			
2	Low likelihood		F3	C3
3	Medium likelihood		F2	C2
4	High likelihood	R2, R3, R4	F1	C1
5	Very high likelihood	R1		

The inspector shall assess if the location of the defect influences the likelihood of it being encountered; for example, if a defect is located under a bench, or close to the built-up edge of the footway it may be considered to have a lower likelihood of being encountered. The location factor may be used, for example, to adjust the likelihood as following:

a) High likelihood that defect will be encountered due to location, e.g. defect in centre of a footpath, cycle route or wheel path – no change to the rating from Table 33.3.

b) Medium likelihood that defect will be encountered due to location, e.g. defect close to street furniture/tree/kerb – reduce rating from Table 33.3 by one or more categories as assessed by the inspector (but not lower than Very low likelihood).

c) Low likelihood that defect will be encountered due to location, e.g. defect under a bench or

close to a building – reduce rating from Table 33.3 by two or more categories as assessed by the inspector (but not lower than Very low likelihood).

Risk

The risk score determines the defect response as shown in Table 33.4. The risk score is the product of the consequence rating and the likelihood rating, so has a range from 1 to 20.

The person undertaking the risk assessment shall pay particular attention to any individual hazards or defects that they consider expose road users to any immediate risk to life or serious/severe injury and are therefore unsafe to be left without intervention. Such defects shall have their risk factors escalated in order to achieve a risk rating appropriate to the situation, irrespective of the risk rating derived from tables 33.2 and 33.3.

Table 33.4

Risk factor	Category of defect	Response
16 or 20	ECO*	Attend and take appropriate action within 1 hour for defects affecting principal road** carriageways or High Pedestrian Density footways and within 2 hours for all other Client's Property within the Core Service Area.
10 to 20	Cat 1	Make safe or complete temporary repair within 24 hours and permanent repair within 7 calendar days
6 to 9	Cat 2H	Complete permanent repair within 7 calendar days
3 to 5	Cat 2M	Complete permanent repair within 28 calendar days or where specifically agreed by the Client continue to monitor the defect.
1 or 2	Cat 2L	No response required

* Emergency Call Out

** Classified 'A' roads.

Appendix 33/7 Tree Defects

Tree defects shall be recorded using tables 337.1 and 337.2 as appropriate, with additional free text in 'tree defect comments' to give specific detail such as the size, location and/or extent of defects. Up to 3 of the most significant defects shall be taken from the pick lists. Where more than 3 tree defects are present, the additional tree defects shall be recorded in the free text 'tree defect comments' field. Below are some specific points of guidance to ensure consistent collection of data:

Deadwood – This shall only be recorded as a defect against a tree where the volume (size and/or frequency) of deadwood within the tree crown is significantly more than would typically be expected of a healthy tree of the same species. Comments shall state the approximate frequency and size of deadwood.

Cavities – The location and extent of these shall be recorded. The type of cavity can also be recorded such as whether it results from poor pruning that cannot occlude, historic impact damage or wet cavities with or without pockets of water.

Past husbandry – This defect item shall be used where past works require either monitoring or remedial actions. Examples include proactive works such as cable bracing or poor past husbandry such as lions tailing, flush cuts and pruning stubs.

Vehicle/impact damage – This defect shall be used where a high-sided vehicle has damaged the main stem or limbs of a tree. Within comments it shall be stated where on the tree the damage has occurred and its extent, e.g. 5m roadside 50cm diameter heartwood exposed, or base to 1m south side bark removed.

Low branches – Clearances shall be 5.5m over carriageways, 3.0m over cycleways, and 2.4m over footways

Empty tree pit/missing tree – This shall be recorded where there are empty tree pits on the highway or where tree stumps have been encountered. When recorded in the defect notes, a description to clarify the problem shall be made.

Young tree/planting defects – Examples of this defect include leaning young trees, vandalised or damaged trees, vandalised or damaged stakes and ties, or trees showing transplant shock/drought stress.

Street furniture interface – Where foliage of the branches of the tree obstructs or interferes with other street furniture, such as street lights or signs, or where trees are very close to structures, such as houses, so that pruning is necessary to remediate the problem.

Structural weakness (specify) – This shall be used to record the presence of other structural defects not covered by other defects; this may include compression forks and crossing branches among others. When recorded, details shall be given in the comments field.

Pathogenic disorders (specify) – This field shall be selected when fruiting bodies of decay fungi are present. Also covered by this defect are other pests and diseases and, where present, the species shall be recorded in the comments field.

Any other dysfunction (specify) – This field item shall be used sparingly and only when the observed defect does not fit into others. When recorded, details of the defect shall be recorded in the comments field.

ISA Risk rating shall be presented as a score between 3 and 12 based on the ISA methodology (Matheny and Clarke (1994) “A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas” 2nd Edition). This risk rating shall be calculated before data is entered to AMIS.

Bat potential shall be recorded as:

Low - Unlikely to be habitat suitable for bats. An example of this would include areas with trees at an early stage in growth cycle and containing either none or limited cracks, cavities, crevices or ivy.

High - Likely to be habitat suitable for bats. An example of this would include semi-mature to mature specimens with the presence of ivy, cracks, cavities, crevices.

Present - Bats seen, heard, or other direct evidence, eg droppings.

Nesting bird potential shall be recorded as:

Low - Unlikely to be habitat suitable for nesting birds. An example of this would include areas with trees at an early stage in growth cycle and containing either none or limited shelter, nest building material or ivy.

High - Likely to be habitat suitable for nesting birds. An example of this would include semi-mature to mature conifers with the presence of ivy or foliage as shelter.

Present - Nesting birds seen in the tree with nest visible, or action from birds indicating presence of nest.

Record whether or not the tree is within a conservation area. This will probably be a desk exercise and contact with the local planning authority may be required to establish the location and boundaries of conservation areas.

Record whether or not the tree is protected by a Tree Preservation Order. Checks shall be made with the local planning authority to confirm this. Any reference numbers shall be given in the ‘Note’ field.

The next inspection date shall, as a default, be 1 year after the date of inspection, but can be sooner if recommended for additional monitoring.

Tree Defect Survey Data Sheet

Table 337.1 Individual Trees

Attributes	All existing assets -Level 1	All new assets -Level 1	Defect Tree -Level 2	Tree in AMIS but not on site
AMIS Unique ID	Yes	Yes	Yes	Yes
Borough Name	Yes	Yes	Yes	Yes
Owner	Yes	Yes	Yes	Yes
Species	-	Yes	Yes	Yes
Physiological Condition	-	Yes	Yes	-
Structural Condition	-	Yes	Yes	-
Tree defects 1	-	Yes	Yes	-
Tree defects 2	-	Yes	Yes	-
Tree defects 3	-	Yes	Yes	-
Tree defects comments	-	Yes	Yes	-
ISA Failure potential	-	-	Yes	-
ISA Size of part	-	-	Yes	-
ISA Target rating	-	-	Yes	-
ISA Risk rating	-	-	Yes	-
Nesting birds	-	Yes	Yes	-
Surveyor	Yes	Yes	Yes	Yes
Last defect inspection date (annual)	Yes	Yes	Yes	Yes
Next inspection date	Yes	Yes	Yes	-
Notes (can include Conservation Area name)	Yes	Yes	Yes	-
Task order (including all required fields in AMIS)	-	-	Yes	-
Reason for removal	-	-	-	Yes

Table 337.2 Woodland Trees

Attributes	All existing assets -Level 1	All new assets -Level 1	Defect Tree -Level 2	Tree in AMIS but not on site
AMIS Unique ID	Yes	Yes	n/a	n/a
Borough Name	Yes	Yes	n/a	n/a
Dominant species	-	Yes	n/a	n/a
Subdominant species	-	Yes	n/a	n/a
Install Date	-	Yes	n/a	n/a
Owner	-	-	n/a	n/a
Woodland maturity	-	-	n/a	n/a
Shrubs present	-	-	n/a	n/a
Shrub cover (%)	-	-	n/a	n/a
Graphic area	-	-	n/a	n/a
Injurious weeds	Yes	-	n/a	n/a
Bat potential	-	-	n/a	n/a
Nesting birds	-	-	n/a	n/a
TPO	-	-	n/a	n/a
Conservation Area	-	-	n/a	n/a
Surveyor	Yes	Yes	n/a	n/a
Last defect inspection date (annual)	Yes	Yes	n/a	n/a
Last condition survey date (5yr)	-	-	n/a	n/a
Next inspection date	Yes	Yes	n/a	n/a
Comments	Yes	Yes	n/a	n/a

Appendix 33/8 Tree Condition Data Sheets

Table 338.1 Individual trees

Ref No.	Attributes	Data structure	Additional notes
1	AMIS Unique ID	Number	Generated by AMIS system
2	Borough Name	Picklist	
3	Species	Picklist	
4	Installation date	Date	Update where known
5	Reason for removal	Picklist	Update where known
6	Owner	Picklist	
7	CAVAT basic value (£)	Financial value (basic)	Initial value based on FULL CAVAT Method using stem diameter
8	CAVAT CTI value	Percent (100-250)	
9	CAVAT function value	Percent (0-100)	
10	CAVAT Adjusted Value - Amenity Factors	Percent (0-40)	Percent increase
11	CAVAT Adjusted Value – Appropriateness	Percent (0-40)	Percent decrease
12	CAVAT Final Value	Financial value (interim)	Interim value based on Full Methodology
13	CAVAT Accessibility	Percent (40-100)	
14	CAVAT SULE	Percent (5-100)	Percent of value retained based on CAVAT Full Methodology
15	CAVAT Full	Financial value (full)	Full CAVAT value using all factors
16	Stem diameter (cm)	Number	Measured
17	Height (m)	Number	Measured
18	Crown spread (m)	Number	Measured
19	Tree size	Picklist	A-G based on Appendix 30/10
20	Age Class	Picklist	
21	Physiological Condition	Picklist	
22	Structural Condition	Picklist	
23	Tree Defect 1	Picklist	
24	Tree Defect 2	Picklist	
25	Tree Defect 3	Picklist	
26	Tree defects comments	Free text	Details of defects
27	ISA Failure potential	Picklist	
28	ISA Size of part	Picklist	
29	ISA Target rating	Picklist	
30	ISA Risk rating	Picklist	

Table 338.1 Individual trees (continued)

Ref No.	Attributes	Data structure	Additional notes
31	Cyclical pruning frequency (years)	Number	
32	Cyclical pruning type	Free text	
33	Last cyclically pruned	Date	Updated after works by *Contractor*
34	Annual epicormics	Picklist	Yes or No
35	Street furniture pruning proximity	Metres	
36	Bat potential	Picklist	High, low, present
37	Nesting birds	Picklist	High, low, present
38	TPO	Picklist	Yes or No
39	Conservation Area	Picklist	Yes or No
40	Surveyor	Free text	Initials of the last (current) Surveyor
41	Last defect inspection date (annual)	Date	Date (YYMMDD)
42	Last condition survey date (5yr)	Date	Date (YYMMDD)
43	Next inspection date	Date	Date (YYMMDD)
44	Planted date	Date	Date (YYMMDD) where known