The Delivery hub health, safety and environment
Raising the bar 27
Managing temporary traffic management incursions

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Objective
This ‘Raising the Bar’ document is part of a suite of documents published by the Highways England Safety Hub, a group made up of Highways England and representatives of the highway construction and maintenance contractors. It sets out current best practice developed by the industry. It is intended to be a means of sharing best practice, set the expected standard for our works sites and promote the importance of a consistent approach in reducing the risk of incursions into road works.
For further information on this Raising the Bar and the others in this series please go to https://www.gov.uk/government/collections/health-and-safety-for-major-road-schemes-raising-the-bar-initiative.

Definition of an incursion
An intentional or unintentional unauthorised entry into temporary traffic management by members of the public or emergency services.

Intentional Incursions can be separated into three groups
- Intentional Incursion where the road user seeks to gain a benefit.
- Intentional Incursion where the road user is seeking information.
- Intentional Incursion where the road user is seeking refuge.

Road users entering our workplace is not acceptable
Unintentional Incursions can be separated into three groups
- Unintentional incursion where a road user follows a works vehicle into the works in error, also known as a follow in.
- Unintentional incursion where a road user enters the works area as a result of confusion.
- Unintentional Incursion where a road user enters the works area or traffic management as a result of a collision or to avoid a collision.

Why are incursions a problem?
We do not expect road users to enter our work sites. The work site is our workplace. Road workers need to be able to work effectively and efficiently and above all safely within their work site. We are producing this document to ‘raise the bar’. By doing this we hope to eliminate or reduce the likelihood of road users entering our workplace.
Focus of this ‘Raising the bar’ document

Industry has identified vehicle incursions as one of the highest risks to road workers. Since the beginning of 2016 over 5500 vehicle incursions have been reported on Airsweb*. Each incursion represents a risk to the workforce.

*As of April 2018

Across industry, there is a continuing need and desire to address this. Best practice by the industry has been brought together in this document to raise the bar even further. This document gives guidance on how we can achieve this and creates a solid position from which the industry can continue to develop new methods to raise the bar further and ultimately eliminate incursions.

Other resources

Other resources are available to support reducing incursions including other Raising the Bar (RtB) guidance, in particular the RtB on influencing driver behaviour at road works.

Preventing Incursions – The Four Step Approach

Assess: Identify the risk of incursions and where they are likely to happen.
Address: Design methods to eliminate or reduce the likelihood of incursions.
Implement: Install traffic management to eliminate or reduce the likelihood of incursions.
Monitor: Maintain the traffic management and report all incursions

Assess

Identify the risk of incursions and where they are likely to happen.

At the planning stage of any traffic management it is important that a detailed design brief has been prepared. The design brief should include, as a minimum, details such as:

- The exact location of planned works, including any marker posts locations of the work zone.
- The presence of side roads or grade separated junctions within the works area.
- Any private frontages that are requiring access during the works period.
- The presence of bus stops or lay-bys.
- The likelihood of pedestrians or cyclists within the works area.
- Whether works will be undertaken using lane closures, narrow lanes, hard shoulder running or complete carriageway closures.
- The exact nature of the works, such as surfacing, barrier repair etc.
- The likely number of works vehicles wishing to access the site, this should be expressed as vehicles per hour.
- The expected duration of the works.
- A sketch detailing the works zone.
- Historical data on likely traffic flows throughout the operating period.
- Historical data on any incidents that have occurred at that location, including STATS19 data, particularly incidents when traffic management was in place or being established / removed.

This check list is not exhaustive and other factors will require additional information. With the design brief in place the traffic management designer can start the process of assessing the locations and likelihood of possible vehicle incursions.
Risk assessment

Every aspect of the works site must be looked at and a detailed site-specific Risk Assessment must be prepared. This should detail each of the hazards identified and what control measures have been put in place to reduce the likelihood of a vehicle incursion and to reduce the consequences of an incursion should it occur. Certain hazards must be detailed on the drawings, for instance the presence of private frontages or where bridleways or footpaths intersect the carriageway. The risk assessment must be robust in its nature, all aspects of the design must be assessed, and mitigation recommended. All risk assessments should be carried out in accordance with GG104 Requirements for Safety Risk Assessment (formally GD04/12 and IAN 191/16). The framework presented in this document requires that the safety of all road populations is taken into consideration in safety risk assessments, in order to achieve the optimal safety outcome for everyone. It acknowledges that this may lead to having to balance competing safety risks for different motorway and all-purpose trunk roads populations.

These populations include:
1. everyone who works for Highways England on our road network
2. everyone travelling on our road network, including people who work for someone else
3. people who are neither working on nor using it but are affected by it, such as those who live adjacent to the road network.

It is important that the measures used to reduce the risk to the workforce do not increase the risk to road users or others.

Areas beyond the site

A wider assessment should be carried out on the surrounding area. It is less likely to experience an intentional vehicle incursion in a wholly rural area with no junctions or side roads, whereas it is highly likely to experience incursions in urban areas with many side roads, bus stops etc. In rural areas there is the potential for incursions where, for instance, a side road leads to a village or town where a considerable number of vehicles may wish to access. It is often the case where drivers with local knowledge are aware of a lengthy diversion route in place and try to circumvent this by driving through the works area.

Emergency vehicles

As part of the assessment process consideration should be given to emergency vehicles. It should be clearly noted on the Temporary Traffic Regulation Order (TTRO) as to whether emergency vehicles and the Traffic Officer Service will have access through the works. Careful consideration should be given at this stage as to whether it would be safe for the workforce to allow emergency vehicles access through the works. Any decision should be taken in consultation with emergency services and the Traffic Officer Service.

Incursions at a works access

When assessing the location of a works access or works exit, careful design can contribute to fewer incursions. In many cases the principal contractor will request works accesses at various locations throughout the works area. These locations should be subjected to a suitable and sufficient risk assessment, and if necessary these locations may have to be changed. The TM designer should look at each access and assess whether incursions, either intentional or accidental, are likely to occur and what measures need to be taken to reduce this likelihood. Local road geometry and permanent, existing signing, that may give confusing information to road users are just two considerations the designer should take into account. Many more will be present.
Address
Design methods to eliminate or reduce the likelihood of incursions.

Airlock system
Where a complete carriageway closure is required, the airlock system is a proven method to reduce the likelihood of vehicle incursions. When specifying this system, the safety of the public must be taken into consideration. The primary reason for using the airlock is to prevent road users from gaining unauthorised access to the closed carriageway, however if a road user manages to enter the traffic management they must be able to rejoin the live carriageway in a safe and controlled manner.
The design should show how an escape route for unauthorised vehicles can be implemented, where possible.

The airlock system should be used at all entry points to the closed carriageway where works vehicles will access the works. To reduce the number of follow-ins it is suggested that the access be from the primary carriageway and not an entry slip road. It is less likely to get intentional incursions from the main carriageway as traffic is gradually being directed down the slip road. The works access on the main carriageway should be located as far away from the point of closure as is possible, the additional risks to the traffic management operatives in extending lane closures should be considered and weighted against the benefits of increasing the distance of the works access to the point of closure. It is strongly recommended that the works access is sited prior to the ‘Road ahead closed’ sign. The length of the airlock should also be specified, where a site with a minimal number of works traffic accessing the works is likely then 20 to 30m would be sufficient. Where greater numbers of works vehicles are likely, such as surfacing operations, the ‘airlock’ should be lengthened accordingly to allow for more works vehicles to get onto site with the minimum of hindrance.
Exit slip road closures
The airlock system can also be used where an exit slip road is to be closed. It is more likely that an attempted incursion may take place as the motorist can see the destination but cannot use it and may be aware of a potentially lengthy diversion route.
As with the main carriageway closure it is important that there is a safe escape route back on to the main carriageway for any road user who has gained entry in to the traffic management.
All layouts should make use of a ‘CCTV in operation’ or similar sign to indicate to the public that their actions may be recorded. The use of CCTV will require the organisation utilising the CCTV to be registered with the Information Commissioners Office (ICO) and they must comply with the General Data Protection Regulation (GDPR).

Entry slip road closures
Where works accesses are located at entry slip roads the public are more likely to either attempt to gain access to the slip road by force, i.e. moving the cones or driving through them, or following a slow moving works vehicle. This will make it difficult and potentially hazardous to direct the unauthorised vehicle back onto the carriageway in a safe and controlled manner. Therefore, unless it is absolutely necessary, a works access should not be specified at entry slip roads.
Where it is unavoidable, consideration must be given to members of the public gaining unauthorised access to the site. The airlock system will retain them in a controlled area, however a safe method should be designed to allow unauthorised traffic to exit the slip road in a safe and controlled method, this may require an outer ring closure to the roundabout to facilitate this.

A balance must be found between achieving this and exposing traffic management operatives to a higher risk by establishing additional traffic management. Where an entry slip road is to be closed and not used as a works access a solid line of cones should be detailed across the entire width of the mouth of the slip road. A robust barrier should be sited behind the cones completely blocking the carriageway with no obvious route around the barrier. An operative should be briefed to remain at the slip road, however the works vehicle should be situated back from the entry to the slip road. This should deter the public from confrontation with the operative. It is important to keep the operative in the vicinity as they would provide a much greater deterrent to motorists trying to gain access to the closed carriageway. The use of additional technology such as movement sensors built into certain TM equipment may provide additional warning to the operative of an incursion attempt. A suitable and sufficient risk assessment is required for all entry slip roads as this has, in the past, been the area at the highest risk of intentional incursion.
Specifying the equipment

In certain circumstances the type of equipment to be used should also be specified. Where an airlock system has been specified the TM drawings should detail the use of a robust white barrier with red reflective blocks and red lights. The barrier should be sturdy enough to withstand most weather conditions anticipated during the closure period and be relatively easy to install and remove without specialist lifting equipment. For closures which are likely to be in place for longer than 24 hours then the use of a temporary barrier or lockable gate may be more appropriate, this would alleviate the need for a traffic management crew to be in attendance throughout the closure period. The barrier or gate should incorporate some form of conspicuity to avoid the risk of vehicles striking it in error.

Follow-ins

Follow-ins can be quite regular on busy stretches of carriageway and it is quite likely that this may involve many vehicles. It is imperative that the principal contractor has educated their workforce on the safe access into the works area, see Raising the Bar – Traffic Management Entry and Exit. The TM designer should take steps to make this type of incursion less likely. This could be achieved by the use of larger signs, although on some sites this would not be possible where there is already restricted room available. Another possible solution would be to specify more advance works access signs. If an incursion does occur there should be a safe means of getting public traffic out of the traffic management and back onto the live carriageway in a controlled manner. It is not practical or safe to ‘escort’ members of the public through a construction site with all the hazards associated with that.

On short term overnight works it may be more common for incursions to occur at a works access because of a follow in, with the works vehicle unaware of a vehicle following them through the works. This will lead to the motorist arriving at the works area where the workforce is present, and the safety zone has been established, leading to a problem of getting the vehicle safely out of the works area. To avoid this the designer may consider it necessary to install an internal airlock system prior to the works area and before the safety zone. This will allow for a controlled access in to the works area and the opportunity for motorists who may have followed a works vehicle into the lane closure to safely rejoin the carriageway without reaching the works area.

Works accesses

Works accesses should not be sited where the public could be misled. Locations such as adjacent to advance direction signs could give the impression that the public should exit at that point and this could result in a number of incursions. This not only puts the workforce at risk but also the public who may be confused and disorientated by driving through a construction site with all the hazards associated with that.

Where relaxed lane closures are to be used the TM designer should ensure that the works access is as far enough away from the works zone as is reasonably practicable, this will ensure that possible fast moving public traffic that does enter the traffic management in error does not come straight into the works zone. To present a clear message to the motorist a ‘WORKS TRAFFIC ONLY’ sign should be used at the access point instead of the more commonly used ‘WORKS ACCESS’ sign. This informs the motorist as to the type of vehicles that are permitted to enter the lane closure. Both the advance warning sign for the access and the works access sign itself should be sited as close to the live carriageway as possible. Siting these signs at the back of the verge or in the central reserve can lead to the signs not being visible, especially at night where temporary vehicle restraint is in use. Evidence has shown that poorly sited access signs can lead to a significant increase in the number of motorists entering the works through confusion.
To avoid incursions through confusion it is recommended that works accesses or exits are not located close to an exit slip road. During long term works the motorist may have driven through several miles of road works and will be experiencing a high work load. A poorly sited access or exit, close to a slip road, can lead to the motorist thinking that it is the exit slip road, this risk can increase where road markings across the works access or exit have been installed.

To avoid this, it is recommended that works accesses or exits should not be established within 300m upstream of an exit slip road and that works exits should feed directly into the slip road. Where this is not possible a suitable and sufficient risk assessment must be carried out and further mitigation measures should be sought such as reducing the length of the access or providing gated ‘WORKS TRAFFIC ONLY’ signs. The spacings between cones could also be reduced to make it more difficult for a vehicle to enter the works area.

The TM designer should be aware of the programme to ensure that alternative works access and egress points have already been planned so that when works have reached the point of an existing access or exit it can be moved to a safer pre-agreed location.

**Variable message signs**

Where carriageway or slip road closures are required it is important that the TM designer takes into account the suitability of the diversion to be used. The longer the diversion route the more frustrated motorists may be and the more likely they are to attempt a vehicle incursion to avoid a lengthy route.

Where there are Variable Message Signs (VMS) available a request should be made to the Regional Control Centre in plenty of time to post an advance notice, of up to one week, of the closure on the VMS signs. If such signs are not available the designer should consider the use a mobile VMS, these signs have a greater impact over more traditional methods of signing and but should only be used in conjunction with and not instead of traditional signs. The use of mobile VMS signs is particularly recommended where a carriageway or slip road closure might affect traffic wishing to access a mainline railway station or airport outside normal working hours or on routes that carry large numbers of lorries to ports.
Temporary vehicle restraint barrier
Where narrow lanes or hard shoulder running is required for longer than 24 hours the TM designer should take into account the likelihood of an unintentional incursion into the works area as a result of a Road Traffic Collision (RTC). By their very nature RTCs are very unpredictable in the location, time and in its outcome. Sufficient protection must be given to both the work force and road user alike. Where there is a clear requirement for a temporary vehicle restraint barrier to be used, it is important that the correct type of barrier is specified. In all circumstances only barrier that is approved by Highways England may be used on motorways and the Strategic Road Network (SRN). Details of the current acceptable systems available are published regularly by Highways England called ‘List of EN1317 Compliant Road Restraint Systems’ and may be found at www.standardsforhighways.co.uk.

The type of barrier specified will depend on a number of variables such as:

- The speed restriction in force.
- The width of the lanes.
- The severity of a breach of the barrier.
- The working room required.

Typically for temporary layouts either a N1 or N2 barrier would be used, where protection is needed that requires a higher restraint value, such as protection for structures or protection for deep excavations then a higher restraint value must be specified. Another consideration will be the working width. A working width of W2 is much narrower than that of say W6, thus giving more working room, however W2 barrier would be much more expensive and usually takes longer to install or remove, a balance must be found and the results recorded of the working width to be specified.

Care must be taken when hard shoulder running has been specified, the TM designer must take into account the additional hazards that may be present when traffic is running on the hard shoulder. Additional measures such as hardening of verges or stone drains must be thoroughly assessed and addressed. Existing vehicle restraint barrier should be assessed and addressed for suitability where high volumes of traffic, particularly heavy goods vehicles, are running adjacent to the barrier during hard shoulder running. There may be a need to specify a barrier with a higher restraint value.

Where a scheme is of a particularly complex nature and would require a Stage 3 Road Safety Audit due to a significant diversion of the traffic, then the traffic management design should be subjected to a Stage 2 Road Safety Audit. In all cases a Road Restraints Risk Assessment Process (RRRAP) must be undertaken, as detailed in TD19/06, to determine the need for a vehicle restraint system and, if so, its performance requirements.

Breakdowns
During long term works, particularly where closures exceed the recommended maximum of 4km in length, consideration should be given to motorists that may break down and attempt to pull in to the traffic management, although this is a lower risk to the workforce it may be a higher risk for the motorist being stranded on a construction site and the subsequent recovery of that vehicle. The TM designer should seek ways to minimise this risk. An effective recovery system should be implemented with regular signing to inform the motorist that they will be recovered free of charge. Where space exists, consideration should be given to providing Emergency Areas to provide a safe area for broken down vehicles. The design risk assessment should detail where such Emergency Areas are to be provided and, where they are not able to be located, to ensure that all possible opportunities have been assessed.

Managing incursions
Where the risk of allowing emergency vehicles to enter the works, particularly during carriageway closures, is assessed to be acceptable then further mitigation measures should be used to warn operatives of the approaching emergency vehicles.

For all incursions, whether it be authorised, such as emergency vehicles, or unauthorised incursions, a system should be considered that can warn operatives of an approaching vehicle, possibly at high speed.

Audio-visual alarms can be specified that are activated either by motion sensitive sensors at closure points to the site or activated by operatives situated at a gate. Once activated the system provides an audio-visual alarm to the operatives at the work area warning of approaching vehicles. A detailed plan must be made and...
briefed to the operatives on the course of action to be taken in the event the alarm is activated, this must include safe areas for the operatives. Traffic management operatives situated on a gate can also be provided with personal alarms which can offer increased security from abuse. A detailed plan must be made on what course of action should be taken where operatives are subjected to threats or abuse. This type of equipment can generate automated incursion location reports that can be incorporated into a heat map and can be used to provide further details for the reporting of incursions.

There are products available to automate gates at works access points. These products can give the impression of a solid barrier across the carriageway but are able to be opened electronically, either at the gate or remotely. This gives the benefit of being able to monitor who has access into the works area without the traffic management operatives being in a place of danger having to move traffic management equipment.

At some locations, during full carriageway closures, access into the closure may be required by residents directly affected by the closure. The designer should, where required, make allowance for these vehicles to enter or exit the closure. To avoid members of the public driving through the site unattended the designer should specify a system to be installed to alert the traffic management crews that a member of the public wishes to either access or exit the traffic management. This could be either by mobile phone or by using a remote monitoring system with 2-way communication. A suitable and sufficient risk assessment must be in place that details all the hazards and residual risks for members of the public using the road closure.

**Implement**

Install traffic management to eliminate or reduce the likelihood of incursions.

It is important that all the measures shown on the traffic management drawings are implemented on site. And are checked for compliance by the Traffic Safety and Control Officer (TSCO) or TM Foremen.
Gates

During carriageway or slip road closures an operative should always be in attendance during the closure even if there isn’t a works access at that location. Under certain circumstances enhanced technology could be used instead of the operatives, but only at lower risk sites and where a risk assessment has indicated this is acceptable. Where a physical barrier, such as steel or concrete, that cannot be moved without specialised equipment, is used it would not be necessary to have operatives based at that location. This would usually be at a location where the closure was likely to be in place for longer than 24 hours.

It is strongly recommended that all operatives placed at entry points are issued with working video recording equipment, this will act as a deterrent to members of the public against threatening or abusive behaviour towards the operative. Good evidence helps support any enforcement action and improves incident data quality, enabling further measures to be implemented as appropriate. A key part of the use of CCTV of any type is ensuring that road users know that CCTV is in use and their actions are being recorded.

Where members of the public do come into direct contact with traffic management operatives it is important that the operatives remain calm and courteous at all times. This often has the effect of defusing the situation and makes the likelihood of abusive actions against the operative less likely.

Operatives who are detailed to work at a gate must have received some form of Conflict Management Training. This training must be given by Approved Contractors of the Security Industry Authority.

It is recognised that operatives at gates have, in the past, received physical or verbal threats against them by members of the public. This is not tolerated at any time. An information board should be placed at each closure point where there is an interface with the public and the workforce. This information board must include the Highways England helpline telephone number.

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Our workforce have the right to be treated with dignity and respect at all times. We will not tolerate any acts of physical or verbal abuse against our workforce. Offenders will be reported to the Police.

CCTV is used for the security and protection of our workforce, for further information please call the Highways England helpline on 0300 123 5000

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Stage 3 Road Safety Audits
On all Highways England Major Project schemes, it is usual that, where a significant diversion of the traffic has taken place, a Stage 3 Road Safety Audit is carried out. The Road Safety Audit should be undertaken by an audit team in accordance with GG119 (formally HD 19/15). On completion of the audit a report is prepared and sent to the client.

The auditor, in addition to the main audit, should look for and identify any areas within the traffic management that they believe are at risk from either accidental or intentional incursion. The checklist below identifies some of the area's that would require auditing for vehicle incursion.

- Sufficient vehicle restraint barrier adjacent to works area, where required.
- Sufficient vehicle restraint barrier adjacent to verge during hard shoulder running.
- Likelihood of vehicle incursion at crossover points.
- Works Accesses in a location that may mislead the road user.
- Verges that may cause loss of control if a vehicle leaves the road, such as stone drains etc.

This information should be recorded and sent to the client and the traffic management designer for comment and possible rectification.

Informing the motorist
It is important to keep the motorist informed, particularly where a slip road or carriageway closure is required. Intentional incursion where road users are seeking to gain information such as the diversion route to be followed can be avoided by the use of advance notice signs at least two weeks in advance of the closure and by the use of clear diversion route signing. The diversion route must be regularly inspected during the closure period to ensure all signing remains visible.

Monitor
Maintain the traffic management and report all incursions

Maintenance
To prevent accidental incursion, it is important that the traffic management system is patrolled at regular intervals as recommended in Chapter 8 of the Traffic Signs Manual. Where previous incursions have been identified at a particular location the frequency of the patrols should be increased. Areas of coning that have been displaced may lead some motorists to enter the traffic management in error. It is important that any displaced equipment is replaced as soon as possible to prevent this and recorded in maintenance records.

Deterrents and enforcement
Where vehicle incursions do occur, it is important that as many details are captured at the time of the incident, this also includes photographic evidence that may be used in a court of law as evidence. The workforce must be made aware that they may be called as a witness if an incident results in the driver going to court. Many will not want to get involved if they know this may be required. It should be impressed upon them that their assistance will help prevent future incidents and possible injuries or fatalities to their workmates.

Where appropriate it may be possible to add a deterrent to road users committing a wilful incursion into the work area by the use of strategically placed works vehicles.
with livery similar to that used by the Safety Camera Partnerships. These vehicles are welfare vans that have been modified by the use of magnetic stickers. Trials taken place have shown the use of such vehicles have significantly reduced vehicle incursions and also a noticeable increase in traffic compliance with the road works speed limit.

Where such vehicles are used as a deterrent within the works area, the markings indicating the vehicles use must not be displayed when accessing or leaving the site. It is possible to fit working cameras to the rear of the vehicle to record any incursions, or a dummy camera could be fitted. Where such vehicles contain a video camera which is recording but display a speed camera sticker, a separate sign should be displayed upstream of the video camera to warn drivers that traffic movements are being recorded. It is recommended, prior to this type of camera vehicle being used on the network, that there is liaison with the local Safety Camera Partnership.

Site Inspections
An inspection of the site should be carried out to ensure all measures used to reduce the likelihood of incursions have been implemented. It is recommended that this inspection is carried out by the TSCO or the TM Foreman. Any issues identified should be relayed to the TM designer for comment. Where a serious incursion has occurred that has either resulted in a high potential incident or where an operative has received an injury then the subsequent investigation should look at the design of the traffic management to ensure that the design risk assessment had identified all the hazards and put into the place the appropriate control measures. The Assess and Address sections of this document can be used to assist in the investigation.

Reporting
By reporting all instances of incursion, we can help make your workplace safer.
To enable the industry to monitor the effectiveness of the measures used to eliminate or reduce vehicle incursions it is vitally important that ALL incursions are reported, no matter how trivial they appear to be. Details such as time of day, day of week, weather conditions, counter measures used to prevent incursion, should all be recorded. It is only by monitoring the effectiveness of these measures that we are better placed to plan for them in the future. All incursions must be reported on AIRSWEB. The data collected will enable Highways England draw up a heat map of areas where vehicle incursions have occurred. This information can then be used to identify areas where incursions are more likely and will assist in planning to eliminate these incursions.

By reporting all instances of incursion, we can help make your workplace safer.