

Direct Vision Standard

Phase 1 Consultation supporting document

Improving HGV safety

The efficient movement of goods and services is fundamental to sustaining London's global competitiveness. We are working to ensure that freight is embedded into planning for London's growth. The growth in London's population, along with the rise of online retail and large-scale construction and development, increases the number of freight and fleet trips on our roads.

Like many other cities, the majority of London's freight is moved by road, and while this is vital to our economy, we need to tackle its negative impacts. Heavy Goods Vehicles (HGVs) make up less than four per cent of the miles driven in London, but in 2015 they were involved in around 78 per cent of cyclist fatalities and 20 per cent of pedestrian fatalities. Between 2013 and 2015, 116 pedestrians and cyclists were killed or seriously injured in collision with goods vehicles over 3.5 tonnes.

No loss of life is inevitable or acceptable, which is why the Mayor is adopting a 'Vision Zero' approach to road danger reduction, putting the elimination of road danger at the very heart of the transport system. Vision Zero means recognising that the cause of road danger is the presence of potentially dangerous vehicles in built-up areas where people want to be, and seeking to reduce the risk that they pose. Vision Zero forms part of the Mayor's vision to create 'Healthy Streets' – safer, more attractive, accessible and people-friendly streets where everybody can enjoy spending time and being physically active, to ultimately improve people's health. Part of this is ensuring that we have the safest possible vehicles on our streets that pose the minimum risk to more vulnerable road users.

Significant progress in improving HGV safety has already been made by TfL, the freight industry, and their customers through the Fleet Operator Recognition Scheme (FORS) and the innovative, industry-led Construction Logistics and Community Safety programme (CLOCS).

In September 2015 we launched the UK's first Safer Lorry Scheme, requiring mirrors and sideguards to be fitted to all lorries using roads within Greater London. It is vital that this work continues, but we now need to go further as part of the Vision Zero approach. A key part of this in relation to HGV safety is responding to research. Evidence suggests HGV driver 'blind spots' (their inability to see other road users who are close to the lorry) are a key causal factor in vulnerable road user death and injury. Promoting safer, 'direct vision' HGVs was therefore outlined in the Mayor's manifesto as the next logical step, and on 30 September 2016, the Mayor announced his intention to introduce the world's first Direct Vision Standard for HGVs.

The Direct Vision Standard

Evidence from in-depth research and collision investigation has shown that restrictions in an HGV drivers' field of direct vision – the vehicle's blind spots – has contributed to too many collisions, with tragic consequences for victims, their families and loved ones, and the drivers involved, as well as serious implication for the vehicles' operators.

To date, the regulatory solution for HGV blind spots has been to add mirrors to improve indirect vision. Drivers now have six mirrors fitted to their HGV cabs and many operators also fit camera and sensor systems to further aid the driver. This raises concerns about how much a driver has to deal with in an already complex urban environment such as London.

Our research shows that drivers react more quickly when they can see cyclists and pedestrians directly rather than by use of mirrors or other equipment, the findings of these studies are discussed further in the Annex. While regulatory standards exist for indirect vision from mirrors, there is no minimum standard for how much a driver should be able to see directly from their cab. We want to tackle this basic but fundamental HGV design issue by enabling road users to better see one another to avoid collisions.

To understand the benefits of direct vision, we commissioned the development of the first Direct Vision Standard for HGVs, working with the principal HGV manufacturers supplying to the UK and a number of leading freight companies.¹ This Standard objectively measures the direct view available to the driver of the area of greatest risk around a range of different HGV cab models. It is the first standard for direct vision to be developed anywhere in the world, as all other HGV design standards cover mirrors.

Using the Direct Vision Standard, we can ensure that a good standard of direct vision is specified and enforced. While based on detailed technical analysis, the approach will be simple to understand for regulators, manufacturers, operators and stakeholders in categorising both new and existing vehicles.

- Regulatory bodies will have standards and performance criteria in a recognised and acceptable format for consideration when reviewing or revising relevant regulations for direct vision standards for HGVs
- Vehicle manufacturers will have a progressive vision standard for designing and developing vehicles, providing certainty when making investment decisions about new HGV designs
- HGV operators and those buying or leasing HGVs will have a comprehensible standard to inform their purchasing decisions

¹Definition of Direct Vision Standards for Heavy Goods Vehicles (TRL, September 2016) Summary report: <http://content.tfl.gov.uk/assessing-direct-vision-in-hgvs-summary.pdf> Full report: <http://content.tfl.gov.uk/assessing-drect-vision-in-hgvs-technical.pdf>

- Local authorities and client organisations, either employing or influencing HGV operations in the public or private sector, will be able to specify safer HGVs through legal contracts or planning conditions.
- Enforcement agencies will be able to use new regulation based on the Direct Vision Standard to take action against the HGVs with the poorest direct vision that are proven to pose a risk to vulnerable road users.

Direct Vision Standard rating

The Direct Vision Standard uses a simple star rating system, similar to the New Car Assessment Programme (NCAP) rating used to inform consumers about car safety. The DVS is an objective, scientific measure of how much a HGV driver can see from their cab directly through windows, as opposed to indirectly through mirrors or camera monitoring systems.

How Direct Vision is rated

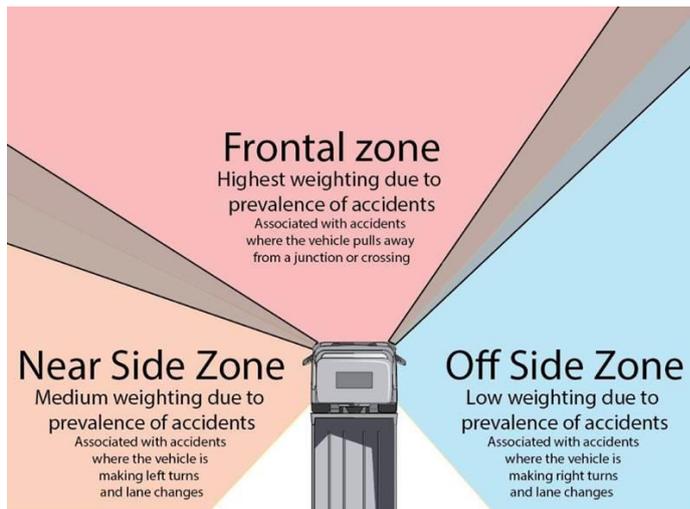
Each HGV is awarded a rating based on how much a driver can see of the area of greatest risk to vulnerable road users. This area has been identified through analysis of collision data and through consideration of how much of a person can, and needs to be seen to avoid collision.

The area of greatest risk is split into different zones: the zones in which the greatest number of collisions occur, and therefore most important for the driver to be able to see in order to take action to avoid a collision, are awarded a higher weighting.

An objective, defined technical measurement is used to calculate the total volume of the weighted area of greatest risk that can be seen directly by the driver, and each vehicle is awarded a score. The score determines the star rating which rewards incremental improvements to direct vision.

The higher the star rating, the more a driver can see directly of the area of greatest risk. Five stars will represent the 'best in class', those HGVs that allow the greatest direct visibility with features like low-entry and re-modelled cabs,

We are now working with HGV manufacturers and others to be able to apply the rating to HGV models used in London. The height of a vehicle is the design feature most likely to impact a vehicles star rating. The largest and highest vehicles including some 'off-road' construction vehicles and long-haul articulated cabs designed to operate on motorways are most likely to receive lower or zero star ratings.



Figs. 1: Direct vision blind spot modelling uses three different weighting zones

Having an objective measurement of key safety design features allows a range of new policies and allows companies to make informed purchasing decisions and manufacturers to market the right vehicle for the right job.

Driving change for increased direct vision

Approaches taken by programmes like CLOCS show that change can happen quickly when industry, manufacturers, regulators and clients collaborate. CLOCS enabled substantial changes to be made across London and the rest of the UK by all parties using agreed standards of specified safety equipment, training and management procedures.

The programme led to the development of new vehicle designs with improved direct vision in just over a year. There will be over 50 new HGVs which will meet five stars by the Direct Vision Standard on London's streets by the end of the 2016/17 financial year.

The Mayor is committed to encouraging a much wider uptake of these safer vehicles. HGVs with higher direct vision are already operating in our supply chain, and will be specified for use on the Northern Line extension and Silvertown Tunnel projects. The wider Greater London Authority group will continue to lead by example and require the adoption of the new Direct Vision Standard in all future contracts from the new financial year, to ensure that no HGVs with poor direct vision are used in their future supply chains.

The Mayor and TfL will also work with developers and councils to encourage them to do the same, to stimulate the market to the point that in the near future high vision HGVs become the industry best-practice norm, reducing the need for enforcement of future regulation. The Mayor has pledged to continue pressing the European Commission to introduce new EU-wide safety standards for HGVs (see Annex).

Mandating the Direct Vision Standard to improve HGV safety

The Safer Lorry Scheme was introduced in September 2015, requiring safety mirrors and side guards to be fitted to all HGVs on roads within Greater London. Levels of

compliance are consistently high at over 97 per cent. Building on the success of that scheme, we, together with London Councils, are proposing to restrict or ban those HGVs with poor direct vision – those rated zero stars – from London’s streets entirely by January 2020 on the basis they are unsuitable for an urban environment like London’s and pose a significant potential risk to other road users including cyclists and pedestrians. Only HGVs meeting three stars or above – a ‘good’ rating in the new Direct Vision Standard – would be allowed on London’s roads by 2024. (These proposals will be subject to further detailed consultation and relevant statutory procedures.)

The Direct Vision Standard could be used as the basis of rating all HGVs operating in Greater London. For example, HGV operators could be required to display an authorised sign on each vehicle stating its individual Direct Vision Standard star rating. That could be used as the basis of any potential ban or other restrictions applying to all roads within Greater London (the same area covered by the Safer Lorry Scheme and Low Emission Zone) 24 hours a day, seven days a week. No specific measures are proposed at this stage as the focus of this consultation is the proposed Direct Vision Standard concept itself.

It is, however, likely that any such measures would be implemented by a series of coordinated Traffic Regulation Orders made by London’s various statutory traffic authorities², in the same way as the existing Safer Lorry Scheme was introduced. A TRO creates a criminal offence; enforcement is by the police by a fixed penalty notice or, if convicted in a magistrate’s court, a fine. We are exploring options on penalty levels and enforcement with the Government and these issues will be the subject of further later consultation.

A potential alternative method of encouraging the use of increased Direct Vision vehicles is to impose a road charge for the use of low or zero rated vehicles. Under this system, driving a non-compliant vehicle creates a liability to pay a charge, which if un-paid can lead to civil enforcement through the issue of a higher penalty charge notice. (This is how the Low Emission Zone operates.) However, we do not believe that allowing operators to pay for the use of HGVs with poor visibility that are unsuitable for use in an urban environment like London, and which potentially pose a significant risk to other road users, is in keeping with the Mayor’s ‘Vision Zero’ approach to casualty reduction. Responses to our previous consultation proposal on improving direct vision from HGVs, by requiring the fitting of additional window panels in passenger doors, showed that 56 per cent of respondents supported a criminally enforced ban on non-compliant HGVs, whereas only 11 per cent supported a civilly enforced charge. This indicates strong public and stakeholder support for any measures to be mandatory and criminally enforced.

Implementation of any such measures will involve close working with the UK Government and the European Commission, including compliance with relevant UK and European law requirements. There will have to be a careful examination of its likely impacts covering issues such as road-user safety; the social, environmental and economic benefits to society of reduced fatalities and injuries; the wider impacts on equalities, traffic movement and congestion, the construction industry, London’s economy and business generally, and related practical/logistical implications. A reasonable lead-in period will allow time for necessary adjustments.

² Transport for London for the Transport for London road network (TLRN) and the boroughs for other roads in their areas

We urge vehicle operators to consider the proposed Direct Vision Standard requirements in conjunction with the Mayor's proposals to improve London's air quality, which will also affect HGV operators. The Mayor proposes introducing a new Emissions Surcharge in 2017, which would charge vehicles, including HGVs, that do not meet certain emission standards (mostly for vehicles registered in 2005 and older) entering Central London, in addition to the Congestion Charge.

The Mayor is also considering how to enhance the Ultra Low Emission Zone (ULEZ) to drastically improve London's current poor air quality. High-level ideas consulted on to date³ include requiring HGVs to meet Euro VI emissions standards, by bringing the ULEZ forward from 2020 for all vehicles in central London, extending it further up to the North and South Circular roads, and applying ULEZ emission standards for HGVs, buses and coaches London-wide in 2019 or later. (These are to be developed in their own separate statutory consultation in due course and no decisions have been taken at this point.) Against this background, HGV operators considering upgrading their fleets to meet the ULEZ emission standards should consider vehicles that have a high star DVS rating.

Steps to implementation

We propose the following next steps for the implementation of HGV safety measures based on the Direct Vision Standard:

1. Winter/Spring 2017: we will carry out this first phase consultation. We will also work with manufacturers to rate vehicles against the Direct Vision Standard
2. Spring/Summer 2017: we will analyse and publish the responses to this phase of the consultation. New Euro VI, ULEZ compliant, HGV models will have been rated to the DVS to inform operators buying new vehicles
3. Autumn 2017: we will complete the impact assessment of the use of the Direct Vision Standard on London and finalise our proposals for any ban or other restrictions on zero and low DVS rated HGVs, informed by responses to this phase of the consultation. We will launch a full policy consultation on the final proposals for the scheme, including appropriate impact assessments
4. Spring 2018: we will launch a statutory consultation on the appropriate regulatory measure (e.g. TROs) to enable any ban or other restriction, subject to Government and European Commission support
5. Pre-2020: a lead-in period to allow necessary adjustments and preparation for compliance
6. Early 2020: enforcement of the regulatory measure for the DVS scheme will go live.

Have your say

Great progress has been made through partnership working to ensure that a wide-ranging programme is in place to continually improve HGV safety. Effective interventions are driven by solid evidence and an extensive body of evidence points to the need to improve direct vision from HGV cabs. HGVs designed to work in off-road environments or for long-haul motorway trips and whose basic design has not changed since the 1970s are not suitable for an urban environment like London. We must work together to ensure that our streets are safe for everyone.

³ <https://consultations.tfl.gov.uk/environment/air-quality-consultation-phase-2/?cid=airquality-consultation>

We recognise that adopting the Direct Vision Standard may be challenging, particularly for the freight and logistics industries and their customers, but the dangers certain HGVs continue to pose to other road users compel us to tackle this issue head on, without delay. The progress achieved through the CLOCS programme has demonstrated that the freight industry is innovative by nature. By going further and tackling the most dangerous HGVs through the Direct Vision Standard, we can make sure the HGVs delivering to our shops, building sites and businesses are as safe as possible as one part of our wider work to make the Capital's streets safer for everyone.

Continuing in this spirit of partnership and collaboration, we want you to help shape how we best utilise the opportunities presented by the Direct Vision Standard, by expressing your views in this consultation. Please take the time to consider the information in this document and answer the questions provided.

Annex: The case for further intervention on HGV safety

This Annex sets out the case for further measures to improve safety based on a Direct Vision Standard for HGVs, outlining:

- The wider programme of activity to improve HGV safety
- The evidence of the risk posed by HGV blind spots
- The limitations of indirect vision from HGV cabs
- The benefits of direct vision in reducing danger posed to other road users
- The variation in blind spots across different HGVs

Progress in improving HGV safety

We have adopted a holistic 'Safe System' approach to road danger reduction. This identifies all the elements that can contribute to a collision, in order to develop a wide range of solutions to improve the safety of our streets, vehicles and road users. Our aim is to ensure that the safest vehicles are operated in the safest manner on streets designed wherever possible to reduce the likelihood and the impact of collisions.

In 2012, recognising the power of procurement processes to bring about change, we embedded clauses in our contracts that require HGV operators to manage work-related road risk (WRRR) through the safe operation, driving and upkeep of HGVs in our supply chain. Since then we have worked with the wider construction and logistics industry to better manage road risk through the industry-led Construction Logistics and Community Safety (CLOCS) programme. CLOCS was based on research showing a significant discrepancy between health and safety policies and practices involving potentially dangerous machinery (including HGVs) on and off construction sites. Through CLOCS, TfL and over 45 major construction sector clients have incorporated the same WRRR clauses in their supply chains. These clauses require the use of safe operators, drivers and vehicles within supply chains.

We encourage HGV, van and public service vehicle operators to become accredited to the Fleet Operator Recognition Scheme (FORS), which gives assurance to existing and potential clients that an operator adheres to high quality standards, that their drivers are licensed and appropriately trained, and that their vehicles meet minimum requirements. FORS members have seen reductions in injury and damage-only collisions.

Beyond CLOCS and FORS, TfL is working with partners on all fronts to develop safe streets, safe vehicles and safe people to reduce the number of collisions involving HGVs, for example:

- Working with the freight industry to reduce the number of vehicles on the roads by using water, rail and consolidation, and to explore options for retiming deliveries out of peak hours
- Carrying out further work to improve the design and operation of the road network, particularly at junctions, to reduce the conflicting movements that cause collisions
- Delivering road danger reduction marketing and communications campaigns that highlight the dangers of HGV blind spots and promote safer positioning when cycling near large vehicles

- Funding free on-road cycle skills training for everyone living and working in London. We also support the ‘Exchanging Places’ events delivered by the police, in which road users sit in the cabs of HGVs to gain greater awareness of the areas of greatest danger around these vehicles and the demands on drivers’ attention, complementing the Safe Urban Driving course where drivers undertake on-bike training
- Developing the Safer Lorry Scheme, which closed legal loopholes that allowed certain HGVs to travel in London without side guards and blind spot-reducing mirrors
- Using the London Freight Enforcement Partnership to deliver road-side stops targeting illegal, dangerous and non-compliant HGVs and drivers. The Partnership includes the Metropolitan and City of London Police forces and the Driver and Vehicle Standards Agency. Every one of the 2,300 officers in the MPS Roads and Transport Policing Command has road danger reduction as key priority, and enforce the law to improve the behaviour of all road users, including drivers, riders and cyclists.

The danger posed by HGV blind spots

Effectively tackling road danger at source requires an understanding of the causes of fatal and serious injury collisions, approximately 80 per cent of which involve cyclists, pedestrians and motorcyclists. Our ongoing analysis of collision data in London shows that the most common contributory factor attributed by the police to HGV drivers involved in fatal collisions with cyclists and pedestrians is that their ‘vision was affected due to a vehicle blind spot’.^{4 5}

This points to an obvious need to minimise HGV blind spots as much as possible.

What is Direct Vision and why is it important?

Drivers of all vehicles use mirrors to enhance their awareness of their surroundings. HGV driver vision is enhanced by additional mirrors, particularly the Class V and Class VI mirrors that help to reduce blind spots. Exemptions to the fitting of these mirrors were removed by the introduction of the Safer Lorry Scheme in September 2015, ensuring that vehicles over 3.5 tonnes have the basic safety equipment fitted. These tools of indirect vision are supplemented in some HGVs by visual display units (VDUs) which use cameras or sensors to help the driver identify objects in proximity to the vehicle, when they cannot be seen directly through the windscreen. Independent research into indirect vision tools and how they are used has produced very useful findings:⁶

⁴ Analysis of police collision files for pedestrian fatalities in London, 2006-10, (TRL, July 2012) <https://tfl.gov.uk/cdn/static/cms/documents/pedestrian-fatalities-in-london.pdf>

⁵ Pedal Cyclist Fatalities in London: Analysis of Police Collision Files, 2007-2011 (Loughborough University and University College London), <https://tfl.gov.uk/cdn/static/cms/documents/pedal-cyclist-fatalities-in-london.pdf>

⁶ Direct Vision vs Indirect Vision: A study exploring the potential improvements to road safety through expanding the HGV cab field of vision, (Arup, University of Leeds, January 2017) <https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>

- Mirrors are unquestionably essential driving aids, but there are risks involved in their use. Reflected objects may be distorted and tend to be overlooked in comparison to objects viewed directly; object recognition is compromised towards mirror edges; mirrors may be set up incorrectly, impairing coverage; and views can be influenced by elements such as rain and dirt.

Research into the cognitive process of using HGV mirrors also reveals a number of points of possible failure. Most of these are associated with a breakdown in visual awareness. If either a cyclist or a HGV is moving, the cyclist may pass through the field of view of a Class V mirror in less than two seconds.⁷ Experimental studies have indicated it may take over five seconds to properly check all mirrors.⁸ This makes cyclists difficult to spot, and even if drivers do see certain visual indications, it is not necessarily easy to recognise what is seen as being a cyclist or a hazard.

In the case of pedestrian/HGV collisions, the majority involve the front of the vehicle colliding with the pedestrian when it moves off from a stationary position, despite the presence of Class VI mirrors to address that frontal blind spot.⁹

- Many companies use camera systems, or visual display units (VDUs) to supplement a driver's indirect vision. VDUs can extend a driver's field of view and aid decision-making. However, there remain some important technical issues with these technologies: image resolution can be sensitive to environmental conditions i.e. rain, fog, lighting, moving images can be distorted, and many systems come with limited resolutions and colour ranges.

Indirect vision through mirrors and VDUs increases the 'cognitive load' for the driver through increased visual processing demands. Their use involves increased periods of off-road glances, with drivers taking longer to acquire critical information when returning their gaze to the road. Laboratory experiments were conducted using a simulator to test reaction times of people responding to visual objects that appeared directly through the windscreen or indirectly in a mirror, and found that:

- Participants took longer to detect stimuli presented in the Class VI mirror as opposed to stimuli presented on the front windscreen. Indirect vision responses were on average 0.7 seconds slower than direct vision responses. In 0.7 seconds a vehicle moving at just 5 mph would travel an additional 1.5 metres; this increases to 4.7 metres at 15mph, more than enough to collide with a pedestrian, cyclist or motorcyclist near the vehicle;
- Increased reaction times when relying on indirect vision in the simulated laboratory experiments resulted in an increased incidence of collisions by 24 per cent compared to the direct vision scenario. When navigating a simulation

⁷ Construction logistics and cyclist safety: Summary Report (TRL, January 2013), <https://trl.co.uk/reports/PPR640>

⁸ Pedal Cyclist Fatalities in London: Analysis of Police Collision Files, 2007-2011 (Loughborough University and University College London, September 2014) <https://tfl.gov.uk/cdn/static/cms/documents/pedal-cyclist-fatalities-in-london.pdf>

⁹ Analysis of police collision files for pedestrian fatalities in London, 2006-10 (TRL July 2012), <https://tfl.gov.uk/cdn/static/cms/documents/pedestrian-fatalities-in-london.pdf>

of a traditional cab, 27 per cent of drivers collided with at least one pedestrian, compared to 3 per cent of those driving a low-entry, higher vision cab.¹⁰

An HGV cab can be a busy work environment, particularly when traffic is congested or at junctions, and there are many competing demands on the driver's attention. Researchers carried out interviews and surveys with transport managers and drivers to understand to what extent driver distraction is an issue within the freight industry. This research found that vehicle operators tend to only fit equipment deemed necessary. This means that almost 70 per cent of drivers surveyed have more than five pieces of safety equipment in or on their vehicle. There is a 'tipping point' that is fast being reached, beyond which the various indirect vision aids could potentially begin to impact negatively on drivers through introducing 'cognitive overload'.¹¹

When cognitive overload factors were introduced to the laboratory simulation by increasing the number of indirect vision aids, it resulted in increased incidence of collisions by up to 40 per cent compared to the direct vision scenario. These demands on attention can result in impaired driving performance: reduced hazard detection, abrupt steering wheel movements, impaired lane-keeping, and a significantly increased risk of a collision resulting in serious injury or death.¹²

Variation in HGV blind spots

Two types of HGV operate in London: 'on-road' models, classified as N3, which are designed for general road use (supermarkets/retail, beer delivery, general haulage); and 'off-road' models, classified as N3G, which are largely used in the construction and waste sectors. Off-road N3G HGVs have a higher ground clearance in order to work in places like landfill sites and quarries, though only a tiny percentage of their journeys take place off-road. While all standard HGV model configurations have blind spots that can hide vulnerable road users from the driver's direct vision, N3G HGVs have bigger blind spots than the corresponding N3s, and are over-represented in cyclist and pedestrian collisions.

Blind spot modelling research shows that cab height above ground is key in determining blind spot size. For example, the cabs of N3G HGVs are, on average, 32 per cent higher than on-road HGVs. Increased driver eye-height leads to significantly bigger blind spots – the distance a driver will first see the top of a pedestrian or cyclist's head from the cab is three times greater from a higher off-road vehicle than an on-road vehicle.¹³ Long-haul HGV cabs, which are designed in part for drivers to be able to see safely ahead of traffic on motorways, are also considerably higher than urban distribution vehicle cabs. The report from the in-

¹⁰ Direct Vision vs Indirect Vision: A study exploring the potential improvements to road safety through expanding the HGV cab field of vision, (Arup, University of Leeds, January 2017)

<https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>

¹¹ Driver Distraction – Market research (Future Thinking, November 2013) <http://www.clocs.org.uk/wp-content/uploads/2014/03/1593-TfL-Driver-Distractions-report-v2.0-10012014.pdf>

¹² Direct Vision vs Indirect Vision: A study exploring the potential improvements to road safety through expanding the HGV cab field of vision, (Arup, University of Leeds, January 2017)

<https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>

¹³ Understanding direct and indirect vision in HGVs (Loughborough University, 2015) Summary: <https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>
Full: <http://content.tfl.gov.uk/understanding-direct-and-indirect-vision-in-hgvs-full-technical-report.pdf>

depth pedestrian fatality¹⁴ study notes that when an HGV is in stationary traffic and pedestrian attempts to cross the road very close to the front of the HGV, the driver is sometimes completely unable to see them due to the height at which the driver sits in the vehicle, which reduces the line of vision close to the vehicle (see fig. 1). Hence when the traffic clears or the lights turn green, the driver pulls away, unable to see the pedestrian crossing in front of the vehicle, resulting in a collision.



Fig. 2: Example of direct vision enabled by a standard N3G cab

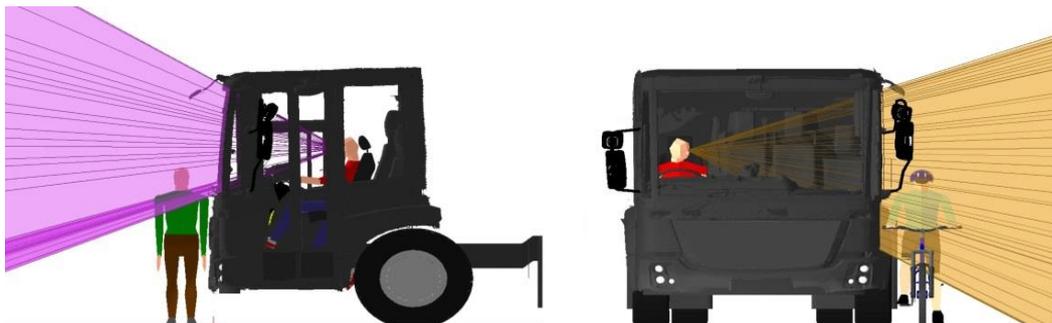


Fig. 3: Example of direct vision enabled by a low-entry, panoramic vision N3 cab

Research shows that using a combination of measures to increase direct vision – lowering cab and dash board heights and having taller and wider windows on all sides – further reduces direct vision blind spots and increases the visibility of road users close by (see fig. 2). Our in-depth study into cyclist fatalities concluded that the primary long-term solution for the deficiencies in vision that contribute to fatal collisions with HGVs is to promote a redesign of HGV cabs that minimise front and side blind spots and facilitate maximum direct vision for the driver.¹⁵

Driver experience of direct vision HGVs

¹⁴ Analysis of police collision files for pedestrian fatalities in London, 2006-10, <https://tfl.gov.uk/cdn/static/cms/documents/pedestrian-fatalities-in-london.pdf>

¹⁵ Pedal Cyclist Fatalities in London: Analysis of Police Collision Files, 2007-2011 (Loughborough University and University College London, September 2014) <https://tfl.gov.uk/cdn/static/cms/documents/pedal-cyclist-fatalities-in-london.pdf>

HGV operators, transport managers and drivers have expressed their views on HGVs with improved direct vision that are currently available on the market, such as the Mercedes-Benz Econic, Dennis Eagle Elite, Scania P Low Entry Cab (LEC) and Volvo FE LEC and through the use of on-road instead of off-road cabs.

Independently-conducted interviews and surveys found that managers were very positive about these vehicles. Drivers who had not driven one of these vehicles were more sceptical, though they felt positive about direct vision upon trialling the vehicle.

Almost half of the drivers interviewed felt that it is sometimes difficult to recognise a cyclist in a mirror, while 41 per cent agreed that increasing the size of windows would help them to avoid collisions with vulnerable road users. Once they drove a higher vision HGV, the drivers surveyed were impressed with the increased vision. They agreed that the combination of lowered cab, high visibility doors and other safety features make the vehicle superior for seeing and identifying vulnerable road users.¹⁶

Most drivers try to make eye-contact with road users and believe that the ability to make eye contact reduces the likelihood of collision. Surveys show that the majority of cyclists and pedestrians hold largely consistent views regarding interactions with HGVs. They do not trust that HGV drivers can see them through mirrors or VDUs. They agree that: drivers who are positioned lower to the ground can see them more easily than those higher up; that drivers who have larger windows and 'bus style' transparent doors can see them more easily than those in cabs with solid doors; and that being able to make eye-contact with HGV drivers makes them feel safer and more confident when passing a vehicle.¹⁷

Additional window panels in passenger doors

Between 22 January and 4 March 2016, we carried out a consultation on a proposal to improve the driver's direct vision by requiring the fitting of extra passenger-door side windows to HGVs operating in London. Though responses generally showed support for the proposal, many expressed support because it was, at that time, our only proposal to improve direct vision from HGVs. Transport interest groups and road danger reduction stakeholder organisations in particular felt that the proposal did not go far enough, and that we should be encouraging the uptake of low-entry HGV cabs with more direct, panoramic vision for drivers as a significantly more effective long-term solution.

Those who did not support the proposal cited numerous impracticalities involved in the fitting and use of these window panels. Many said that it would be impossible to fit them in certain cab models; that there would often be an obstruction, sometimes in the form of a passenger, to seeing through such a panel; that they would cost too much for the benefit they provide; that there is no standard to define what size of panel or field of vision would be acceptable; and that they would negatively impact of the driver's safety and security. Most importantly, many respondents expressed doubt that they added any significant safety benefits, particularly in the absence of any available evidence. Some were concerned that their impact of the safety of other

¹⁶ Evaluation of direct vision HGVs (Future Thinking, January 2017) <http://content.tfl.gov.uk/hgv-evaluation-new-vehicle-research-future-thinking.pdf>

¹⁷ Direct Vision vs Indirect Vision: A study exploring the potential improvements to road safety through expanding the HGV cab field of vision, (Arup, University of Leeds, January 2017) <https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>

road users would be negative, as an isolated window panel would be one more place to check and thus a potential contributor to cognitive overload.¹⁸

Since that consultation ended, blind spot modelling and vision ratings research has provided the verifiable evidence needed to define the benefits that would arise from the fitting of extra windows to passenger side doors. It shows that additional windows in HGV doors have limited benefit as they only marginally improve the driver's direct vision of the front nearside – the area of greatest risk for some cyclists – and make no improvement to the visibility of the front, the area of greatest danger for pedestrians. This limited improvement in vision alone provides little in terms of aiding driver reaction times.¹⁹ In simulator tests, viewing cyclists passing on the inside of the vehicle directly (through the side window in the low entry cab) did not result in fewer collisions than when viewing them indirectly (through mirrors in the traditional cab).²⁰ These additional window panels may also create a false sense of security for cyclists who think the driver will see them, when in fact their visibility through these panels is still limited. Furthermore, they are not possible to fit on all vehicles and would still require a standard to define what constitutes an appropriate window.

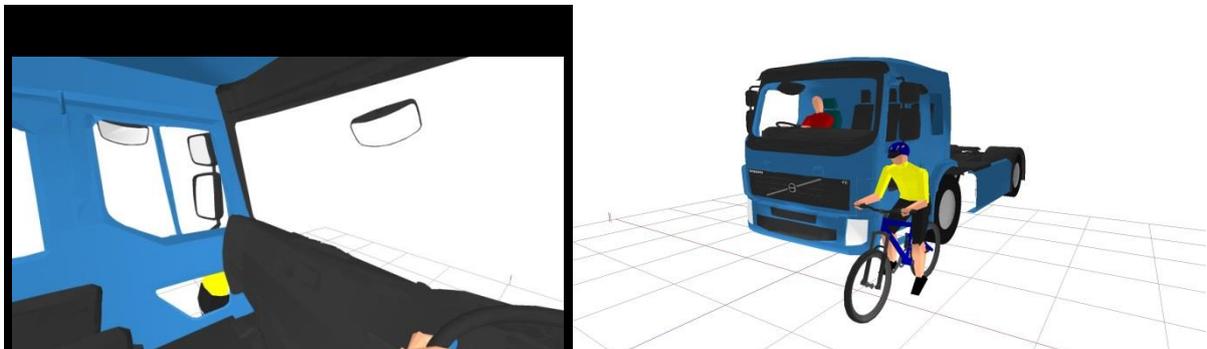


Fig. 4: Driver-eye view: direct vision modelling shows that windows in the lower part of the passenger door allow little improvement in the visibility of vulnerable road users

The results from the consultation show that Londoners want more action taken on cycle and pedestrian safety, above and beyond the comprehensive partnership action already being taken through CLOCS, FORS and our current road danger reduction programme. The wealth of evidence outlined above points to the improvement of cab design and increased direct vision as the necessary next step in tackling the danger posed by HGVs.

¹⁸ Further improving lorry safety in London, Consultation report (TfL, September 2016)

<https://consultations.tfl.gov.uk/roads/safer-lorries/>

¹⁹ Definition of Direct Vision Standards for Heavy Goods Vehicles (TRL, September 2016) Summary report: <http://content.tfl.gov.uk/assessing-direct-vision-in-hgvs-summary.pdf> Full report:

<http://content.tfl.gov.uk/assessing-drect-vision-in-hgvs-technical.pdf>

²⁰ Direct Vision vs Indirect Vision: A study exploring the potential improvements to road safety through expanding the HGV cab field of vision, (Arup, University of Leeds, January 2017)

<https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>

Further work to increase HGV safety

Consultation on this scheme is one part of many in raising vision standards across the board. Apart from the ongoing partnership action being taken through FORS, CLOCS and our road danger reduction programme as outlined above, we are taking further innovative steps with the freight industry to reduce road danger.

Assessing indirect vision technology

Additional equipment such as cameras, sensors and audible warning apparatus can be fitted to HGVs (including trailers) to make the driver better aware of nearby pedestrians and cyclists. As discussed above, research shows that these tools for indirect vision are not an adequate replacement for direct vision. However, this technology can have a role, as a complement to direct vision. These tools might also have a role to play in upgrading zero star or low-rated Direct Vision Standard vehicles, if only for a temporary period.

There is a range of such equipment available on the market at present, but there is no industry standard that allows fleet operators to assess the most effective technology. To address this gap, we are working to develop a tool that, when launched in 2017, will enable the industry to compare and assess safety equipment to ensure that the most effective equipment becomes the industry standard. This will aid purchasing decisions and help drivers to avoid using a combination of equipment that might contribute to cognitive overload.

Removing the need for off-road HGVs in London

Many of the HGVs posing the greatest risk to vulnerable road users are designed to be driven off-road, with high chassis to cope with uneven or soft surfaces. The majority of these HGVs moving on London's streets spend only a small proportion of their distance travelled in off-road conditions. If all construction sites, tips and quarries in and around London had level driving surfaces, there would be no need for an off-road HGV to be on our streets. That is why we plan to work with the construction, waste and other industries to improve the surface conditions of these sites, to make the need for off-road HGVs effectively redundant. This will involve improving the understanding of existing construction and waste site standards and why industry expectation relies on a need for off-road capable vehicles; defining tiered performance criteria for sites and ground condition standards; and developing a network of exemplar sites. This will ultimately benefit operators as off-road, N3G vehicles have higher operating costs and improved site standards can reduce the damage caused to vehicles.

Progressing HGV design regulations

As part of our wider road danger reduction lobbying, we have strongly pushed for change to the regulations governing HGV design so that safer HGVs with increased direct driver vision and smaller blind spots are produced. These blind spots are acknowledged by both regulators and vehicle manufacturers.

HGV design is covered by extensive UK and European legislation. Though in future the UK may no longer be bound by the same regulations as the EU, the majority of the vehicles on our roads will be manufactured in the EU. Existing regulation defines the number of mirrors required, offering the driver increased indirect vision, but no standard or regulation defines the amount of direct vision an HGV driver should have.²¹

Due to our lobbying in promoting the findings from our comprehensive studies into direct and indirect vision in 2014 and 2015 the European Commission revised the Weights and Dimensions Directive, which sets down conditions for free circulation of HGVs around the EU, to include a requirement for direct vision standards. However, this was made contingent on new safety standards being developed and inserted in the General Safety Regulation (GSR). The GSR covers vehicle design and determines the safety requirements that manufacturers must meet. It is this regulation that is currently being reviewed, but any potential changes to HGV cab design which may include direct vision are unlikely to be made mandatory before 2028. We have a responsibility to act swiftly in pursuing all avenues to improve HGV safety, and so we are doing what we can, now, in London.

Conclusion and next steps

This consultation on the Direct Vision Standard is the first phase of a series of consultations aimed at addressing the issue of dangerous HGVs in London. The consultation presents an opportunity to further improve HGV safety and reduce the number of people being killed and seriously injured on our streets, with tragic consequences for all involved. Supported by evidence, we want to ensure that only the safest vehicles, fit for use in an urban environment, are operating in London.

We are starting the consultation process on the proposals to ban zero star rated vehicles by 2020, and only allow vehicles with a three star or 'good' rating from 2024 now in order to allow enough time to develop the scheme and allow industry to make any necessary changes to be able to comply. Your views are important to us as part of this process and we ask that having read this document you complete the consultation questions to provide us with your feedback.

²¹ Definition of Direct Vision Standards for Heavy Goods Vehicles (TRL, September 2016) Summary report: <http://content.tfl.gov.uk/assessing-direct-vision-in-hgvs-summary.pdf> Full report: <http://content.tfl.gov.uk/assessing-drect-vision-in-hgvs-technical.pdf>