Direct Vision in Trucks:

towards a UNECE standard

UNECE VRU meeting

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TRANSPORT & ENVIRONMENT

Areas covered

Substantive standards

- N2
- N3
  - Rigids
  - Articulated (including potentially different application dates for EU / non-EU UNECE contracting parties)

  - Progressivity over time

Methodology governing the standard

- Level of sophistication needed
- One system v. multiple systems
- Relationship with indirect vision
- Adult height
- What must be seen?
- Cost: software v. field testing
- Precedents for software
- Access to CAD drawings and the truck for a physical check

A quick reminder of what EU lawmakers agreed:

"Vehicles of categories M2, M3, N2 and N3 shall be designed and constructed so as to enhance the direct visibility of vulnerable road users from the driver's seat, by reducing to the **greatest possible extent the blind spots in front and to the side of the driver**, while taking into account the **specificities of different categories** of vehicles"

N2 vehicles

References to star ratings in these slides are to the TfL Direct Vision Standard (Oct 2019).

T&E advocates that the UNECE standard provide that:

- N2 new types meet the requirement of 4 stars by 2026
- N2 new types meet 5 stars by 2030
- Truck-makers come forward with dates by when all new vehicles meet 4, and then, 5 stars

Considerable sophistication in measurement methodology is needed so that N2 reach their 5 star potential in line with improvement "to the greatest possible extent"

N3   rigid trucks

For rigid trucks, and drawing particular attention to the evidence presented by Apollo Vehicle Safety at the Brussels meeting, T&E advocates for:

- New rigid *types* meet 2 stars by 2026, except Category G (i.e. certain construction) trucks which meet 1 star by 2026,
- Cat G new *types* meet 2 stars by 2028
- New rigid *vehicles* must meet 2 stars by 2029, except Cat G,
- Cat G new *vehicles* meet 2 stars by 2031
- Truckmakers come forward with date by when all rigid new types meet 3 stars, and date all new vehicles meet 3 stars

N3 rigids: construction is primarily in urban areas

- 72% to 92% of the population of the EU, Japan, South Korea and Australia is urbanised. Most construction takes place in urban areas and this trend will increase as urbanisation grows
- Hence the ambition level for rigid trucks just outlined
- London will only permit 3 star by Oct 2024 - unless trucks add 'safe system' technology (costing around 2,000 GBP, per truck, under 2020 to 2024 requirements). And so truck-makers are already producing 3+ star construction trucks. London's milestone 2024 date is therefore important to note in advance of OEMs coming forward with a date by which they commit all new N3 rigids to be 3 star

N3 Articulated trucks (artics)

It's acknowledged that differences in timing as between EU and non-EU contracting parties may be necessary:

- For all UNECE: by **2028**, new artic types must be at least 1 star; 2031 all new vehicles (UNECE)
- For the EU: by **2026**: new artic types must be at least 1 star; by 2029 all vehicles (EU)
- By 2032 all new types meet 2 stars; truck-makers come forward with date all new vehicles meet 2 stars
- Truck-makers come forward with date by when all new artic types meet 3 stars, and date for all new vehicles

Law-makers foresee longer cabs enhancing vision

Recital 4 to the EU legal act on Weights & Dimensions (2019/984) permitting longer, rounder cabs by 1 Sept 2020:

"With a view for the benefits of aerodynamic cabs, in terms of energy performance of heavy goods vehicles, **but also in terms of better visibility for drivers, safety to other road users as well as safety and comfort for drivers, to materialise as early as possible**, it is necessary to ensure that such aerodynamic cabs can be introduced without unnecessary delay, as soon as the necessary type-approval requirements are in place." (emphasis added)
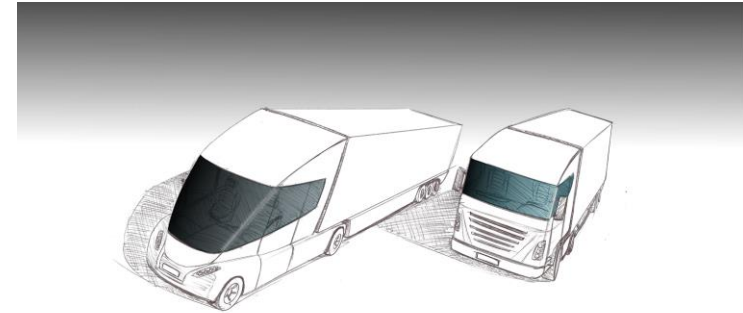
Inside the EU, the Weights & Dimensions reform gives design flexibility (for OEMs that wish to use high mounted cabs that would otherwise not meet one star); this presentation assumes some non-EU contracting parties may need longer to adopt equivalent measures (TBC), or otherwise adapt their law.

W&D cabs are set to be applied in long haul, also capturing aero and fuel saving benefits. We will then likely see a phasing out over time of high mounted cabs which do not undergo W&D modernisation - in line with the Direct Vision standard

Greater flexibility within the EU with the W&D reform
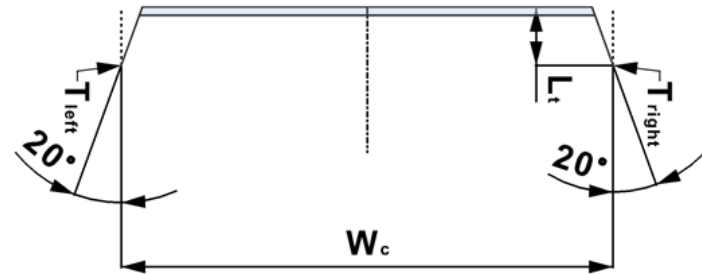
N3 Articulated trucks - public policy background

By **2032**, all artic new types must 2 reach stars (all UNECE)

This will influence a minority of long haul trucks, ie lowering those with very high-mounted cabs, and this is acceptable on the basis of public policy as follows:

- Absence of evidence to suggest very high mounted cabs are involved in fewer highway collisions than mid-mounted cabs,
- Law-makers have been clear on the need to enhance the direct visibility of pedestrians and cyclists to **the greatest possible extent**, and
- If a driver putting her/his foot on one step to reach the bed behind the seats is seen as detracting from driver comfort, this can be compensated by a wider bed and toilet/shower in the cab as enabled by the length extension under the W&D reform. This is a sensible trade-off (see next slide)

Industry needs to come fwd with dates by when all new types & vehs meet 3 star

Summary table

N3	Star rating	Date for new types	Date for new vehicles
N3 rigids (ex Cat G)	2	2026	2029
Cat G rigids	1	2026	2029
Cat G rigids	2	2028	2031
N3 rigids	3	[20]	[20]
EU artics	1	2026	2029
Non-EU artics	1	2028	2031
All UNECE	2	2032	[2035]
All UNECE	3	[20]	[20]

Progressivity - and the methodology for the standard

"**Greatest possible extent**": the level of improvement required under EU law

Only a sophisticated measuring tool can meet this requirement "while taking into account the specificities of different categories of vehicles". And progressive approach gives truck-makers more time to improve to the "greatest possible extent":
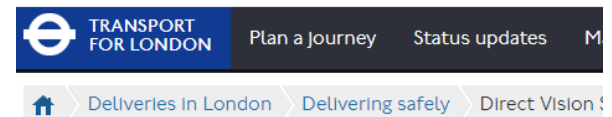
- Moving up from 4 stars to 5 in the case of N2
- Moving up from 1 star to 3 stars in the case of N3
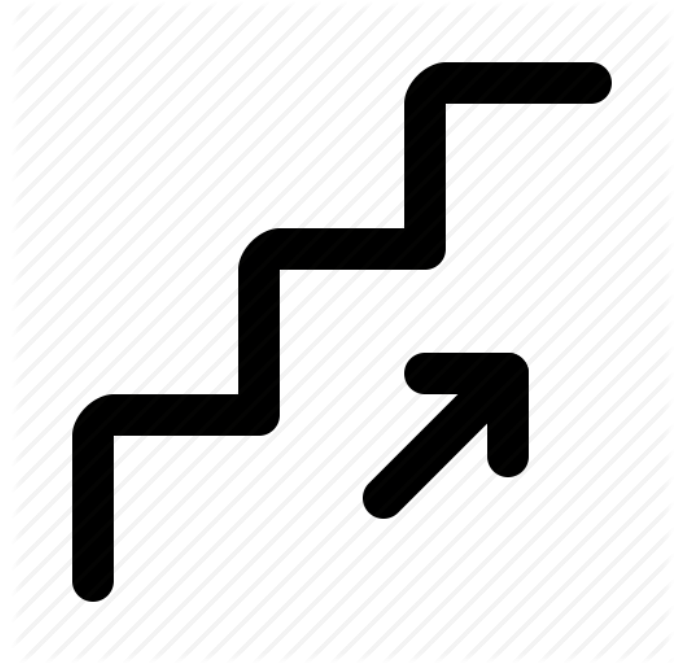
Methodology: avoiding the higher burden of 2 systems

Approx 565,000 trucks will be given star ratings under Transport for London's DVS

- Already 123 make/model variants account for around 470,000 trucks
- As new trucks are produced and placed on the London / southern English market, OEMs are obtaining a star rating for them
- It would be excessive and unnecessary regulation to introduce an additional rating system: 2 systems = higher burden

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Direct Vision Standard

A standard that gives credit where credit is due

- Test must record improvements right across the zone of greatest danger
- Indirect vision, i.e. the space overseen by mirrors, has well documented deficiencies. Better direct vision helps address these long-known shortcomings
- Unacceptable to measure at the mirror boundary as this would ignore area of greatest risk for pedestrians and cyclists
- Test must enable a progressive standard (rising star levels over time)

TfL: Why improve direct vision?
Indirect vision = slower response time
Indirect vision has a 0.7s slower response time
Risk increases with speed as more distance travelled
Extra distance in urban environment especially high risk (5m more via indirect vision when travelling at 25kph)

**Indirect vision = bigger collision risk**
Indirect vision resulted in increased incidence of simulated pedestrian collisions by 23%

Limits to technology benefits
Drivers processing a cognitive task increased simulated collision by 40

How tall?

- Height of pedestrian: to have regard to approx 99% of the European <u>adult</u> population, TfL's star ratings are based on the height of the 5th percentile Italian female (1.5m)
- Average height in highly populous UNECE contracting parties (such as South Korea, Japan, Egypt) implies that the TfL approach is the most appropriate
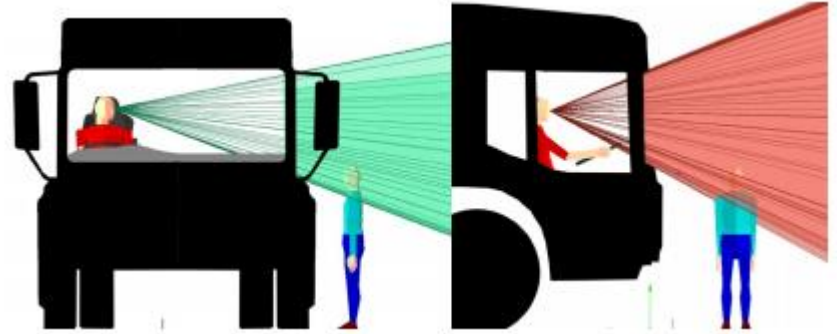
Caution! If regulators were to pick 1.6m instead, this would exclude almost 50% of FR and IT women and nearly 40% of German women.

Implications for Asian women would be similarly stark.

What must be seen?

- The test must be based on seeing a **clearly identifiable minimum area of the person**, namely the full head. There is good consistency here as all truck-makers will have situations where most but not all of the head is visible, hence all are treated equally
- Completely unacceptable would be a situation where the edge of the forehead, or tip of the crown of the head, qualifies as "seen"

Methodology: assumptions around cost

Occasionally regulators assume software-based testing is more expensive than manual field trial type tests. More often, the opposite is the case, as shown using a worked example:

- One person paid €100 per hour takes 30 min to conduct CAD test. Add a (very high) software related payment of €10 and total cost = €60 per truck
- Now contrast this with a field-trial type test requiring 2 persons 2 hours to set it up correctly, and one hour to conduct it and calculate the result: 6 person hours = €600 per truck

Use of software: precedents

- CAD software is already used at UNECE, eg Reg 66 to test the roof strength of buses
- Approved universal software can be developed by the EU/UNECE and supplied to all interested OEMs and TAAs
- This approach has been already taken for truck CO_2 emissions (VECTO software - see image)
- EU and UNECE can replicate this for direct vision (and this is worth doing! Truck are only 2% of vehicles but cause 15% of fatal collisions, nearly 25% of whom are ped's or cyclists)
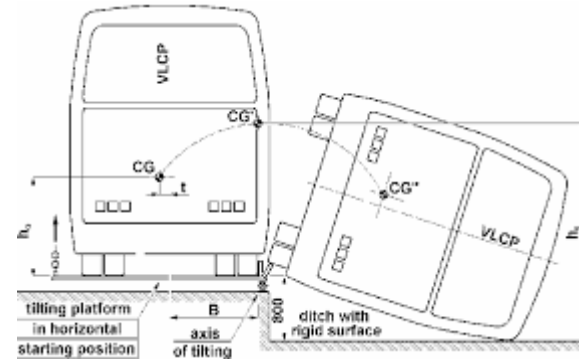
Simulation tool to calculate both, fuel consumption and CO_2 emissions from the **whole** vehicle

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Solving software issues & physical validation

- Assume an issue arises with the approved universal software. Solution: as there is one form of the software only, updates are issued to all users (i.e. same as is done with VECTO today)
- Assume CAD data suspected of being inaccurate or false is supplied to the TAA (i.e. not corresponding to the truck for which a rating is sought). Solution: as well as the CAD files, the OEM must grant access to the physical truck on request, allowing the CAD files to be compared to the reality - with the UNECE standard providing for this.

Verification

Summary slide - proposed standard

N2: all new types must meet 4 stars by 2026, and 5 stars by 2030

Truck-makers are asked to come forward with dates by when all new N2 vehicles meet 4, and then, 5 stars

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All UNECE	3	[20]	[20]

Summary slide - proposed methodology

- Sophisticated methodology, and a step-by-step approach over time, is needed to enhance direct vision "to the greatest possible extent"
- More than 120 model variants have already been rated under the TfL system and new trucks are added over time: a process with a different method would make little sense
- The direct vision standard must help address the very well-known deficiencies of indirect vision (overseen by mirrors) where the impacts take place
- Adult height must think of Asia as well as Europe
- The whole head must be seen
- Software is typically far cheaper than field-type (floor-based) testing
- Software is already used to test buses (roof strength) and truck CO_2
- The UNECE DV standard can provide that CAD drawings and the physical truck be made available to the TAA to allow for a physical test (i.e. empower TAA)

Thank you

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