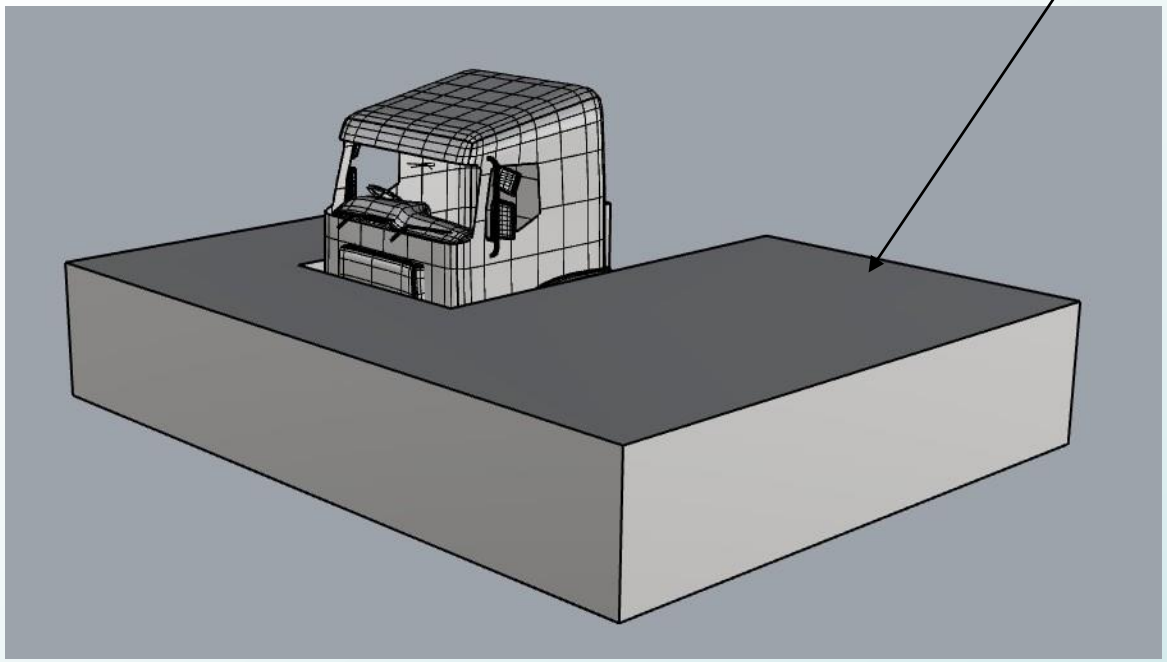
Application of Direct Vision Regulation to Vehicles at Low End of M2/N2 Categories

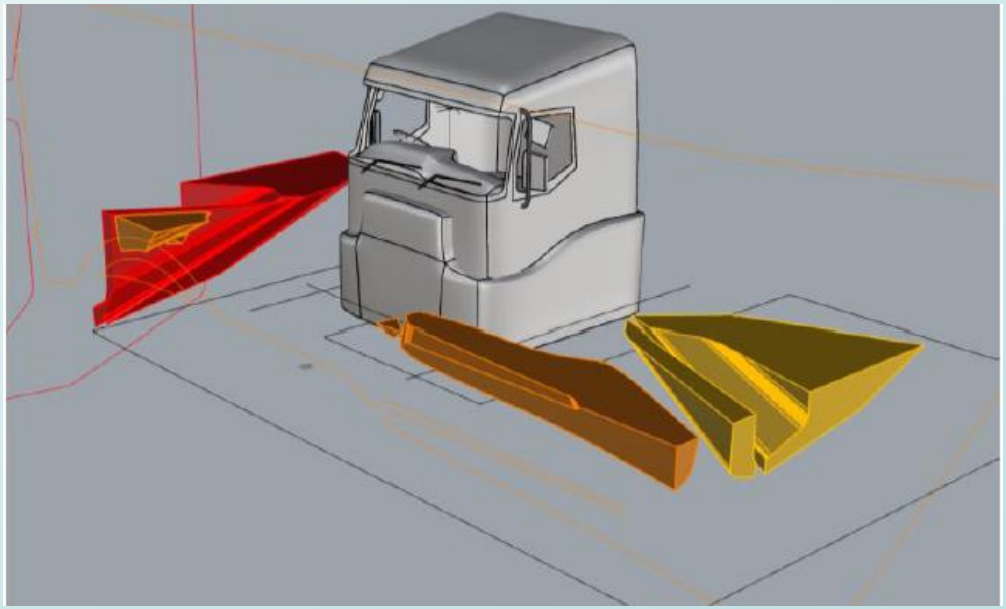
Proposed DVS Methodology

Appr. 45-57m³



Methodology assumes coverage of close-vicinity mainly via mirrors of classes V and VI

Calculation of visible section from driver's ocular points



Discussed "pass/fail"-thresholds are between ~[6…8]m³ and ~[8.5…11]m³

Methodology is specifically developed and tailored to assess heavy trucks with high driver seats

Representativity of method

Vehicles at “low” end of M2/N2 categories are often derived from M1/N1-vehicles, a selection shown here. Some obvious characteristics:

- Eye-point height typically at 1.6-1.7m, i.e. about 40cm higher than normal passenger car, so appr. at VRU head height
- Standing person in direct vicinity to driver cabin is visible
- None of these vehicles is equipped with class V or VI mirrors!

Consequently, dimension of “blind spot” zone as proposed for large trucks derived from class V and VI mirror fields not relevant to these vehicles.

UN R-125 provides suitable assessment method for this vehicle type

With adjacent persons







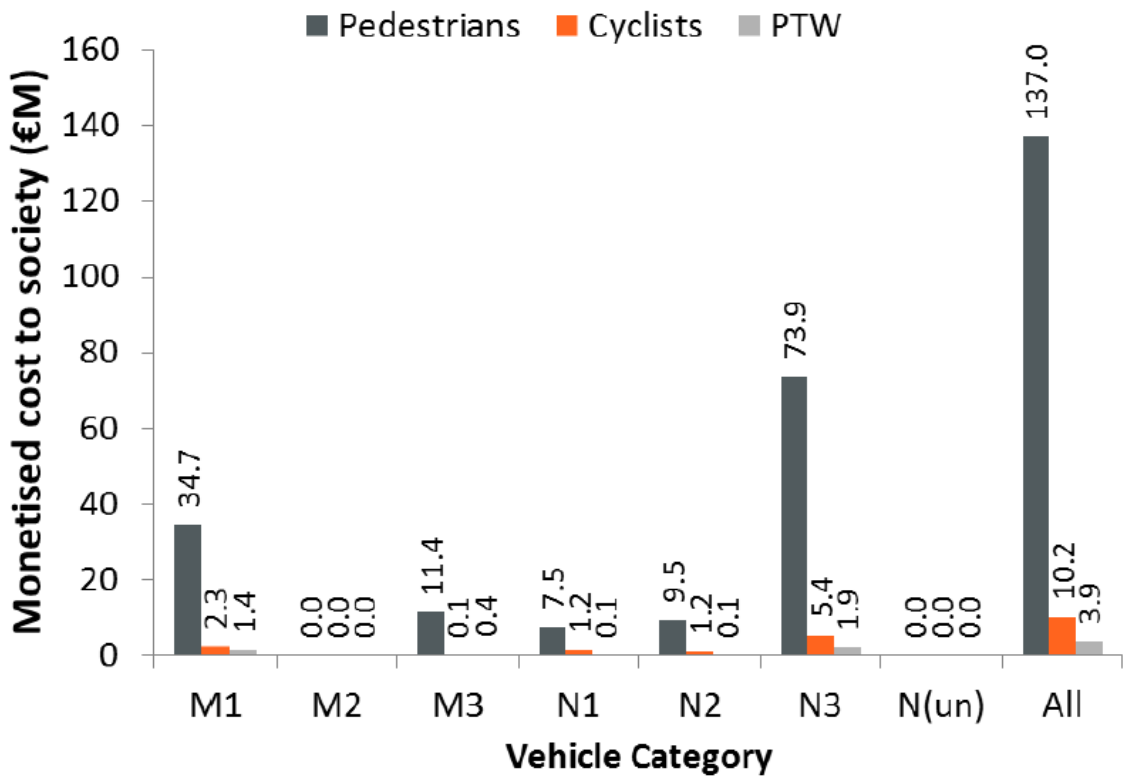


Data Recap

EU28 Target Populations: DIR

- DIR target population
- Total annual societal cost to EU28 of €151M
- Collisions between N3 vehicles and VRUs have highest societal costs
- Pedestrians most affected casualty
- Ranking of societal costs:
  - N3>M1>M3>N2>N1>M2

Total Annual Societal Costs of DIR VRU Casualties (EU28)



the future of transport.

Vehicle categories M2 and N2 show low overall societal VRU-collision costs

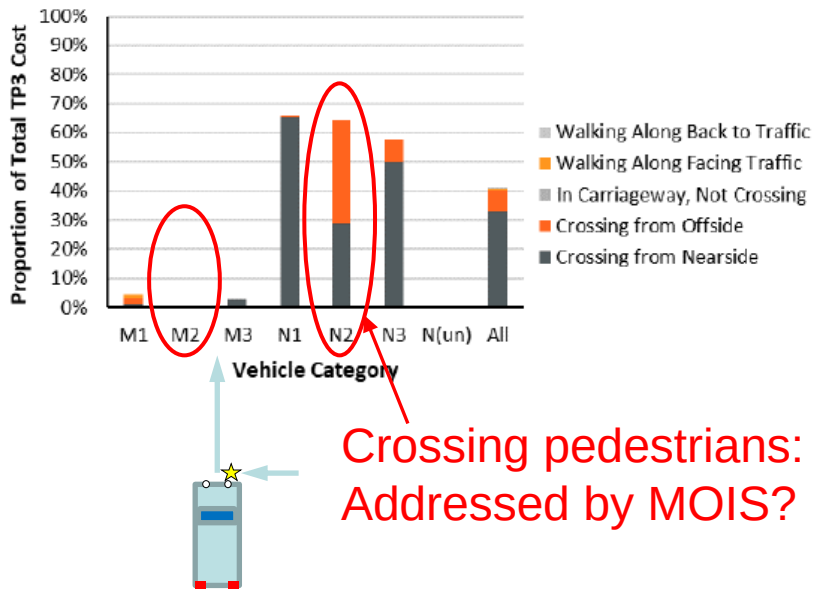
Key Collision Characteristics: DIR

Key Vehicle and VRU Manoeuvres Characterising Pedestrian Collisions

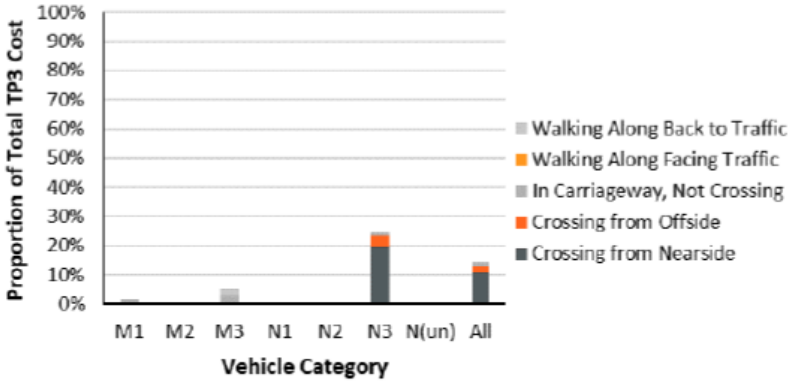
Data Recap

Moving Off

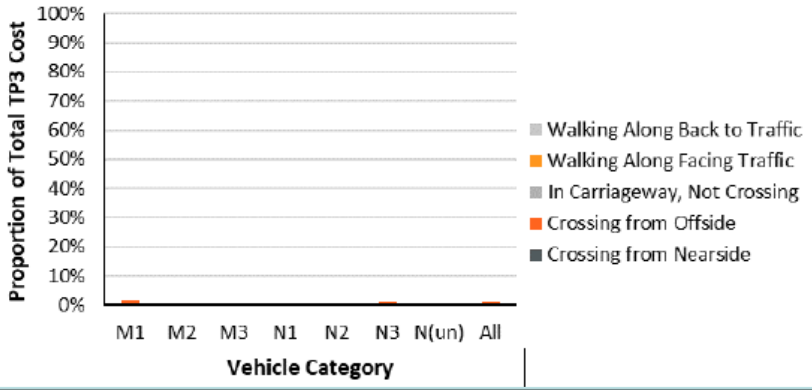
Moving-Off – Frontal Impact



Moving Off – Nearside Impact



Moving Off – Offside Impact



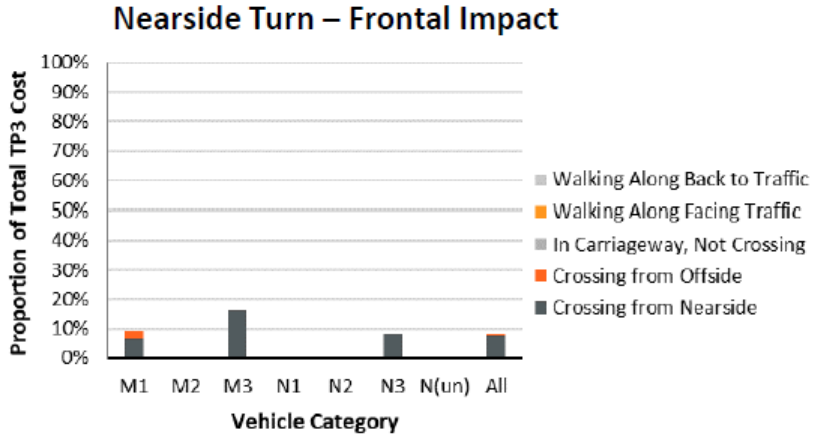
For M2 and N2 only MOVING OFF frontal impact casualties, which are also addressed by MOIS

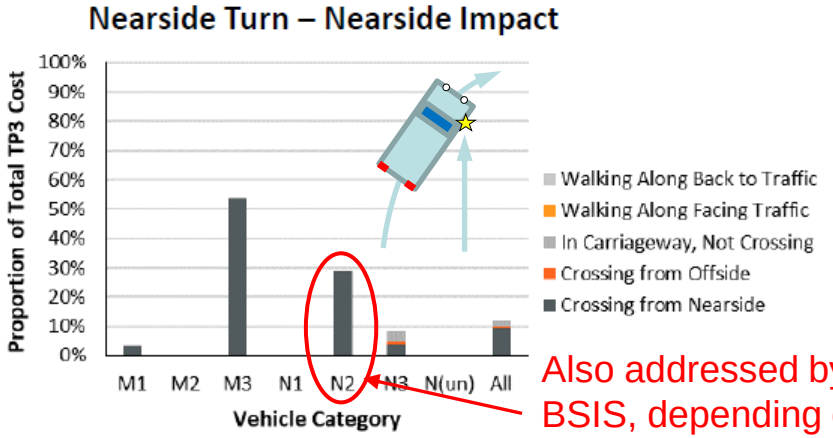
Key Collision Characteristics: DIR

Data Recap

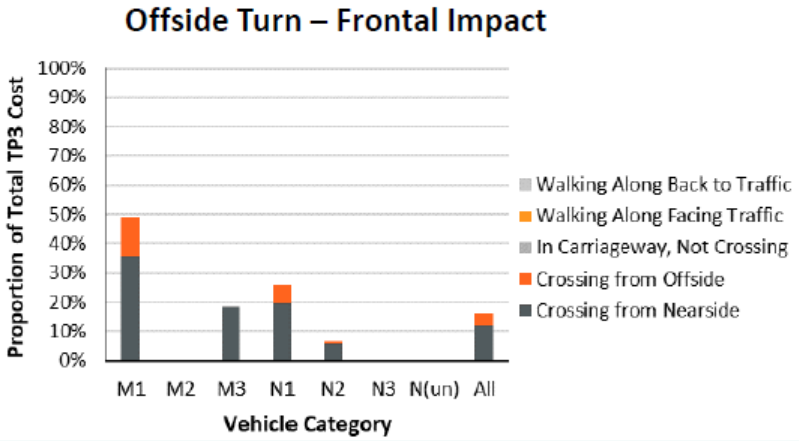
Turning

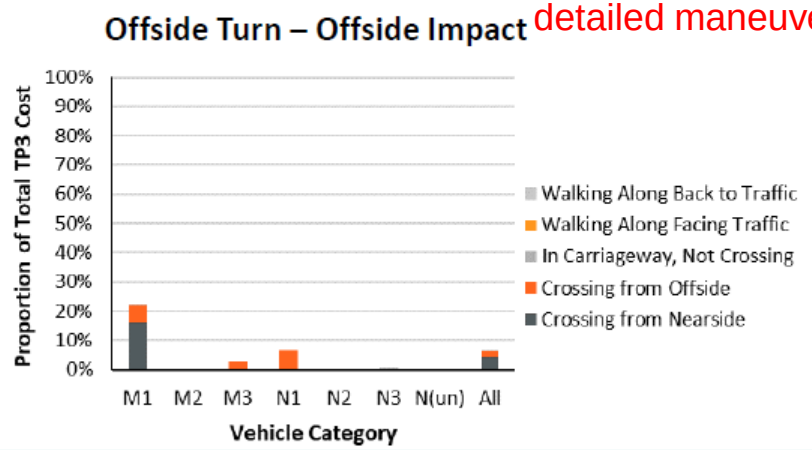
Key Vehicle and VRU Manoeuvres Characterising Pedestrian Collisions





Also addressed by BSIS, depending on detailed maneuvers





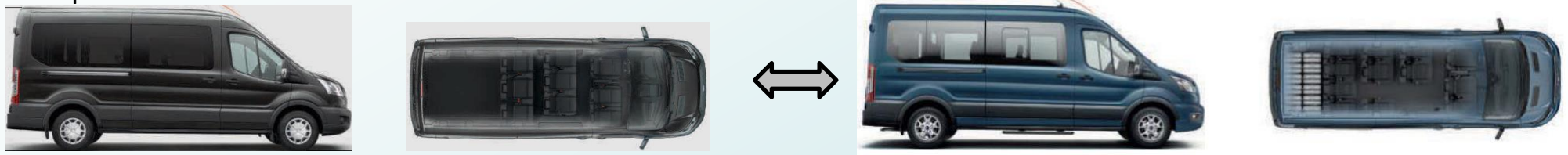
Pedestrian Collisions on nearside when turning nearside also addressed by BSIS

Influence of Regulatory Requirements for M1 and N1 on Direct Vision

Case A: vehicle types of cat N2/M2 (lower range) sharing body structure with derivatives of cat N1 and/or M1 vehicles:

→ Would have to be designed to meet both DVS and UN R-125.

Example:



8/9 seat M1 | 11/12 seat M2

- Design has to consider M1/N1-relevant impact requirements expanded by EU-GSR (full frontal impact, offset frontal impact), with influence on occupant/driver environment that may be conflicting with direct vision (e.g. steering column and seat back angles to become passenger car like as opposed to upright).
- Most vehicles of cat M1/N1 fall under UN R-127 (pedestrian protection) – few "flat front" exemptions anymore – again limiting opportunities to change DVS characteristics with respect to front end height and shape.
- Changes to improve Direct Vision performance are expected to lead to fundamental architectural/platform modifications (e.g. change of seating position, height of hood/cowl etc..), are not implementable in existing designs and would take long lead time.

Case B: vehicle types of cat M2/N2 not sharing body structure with M1/N1 vehicles:

→ Such vehicles are generally not designed to meet UN R-125.

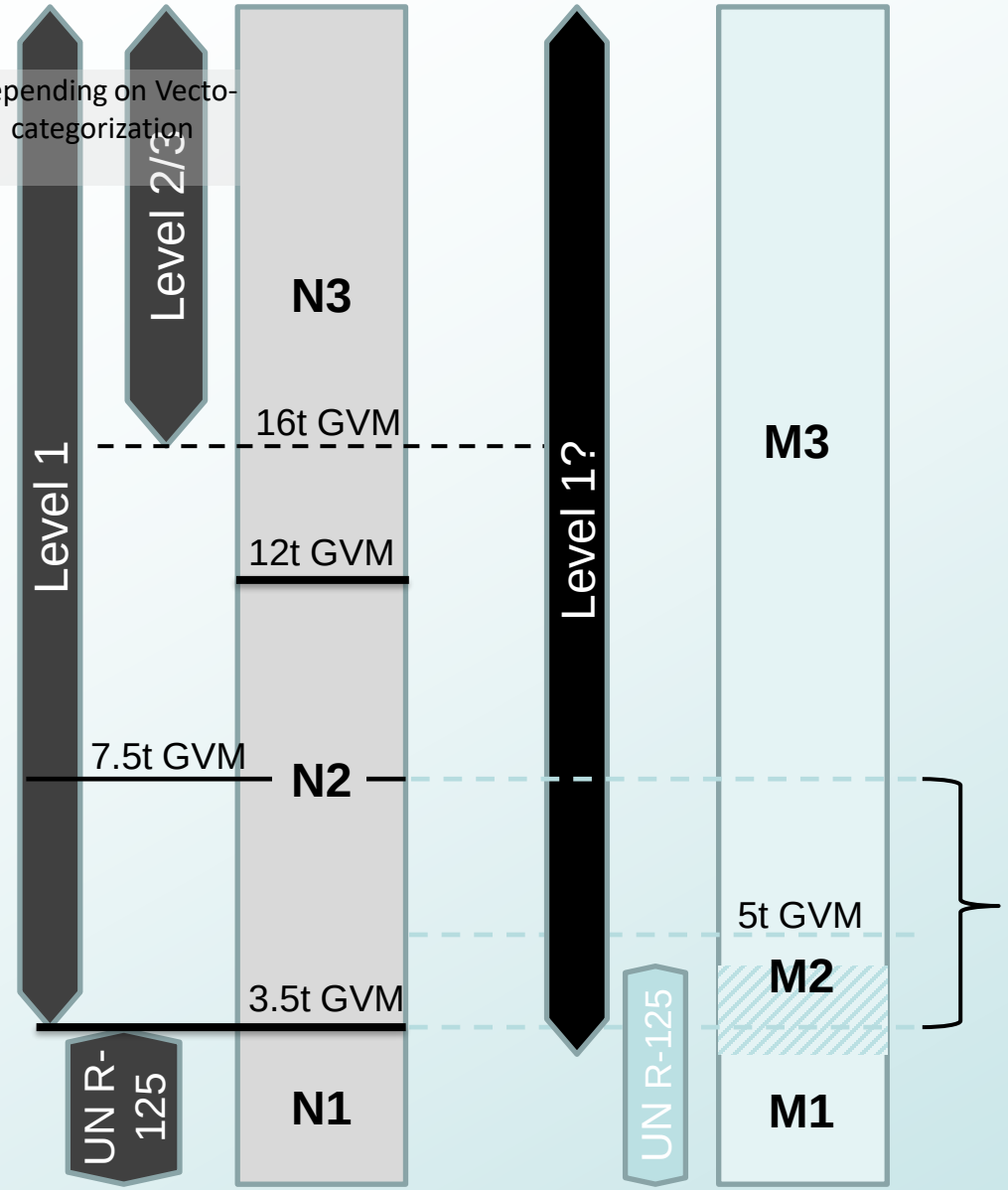
An approach for handling vehicles types overlapping ranges of M1/N1 and M2/N2 categories is proposed (see next slide).

Vehicles types of cat M2/N2 require choice of ECE-R125 and DVS compliance methods

Eye-Point

- The DVS eye-point as proposed by Loughborough University (AHP+ 678mm(x) + 1163.25mm(z)) may be representative for a driver sitting very upright in a large truck or bus, but is not necessarily representative for all smaller commercial vehicles.
- In smaller vehicles the driving position can be more passenger car like (seat back angle ~ 15°).
- Designing the driver environment towards the DVS-eye-point, while in reality the driver's eye-points are closer to the ECE-125 eye-points (V1 and V2), may mislead designs and yield worse visibility.

Categories and Weight Ranges for Proposed Targets



- Adding another category and target to “smaller” vehicles and/or between buses would further increase the regulatory complexity.
- A 4th compliance level might question the principle of regulatory targets.

Proposal to allow alternatively UN R-125 or DV-Reg at Level 1.

UN R-125 option recommended for vehicles up to [5 / 7.5]t GVM

Summary

- Vehicles at low end of M2 and N2 categories do not show elevated numbers of real-world casualties related to Direct Vision.
- The vehicles in this category will fit additional MOIS and BSIS systems for VRU detection.
- Cost/benefit analysis shows an overlap of target population between MOIS, BSIS and Direct Vision measures, irrespective of the different Contributary Factors (Driver did not look properly ←→ VRU in Blind Spot).
- Proposed methodology is based on situation and geometry of large N3-type trucks with high seating positions equipped with mirrors of classes V and VI, which are not fitted to vehicles at low range of M2/N2-category.
- Most vehicle types at low end of M2 and N2 categories have M1 and/or N1 derivatives as well and are already meeting UN R-125.
- DVS eye-point may not be representative of small M2/N2 drivers' positions.

Proposal

1. The “smaller” N-vehicles and buses are expected to be used in urban traffic, so application of the urban/Level 1 targets seems appropriate.

2. In order to avoid unnecessary regulatory burden, vehicles derived from M1 or N1 should be allowed to comply on basis of UN R-125 as well.

   Potential text in DV-Regulation:

   “*Vehicles of categories M2 and N2 < [7.5t] GVM that are not required to fit mirrors of Class V (comment: due to insufficient mounting height) and that are in compliance with UN R-125, are deemed to comply with this regulation*.”

   (This provision implies that UN R-125 is amended to allow for voluntary certification of vehicles of categories M2 and N2.)