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# DIRECT VISION

## N3G – Industry Proposals

VRU-PROXI

ACEA WORKING GROUP TRUCK SAFETY

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# DIRECT VISION – N<sub>3</sub> DIFFERENTIATION

- A division of the direct vision requirement between vehicles that are more likely to run in cities (Level A) and vehicles that very seldomly or never enter a city (Level B) is proposed
  - Different thresholds should apply for the different vehicle groups
  - Proposal based on a few basic vehicle characteristics and leverage on a similar division done in the EU CO<sub>2</sub> Regulations
- N<sub>3</sub>G vehicles are handled in this proposal

# WHAT IS N<sub>3</sub>G – HEAVY OFF-ROAD TRUCK?

- An off-road vehicle is per definition one that qualifies into (sub)category G according to Annex I of Regulation (EU) 2018/858 and paragraph 2.8 of UN ECE Consolidated Resolution on the Construction of Vehicles (R.E.3)
    - Underlying need is to ensure off-road driving capacities and obstacle avoidance
  - N<sub>3</sub>G vehicles – off-road classified heavy trucks – are exempted from, or have less strict requirements in, a number of regulations
    - E.g. FUP (R93), RUP (R58), Noise (R51), Brakes (R13), Lights (R48), External Projections (R61)
    - Underlying reason is that the needs for off-road driving capacities and obstacle avoidance hinder some equipment to be mounted and makes some functions inappropriate
    - When derived from an N<sub>3</sub>, many of those requirements are still fulfilled by the N<sub>3</sub>G vehicle
- **N.B.** A construction vehicle is not per definition an off-road vehicle – most tipper and mixer trucks sold do not qualify into the N<sub>3</sub>G definition

# N3G ≠ CONSTRUCTION VEHICLE

- A construction vehicle is not per definition an off-road vehicle – most tipper and mixer trucks sold do not qualify into the N3G definition


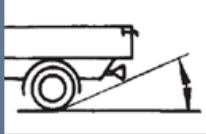



N3 construction vehicle  
N.B. relatively low chassis/cab height



N3G construction vehicle  
N.B. relatively high chassis/cab height

# N3G – REGULATION (EU) 2018/858 (AND R.E.3)

Category	Axles driven simultaneously (power may be disengaged)	Differential lock (or similar)	Ability to climb a x% gradient (solo vehicle)	Approach angle	Departure angle	Ramp angle	Ground clearance		
							under front axle	between axles	under rear axle
M1 N1	Front ≥ 1 Rear ≥ 1	≥ 1	25%	≥ 25°	≥ 20°	≥ 20°	≥ 180 mm	≥ 180 mm	≥ 200 mm
OK if at least 5 of these 6 geometrical conditions are met									
M2 N2 M3 ≤ 12t	All axles	No condition	No condition	No condition	No condition	No condition	No condition	No condition	No condition
or	Front ≥ 1 Rear ≥ 1	≥ 1	25%	≥ 25°	≥ 25°	≥ 25°	≥ 250 mm	≥ 300 mm	≥ 250 mm
≤ 7.5t OK if at least 5 of these 6 geometrical conditions are met > 7.5t OK if at least 4 of these 6 geometrical conditions are met									
N3 M3 > 12t	All axles	No condition	No condition	No condition	No condition	No condition	No condition	No condition	No condition
or	Half of axles, or 2/3 for 3 axles configuration	≥ 1	25%	≥ 25°	≥ 25°	≥ 25°	≥ 250 mm	≥ 300 mm	≥ 250 mm
OK if at least 4 of these 6 geometrical conditions are met									

# N<sub>3</sub>G – NOT POSSIBLE TO “PHASE OUT”

- N<sub>3</sub>G operation in relevant operations and locations, *non exhaustive*
  - Forestry in Scandinavia and South Africa
  - Open pit mining in Australia and Malaysia
  - Underground mining in South Africa and Sweden
  - Reclaiming land from the sea in the Netherlands
  - Road construction in Siberia during flooding in the spring
  - Defence operation all over the world
  - Construction sites all over the world
  - *City construction and waste handling to a low extent, in particular UK*

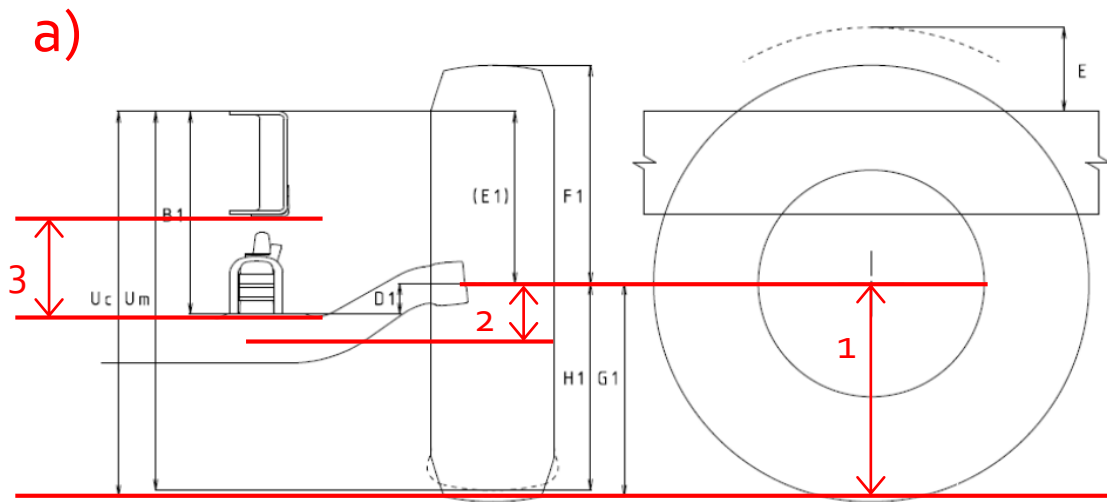


# DIRECT VISION – PERFORMANCE ANALYSIS

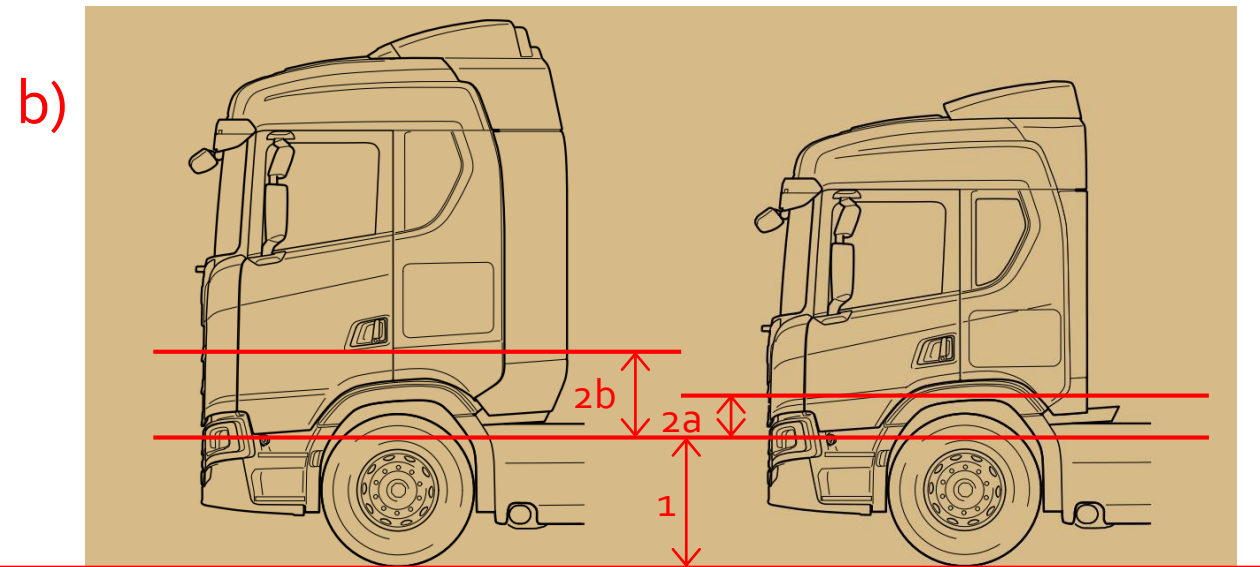
- Achieving a high direct vision performance, according to the volumetric method, requires the chassis/cab height to be low, since direct vision performance is built up from a combination of:
  1. Chassis/cab height (driver's position height)
  2. Cab design specificities (i-panel, doors, windows, driver's longitudinal position...)
- ...in which parameter 1, chassis/cab height, has the predominant influence
  - the higher chassis/cab height, the lower the direct vision performance
- Parameter 1 is a customer choice based on their operational needs
- Parameter 2 can be influenced by the OEM by considerable redesigns of the cab and/or additional medium-heavy development work

# DIRECT VISION – CHASSIS/CAB HEIGHT ANALYSIS

- The most predominantly influencing parameter (1) is the sum of
  - Chassis height, i.e. size of axle drop, height of suspension and wheel size
  - Cab floor height over the chassis



a) Chassis height: wheel size (1), axle drop (2) and suspension height (3)



b) Cab floor height over the chassis (2a, 2b) for two different cabs with same chassis height (1)



# DIRECT VISION – CHASSIS/CAB HEIGHT ANALYSIS

- The most predominantly influencing parameter (1) is the sum of
  - a) Chassis height, i.e. size of axle drop, height of suspension and wheel size
  - b) Cab floor height over the chassis
- For long haulage, the highest chassis heights (a) are rarely needed, while the highest cab floor heights (b) are both needed and desirable
- For off-road trucks (N3G), the highest cabs (b) are rarely needed, while high chassis heights (a) including large wheels are operational prerequisites
  - Exemptions among N3G are AWD-trucks and a small portion of non-AWD

# CHASSIS/CAB HEIGHT LONG HAUL VERSUS N<sub>3</sub>G

- Given the different basic needs between (non-AWD) N<sub>3</sub>G and long haulage vehicles, the following analysis apply
  - For long haulage applications with **flat floor cabs** and **normal-high chassis**, the highest cab floor heights are at approximately X mm \*
  - For non-AWD N<sub>3</sub>G applications with **normal high cabs**, with their **higher chassis**, the highest cab floor heights are found at approximately X-100 mm \*\*
  - A difference of ~100 mm in cab floor height at this level indicates a difference in direct vision volume of approximately 1 m<sup>3</sup>, provided everything else is kept constant
- This is valid in general, but differs slightly between manufacturers and designs and “the tail” of specifications may require further consideration

\* N.B. vehicles not limited to 4,00 m total height can have higher total floor height

\*\* N.B. higher cabs are also used in N<sub>3</sub>G to some content; “the tail”

# LONG HAUL VERSUS N<sub>3</sub>G – GENERAL RULE



N<sub>3</sub>G (left) has higher chassis height than Long haul tractors (right)

The higher cabs that are normally used in Long haul however most often result in a higher total cab floor height, as indicated above

# N<sub>3</sub>G SUMMARY AND PROPOSALS

The following three proposals are possible:

1. Introduce a third level B+ group, with a limit value 1 m<sup>3</sup> above level B group threshold for non-AWD N<sub>3</sub>G vehicles, AWD vehicles in level B group
  - Technology neutral: same cab improvements as long haulage (Level B group) guaranteed
2. N<sub>3</sub>G vehicles qualified through the attack angle ( $\geq 25^\circ$ ) – level B group
  - Provide clarity but is not future proof due to potential FUP requirement
3. N<sub>3</sub>G vehicles qualified through front ground clearance ( $\geq 250$  mm) – level B group
  - Provide clarity and is future proof to FUP requirement