

**Draft report of the 12th Session
GRSG informal group on
awareness of Vulnerable Road Users proximity
in low speed manoeuvres (VRU-Proxi)**

Dates: 26 - 28 November 2019
Venue: CLEPA Offices
Cours-Saint Michel 30
1040 Brussels (Belgium)

Contact: Mr. Paolo Alburno (CLEPA Director Technical Regulation)

Chairs: Mr. Matsui (J) and Mr. Broertjes (EC)
Secretary: Mr. Broeders (OICA), email: johan.broeders@daftrucks.com

1. Adoption of the agenda

Document: VRU-Proxi-12-01 (Chair)

The proposed agenda and changes to the running order as presented by the Chair were adopted by the group.

2. Adoption of the report of the 11th VRU-Proxi session (Loughborough, UK)

Document: VRU-Proxi-11-15 (Chair)

There were no comments, agenda was adopted

3. State of play of close-proximity vision and detection rulemaking in the contracting parties

The European Commission (EC) explained the situation regarding the General Safety Regulation (GSR) Phase 2. The GSR was adopted by the European Parliament at 25th of October 2019 and the Council (EU Member States) agreed on the 8th of November 2019. After final approval it will be published in the Official Journal of the EU. The entry into force will be 20 days after this publication which will likely be in January 2020.

Application date of the GSR will be in July 2022 and the regulations need to be finalized 15 months before (April 2021). Therefore the regulation text has to be finalized before the middle of next year, in parallel to the related UN regulations. Worst case would be that for EU regulations with introduction dates at 2022 (New Types) / 2024 (All Registrations) two regulations (EU and UN) would exist in parallel. As the EC committed to follow in principle the UN process the 15 months deadline for availability of the regulations before implementation could make it complex. For UN regulation an adoption in April 2021 at WP29 (end of January 2021 to be ready) would be needed to be published in time in the Official Journal of the EU.

UK gave an update concerning the UK situation. After the elections at the 12th of December 2019 a new government will be installed. Situation regarding UK leaving the EU is currently not clear as it depends on the outcome of the elections.

4. Accidentology

As there was no update this subject has not been discussed in this session.

5. Reversing motion

Documents: VRU-Proxi-12-02 (CLEPA)
VRU-Proxi-12-05 (Reversing Motion Task Force)
VRU-Proxi-12-06 (Reversing Motion Task Force & Japan)
VRU-Proxi-12-08 (OICA)
VRU-Proxi-12-09 (TFRWS)
VRU-Proxi-12-11 (OICA)
VRU-Proxi-12-16 (Japan)
VRU-Proxi-12-17 (OICA)

Presentation Taskforce Reversing Motion (Mr. Akinari Hirao):

J explained the status regarding the discussions in the Taskforce Reversing Motion, focusing in the following open discussion points:

1. Scope exemptions
2. System response time after cold start
3. Overlays and screen changes
4. De-activation of Rear-View Camera)
5. Direct view by turning around of driver's head (looking back) with or without rear view mirror
6. Image quality or object size of RVC
7. Impact test and radius conditions of devices
8. Test procedure (response time removed and only latency requirements for detection system), de-activation of warning by the driver,

New proposals for changes and raised issues from OICA and CLEPA:

- OICA:
 1. Definition of backing event
 2. Exemptions for bike rack or trailers behind vehicles
- CLEPA issues concerning detection system:
 1. Current test procedure based on passenger vehicle ISO, not addressing truck applications
 2. ISO test based on ultra-sonic sensors
 3. Test objects (poles) not linked to VRU's
 4. Detection range not suitable for trucks
 5. Crossing VRU's are not addressed

The above mentioned issues were discussed or re-considered during a line-by-line evaluation of the regulation proposal based on document VRU-proxi-12-06:

1. Scope

- Discussion on exemptions for N2/N3 tractor units:
 - Accidents with solo tractors in non-public areas: UK noted that there is no accident data info from the UK Health & Safety Organization available yet.
 - An audible warning at the outside (reversing alarm instead of a reversing motion system on the truck) might take away the awareness of the driver as this measure is supposed to be particularly effective for VRU's at the outside.
 - It was questioned whether a reversing alarm mounted on the tractor will be noticeable for a VRU standing 12 m behind a trailer. The Chair explained that Reversing Motion systems on trailers would be the ideal situation but this will not be mandated by the GSR in EU which is only applicable for motor vehicles and not for trailers. Therefore a reversing alarm on the tractor will for many cases be a better situation than having no reversing safety system at all. The Chair remarked that Reversing Motion installation on trailers could be considered as a future upgrade of this UN regulation (by amending or supplementing a new version).
 - Conclusion on exemptions of the scope: DK: exemptions allowed, UK not, FR not, G no opinion yet. J: no exemption in UN regulation. Decision : no exemptions in UN regulation, exemptions and replacement by reversing alarms could be discussed and agreed on Contracting Party level.
- Taskforce Reversing Warning Systems proposed to allow a pause function of the acoustic reverse warning device if the vehicle or trailer is equipped with a Reversing Motion system (see VRU-Proxi-12-09): Japan not agree, UK not agree, ETSC not agree. As these systems addresses different road users (drivers versus VRUs) and they are not mutually exclusive the IWG concluded that Reversing Alarm shall not be paused/disabled if the vehicle has a Reversing Motion system.
- The IWG agreed to maintain the part of 1.4 “Vehicles where installation of any device for reversing safety is incompatible with their on-road use may be partly or fully exempted from the Regulation, etc..”
- OICA raised the issue of incomplete trucks without a complete bodywork and as a consequence possibly without a fully functional Reversing Motion system installed (multistage approval). The Chair responded that the stages shall be evaluated and asked the **Industry** to look for an acceptable solution. As incomplete vehicle does not need to fulfil all legislations this may be subject of discussion/approval of local authorities.

2. Part I: Definitions

The IWG agreed on the following:

- 2.1.2.1 “Rear View Camera” shall be replaced by “Rear View Camera System” (not “monitoring” as proposed by CLEPA as the system needs not intentionally to have a monitor). The part “excluding devices such as periscope” shall be removed.
- 2.1.2.2.1 shall be removed as this definition is only used in the impact test session which has been removed from the document.
- 2.1.4 (shall be consecutively changed into 2.1.6): Field of detection shall “above” instead of “on” ground level (also to be changed in Field of vision definition in 2.1.4)

3. Part I: Requirements

- 6.1.1.3 Impact test and radii requirements.
 - The Chair stated that this might not be needed as, considering the outside rear-view mirror not as device for indirect vision, this would be covered with the

provisions for external projections as laid down in other regulations. It was remarked that this should be considered for the components of the detection system as well. The Chair proposed to remove these sections (no impact/radius requirements neither for mirrors nor for camera or sensors).

- UK, DK and J agreed with the Chair's proposal. G needed more time. FR stated that the impact test shall be included here as ECE R46 requires it also for Class VI (front mirror) as compensation because it is not incorporated in ECE R26 and R61 (external projections for passenger cars and commercial vehicles).
- Provisional outcome: no device of the Reversing Motion regulation is considered as device for indirect vision (so no need for requirements for radius and impact), it should be covered by requirements for internal components and for external projections. It shall be checked that the devices for reversing motion are not considered in other regulations.
- 6.1.1.1: all mirrors may be adjustable (not shall).

4. Part II: Definitions

- 12.9: Proposal to change "Active vehicle mode" was accepted by the group.

5. Part II: Requirements

- 15.1.1: The following changes were agreed:
 - Rephrase the requirement by adding: "...and ends when one of the following conditions is met:"
 - Add "maximum" to the conditions (a), (b) and (c).
 - Delete (d)
 - "Backing event" (as used in US FMVSS 111) shall be kept and not be replaced by "Reversing motion event".
- 15.2.1 (15.2.1.1 and 15.2.1.2): Looking back issue has been discussed with different opinions of the CPs. For direct vision/mirror view (looking back) the distance from the eye point to the rear end of the vehicle might be a limiting factor. CPs were asked: J to check internally but probably OK, EU OK, FR in principle not OK but maybe acceptable for short vehicles. The Chair proposed to accept this but only applicable if the distance between the ocular points and the rear end of the vehicle is smaller than [x.x] meters and maybe also dependent on no. of seating rows. This shall be discussed with CPs. OICA to define and argue a proposal for this distance requirement.
- 15.3: Agreed to change "Monitoring area" into "Field of detection".

6. Part II: Requirements for devices for indirect vision other than mirrors

- Proposed changes to 16.1.1.1 and 16.1.1.3 (including additional OICA proposal) were accepted by the IWG.
- 16.1.1.4: J is not in favor of allowing the driver to change/modify the view. FR and UK agree with J. OICA explained that a long discussion took place and in the end it was proposed to take the FMVSS definition. After discussion the group agreed with the OICA proposal but last part to be changed that driver is only allowed to de-activate the view when the vehicle is not moving rearward.
- The group agreed to delete 16.1.1.6 (Automatic screen change) and to accept the OICA proposal for 16.1.2.1 (Device readiness).

7. Part II: Requirements for detection systems

- 17.1: Agreement that automatic deactivation of the detection system is only allowed if the vehicle has detected coupling of the coupling device. OICA stated that the

definition of the coupling device shall also cover the 5th wheel and drawbar coupling devices for (heavy) commercial vehicles. This was agreed by the IWG and UK may propose a correct wording for this definition.

- 17.2.1.1: It was agreed that one of the information signals may be deactivated manually by the driver (e.g. in case the detection system cannot function properly).
- 17.2.4: “If the optical information is selected, it shall be always visible to the driver” shall be deleted.
- 17.4.2 The Chair stated that response time and cold start requirements are needed for the detection system as well. **OICA** was asked to make a proposal.

8. Annex 9 Test conditions for Close proximity rear-view field of vision

- Paragraphs for lighting and vehicle conditions to be added including conditions for tires, fuel tank filling, vehicle load, etc.. For lighting conditions it was agreed to take over the FMVSS 111 conditions, for the vehicle conditions the Chair proposed to use EU test conditions instead of the FMVSS111 conditions.

The Chair concluded with statement that very good progress was made by the TF and that some remaining discussions shall be undertaken by the Taskforce and OICA. A Working Document of the Reversing Motion Regulation shall be submitted by J to GRSG before the deadline of the 6th of January 2020.

6. Direct Vision

Documents: VRU-Proxi-12-12
 VRU-Proxi-12-13
 VRU-Proxi-12-14
 VRU-Proxi-12-15

Loughborough Design School presented in VRU-Proxi-12-12 a new proposal for physical measuring method to find an analogous test to the digital DVS volumetric approach.

- This new physical method improves the accuracy of modelling the digital DVS in the real world, hence an improvement of the correlation with the DVS. The method will be further elaborated and presented in Osaka meeting.
- OICA asked how lower door windows would be incorporated. LDS explained that this needs to be investigated, maybe lower sticks could be used.
- LDS explained to be in contact with Millbrook who performed R46 homologations, a test and repeatability check will be done at Millbrook (planned for January 2020).

Apollo Vehicle Safety presented in VRU-Proxi-12-14 a Case Study regarding Direct Vision Improvements.

- A case study was performed (not comprehensive) to investigate what direct vision improvements are feasible for Construction and Long Haul vehicles based on the recently revised vehicle from Scania.
- Several aspects of the Scania new versus old model were considered: fascia, A-pillars, mirrors, door windows, windscreen line, AHP/seating position, etc...
- According Apollo Vehicle Safety 1 star is clearly feasible for construction vehicles at cab re-design stages, also significant improvements feasible without changes to main cab structure.

Discussion:

- LDS: with elongation of cab and an additional lower aero front 1 star could be achieved. Scania R with elongated 400mm would achieve 1 star.
- UK expressed that 1 star for the low vehicles may be not stringent enough.
- OICA: high seating position also beneficial for driving more safely on highways and more living comfort (which results in better resting). Also a truck drivers association (voice of the truck drivers) is needed for this discussion.
- EC explained that when 1 star is considered for long haulage this would consequently result in a better direct vision for city trucks due to the lower positioning of the same cab (truck manufacturers generally apply the same cab types for highway and city trucks).

OICA / ACEA presented in VRU-Proxi-12-15 an update of the industry position:

- According LDS the proposed direct vision regulation method from OICA/ACEA is not preferred as it would result in a disadvantage (worse rating) for some models. LDS stated that the volumetric approach was proven to be more accurate and representative for the direct vision performance.
- The 0.6 stars (this value needs to be further justified and confirmed by LDS) will theoretically close the gap between direct and indirect vision. LDS stated that currently no such truck model exists. The truck that has at least no gap between direct and indirect vision to all directions (front, left and right) was chosen as the 1 star level. So it was based on an existing vehicle that just achieve the VRU-visibility at all sides.
- The Chair asked the **Industry** to work on a preparation for a thorough direct vision discussion in the next meeting.

Transport & Environment (T&E) presented in VRU-Proxi-12-13 their view on direct vision regulation.

- OICA: Flat floor in truck cabs is not only comfort but this works also out into safety, good rest, less exposure to noise and vibrations.
- OICA: W&D is EU and not UN. T&E asked for commitment from OICA to investigate the length restrictions. The Chair asked OICA to investigate the W&D restrictions in other UN contracting parties outside EU. **OICA** to coordinate.
- T&E mentioned having concerns about the OICA/ACEA proposal and asked **LDS** to share the summary why the static method does not work (inconsistent results / disadvantage of certain models).
- The Chair expressed to be basically in favour of an easy way for the test procedure type approval.
- T&E explained to be in favour of increasing direct vision requirements over time, therefore volumetric approach would be useful.

7. Forward motion Vehicle driving straight or taking off from standstill

Documents: VRU-Proxi-12-07 (Japan)
VRU-Proxi-12-10 (TRL)

TRL presented the status of the MOIS Taskforce as composed in the consensus document VRU-Proxi-12-10. The 15 basic questions were discussed in the MOIS Taskforce and the outcomes were presented to the group. The decisions and agreed ways forward are given below.

Q1: Vehicle Scope

A two Phase approach to vehicle scope was proposed:

- 1) Vehicle categories M2, M3, N2, N3 shall be considered to be in scope in the first instance.
- 2) Possible addition of M1/N1 in future together with appropriate inclusion of requirements (e.g. “if-fitted” requirements).

In the next VRU-Proxi meeting J might to give an opinion on inclusion of M1/N1 based on an accidentology study that is currently ongoing. OICA and CLEPA asked to have clarity on this before next meeting in order to send an appropriate delegation to the next VRU-Proxi meeting.

Q2: VRU Scope

- The detection of both pedestrian and cyclist (VRU) test targets shall be required by the MOIS Regulation
- VRU test targets shall include child sized test targets (similar to the approach in BSIS)
- VRU test targets shall be based on ISO 19206-2/ISO 19206-4

Q3: System Functionality

- CLEPA explained that, as discussed in the AEBS M1/N1 IWG, it is not useful to give warnings to the driver prior to an emergency braking at low speeds. It will result in many too early warnings which the driver may interpret as false warnings. More explanation is given in document AEBS-04-05 on the UNECE Wiki.
- OICA also proposed to decrease the size of the warning area. The Chair agreed to opt for a warning zone that would result in an acceptable and comfortable system behaviour for the driver.
- OICA raised the issue for driver annoyance in case a VRU is clearly visible. It was agreed that the proximity signal shall be a non-intrusive signal which shall not be annoying for the driver.
- ETSC noted that GSR contains requirements for the MOIS system to provide a warning or avoid a collision and asked why not mandating a motion inhibit. The Chair stated that this is not in line with the Terms of References of this IWG and might be too complex as a first stage. A motion inhibit could however be an opportunity for future improvement of this regulation.
- Options: 1) only information and no warning system, 2) information with warning signal (like BSIS), 3) acceleration limitation, 4) drive-off limit. DK stated that a warning is needed and as early as possible. UK allows driving off with possibly a limitation of vehicle acceleration. OICA explained that it is technically possible to provide a warning in motion scenarios but expressed concerns about high risk for false or too many warnings.
- Conclusions:
 - Proximity information signals (only at standstill) shall be required for N2/N3 (see also Q7a)
 - Collision warning signals (when the vehicle is moving / or starts to move) shall be required for M2, M3, N2, N3 (see also Q7a)
 - Moving-off inhibit function permitted (but will not be mandatory as this is not corresponding with the current Terms of References of this IWG).
 - If moving-off inhibit function is included the collision warning signals would not be required.
 - Effectiveness, risk for false warnings and driver acceptance shall be taken into account.

Q4: Vehicle Motion

The detection of VRU test targets shall be required when the vehicle is stationary, moving off from rest in a straight line and moving ahead slowly in a straight line.

Q5: Vehicle Speed

The operating speed in relation to the detection range and the definition of the max. moving-off speed were discussed thoroughly. Conclusion: the proximity signal shall be given to driver for vehicle speeds of 0-10 kph.

Q6: VRU Manoeuvres

- The detection of pedestrian test targets shall be required for test targets crossing from the nearside and offside of the vehicle.
- The detection of cyclist test targets shall be required for test targets crossing from the nearside and offside of the vehicle.
- The detection of cyclist test targets shall be required for test targets facing away and moving off longitudinally in front of the vehicle.
- The detection of cyclist test targets for test targets facing away and stationary in front of the vehicle shall be considered depending on the proposed test case (where the cyclist may need to move into the field of detection).
- There shall be no requirement for obstructed test target tests

Q7a: Direct Vision

- The effect of direct vision performance shall be considered in the performance requirements for vehicles of different categories. The suggested way forward is:
 - N2/N3 vehicles shall be required to have both the proximity information signal and collision warning signal. OICA proposal to be considered: start with the information signal at standstill and increase to the warning level when the accelerator pedal is applied.
 - M2/M3 vehicles proposed to be required to have collision warning signal, with optional proximity information signal also permitted.
- The worst-case direct vision blind spot distance from the vehicle front end shall be used to determine the maximum forward detection distance of the proximity information signal. LDS calculated that this worst-case distance would be [3.7] m based on the current existing truck models.

Q7b-Q10, Q12: Detection Boundaries

- OICA raised a concern on crossing pedestrians that can suddenly stop or change their trajectories. These cases are very hard to predict and may cause false warnings which could result in an annoying and unacceptable system for the driver. After discussion it was decided to focus only on the driving straight trajectory while moving and look wider at standstill conditions.
- VRU detection performance conditions shall not be required for the collision warning signal and motion inhibit functions, but the manufacturer strategies may be encouraged.
- Proximity information signals shall be provided to the driver when VRU test targets are stationary or manoeuvring in close proximity to the vehicle in situations with the following conditions:
 - Vehicle stationary:
 - VRU test targets travelling at speeds of [3-5] kph and crossing in front of the vehicle from both the nearside and offside, between the distances of [0.6] m

- ([0.45] m for child) and [3.7] m from the vehicle frontal plane to the centreline of the test target.
- VRU test targets travelling at speeds of [3-5] kph within the bounds of the potential future "vehicle trajectory" (path described by width of the vehicle extending longitudinally in a straight line from [0.6] m ([0.45] m for child) to [3.7] m in from the front of the vehicle frontal plane to the centreline of the test target.
 - Notes:
 - all be tested with a test case where the MOIS system shall be allowed to detect a cyclist that "moves" into the detection zone before stopping.
 - Test scenarios are straight ahead scenarios, system shall not completely be turned off in case of curves but it may have a reduced or adapted area of detection to avoid false warnings

Vehicle moving:

- VRU test targets that are either stationary or at speeds of [3-5] kph within the bounds of the vehicle trajectory when the vehicle is moving at speeds of up to 10 kph

Q11: VRUs Masked by Obstructions

As a starting point it was agreed to take VRUs stepping out from behind obstructions not into account. Therefore no test cases shall be included where the VRU test target is obstructed from the view of the MOIS system.

Q13: False Positive Test Cases

It was agreed to include the following false positive test:

- The MOIS shall not give a proximity signal or warning signal when driving in a straight line passing VRU test targets placed at [1.0] m outside of the vehicle trajectory. The VRU test targets may be stationary and/or moving longitudinally (backwards/forwards) to vehicle direction of travel. Environmental clutter may be placed at [1.0] m outside of the vehicle trajectory.

Q14: HMI

- The proximity information signal shall consist of an optical signal.
- The collision warning signal shall consist of two different signal modes selected from audible, optical or haptic signals. Should an optical signal be provided, it shall be different in activation strategy to the proximity information signal (more intrusive, e.g. different colour of flashing).
- The proximity information signal and collision warning signal shall not be located below an angle of -30° from the horizontal through the reference eye point (as defined in R46).

Q15: Audible Signal Suppression

The possibility for a temporary audible signal suppression shall be included.

TRL will process the agreed decisions in a consensus document. As submitting a Working Document for the next GRSG session in April 2020 will presumably not be feasible the GRSG will be requested to approve postponement of the delivery of the MOIS draft regulation.

J presented document VRU-Proxi-12-07 concerning a new proposal for "Front and Close-proximity Passenger-side" Field of vision. J will present accidentology data and trends in

traffic accidents in the next VRU-Proxi meeting in Japan. J is considering a separate regulation, which will be isolated from MOIS and will prepare a proposal for discussion in the next VRU-Proxi.

8. Forward motion Vehicle turning - Blind Spot Information System

Document: VRU-Proxi-12-03 (CLEPA)
VRU-Proxi-12-04 (CLEPA)

OICA informed the group that the proposals for amendments to the BSIS regulation ECE R151 (external projections, front overhang, cone height, reduced detection area 7m – 30m, deletion of d_d) were adopted in last GRSG session.

Issues regarding the current ECE R151 were tabled by CLEPA in VRU-Proxi-12-03. It was agreed that CLEPA will discuss with BAST whether adaptations to ECE R151 are needed or not.

CLEPA updated the movies to explain and visualize the different BSIS test cases, these movies are available on the UNECE wiki (VRU-Proxi12-04).

In current ECE R151 the vehicle categories N2/M2 are included in the scope on a voluntary basis. For EU this will not be an option as BSIS for N2/M2 is obliged by the GSR Phase 2. OICA is working on a proposal to adapt the current BSIS regulation with tailored requirements for N2/M2 categories. OICA expressed the following subjects to be considered:

- N2/M2 vehicles have better direct vision to the side area near the front of the vehicle compared to N3/M3.
- Some of these vehicles are already equipped with blind spot information systems but for a different purpose.
- LPI of 30m behind vehicle front seems to be not appropriate for lighter/smaller vehicles.

The opinion of CPs on including N2/M2 was requested. UK stated that it depends on accidents if this is really needed. TRL mentioned that there are more collisions with M1 than M2 and more collisions with N2 than N3.

The Chair asked to the CP's to give feedback on the following question for next meeting: "Is a car-like system without collision warning acceptable for certain light vehicles and what would be threshold 8t or less?"

9. Evaluation of Pedestrian and Cyclist Warning Systems for Trucks

As there was no update this subject has not been discussed in this session.

10. Next meetings

13th meeting: 4-6 February 2020, Osaka International Convention Center, Osaka, Japan.

14th meeting: 21-23 April 2020, Scania, Södertälje, Sweden.

11. Any Other Item

No other items were discussed.