

Proposal for the amendments to Global Technical Regulation No. 9 (Pedestrian Protection)

This informal document is prepared by Republic of Korea and OICA based on a paper
that (INF/GR/PS/141 Rev.1) of the former IWG available at:

www.unece.org/trans/main/wp29/wp29wgs/wp29grsp/pedestrian_8.html

The modifications to the current text of the Regulation are marked in bold or strikethrough characters.

A. Proposal

Insert new paragraph 3.30., to read:

“3.30. “Head Impact Time (HIT)” means time from the first contact of a pedestrian leg on bumper to time of the pedestrian head to bonnet contact.”

Insert new paragraph 3.31., to read:

“3.31. Total Response Time (TRT): time from the first contact of a pedestrian leg on bumper to the deployment moment of the deployable system to protect vulnerable road users. It consists of the Sensor Time (ST) and the Deployment Time (DT).”

Insert new paragraph 3.32., to read:

“3.32. Contact Sensors: sensors detect signals by pedestrian impact (e.g. accelerometer, optical fiber, pressure sensors, etc.).”

Insert new paragraph 3.33., to read:

“3.33. Non-contact Sensors: sensors except contact sensors.”

Paragraph 6.2.2., amend to read:

“6.2.2. All deployable devices designed to protect vulnerable road users ~~when impacted by the vehicle shall be correctly activated before and/or be active during the relevant test. It shall be the responsibility of the manufacturer to show that any devices will act as intended in a pedestrian impact shall be tested according to the test procedure defined in Annex 1.~~”

Insert new Annex 1., to read:

Annex 1.

TEST PROCEDURE FOR ACTIVE DEPLOYABLE SYSTEMS OF THE BONNET AREA

“1. Calculate the Head Impact Time(HIT) for 6yo-child, 5%-female, 50%-male, and 95%-male in deployed position of the system, at a vehicle speed as specified for the leg impact in the legal requirements, at the center of the vehicle, in walking posture as defined in 1.1., using an appropriate simulation tool. The smallest HIT value shall be considered for the comparison with Total Response Time (TRT).

- 1.1. When the numerical simulation is conducted, the manufacturer must provide supporting evidences showing appropriateness of the simulation tool and suitable biofidelity and kinematics of the chosen numerical models. The walking posture of the model shall include the following conditions.
 - 1.1.1. The walking pedestrian model shall be facing in a direction perpendicular to the vehicle centerline with the H-point in the centerline. The legs must be apart from the default standing posture of the model with the rearward leg being impacted by the bumper first. The heel to heel distances are as follows;

6yo-child: 190mm
5%-female: 245mm
50%-male: 310mm
95%-male: 337mm
 - 1.1.2. The friction value to be applied between the foot and the ground shall be 0.3.
2. The vehicle or the system manufacturer must provide the Sensor Time (ST) of the system in principle:
$$\text{Total Response Time (TRT)} = \text{Sensor Time (ST)} + \text{Deployment Time (DT)}$$
3. Perform Legform Test or Upper Legform Test to bumper to measure TRT with the same conditions as specified in item 1 and compare the TRT with the smallest HIT value to demonstrate the performance of the system. The deployment moment is defined as where the system reaches the intended position and activates a device such as locking systems and a spring mechanism to support the system in the intended position. Headform tests shall be conducted based on the result of the comparison between the TRT and the HIT.
 - 3.1. If the TRT is equal to or less than HIT, perform Headform Tests with the system deployed in the intended position.
 - 3.2. If the system is deployed but the TRT is more than HIT, perform dynamic Headform Tests.
 - 3.2.1. Calculate each Head Impact Time (HIT) for 6yo-child, 5%-female, 50%-male, and 95%-male in the un-deployed position of the system, at a vehicle speed as specified for the leg impact in the legal requirements, at the center of the vehicle, in walking posture as defined in 1.1, using an appropriate simulation tool.
 - 3.2.2. Conduct the numerical simulation for each HIT and determine the wrap around distance of each HIT on bonnet. A graph shall be plotted with a best fit straight line with respect to each HIT and WAD. When a test point is selected, as the WAD is known, the equivalent HIT can be obtained from the graph to be used in the dynamic test set up.

- 3.2.3. Synchronize the headform propulsion device and the deployable system based on HIT and ST data for each impact point.
- 3.2.4. Where the TRT is more than HIT partially, the dynamic Headform Tests can be performed partially. In this case, a plotted graph should be considered to determine which area is tested dynamically and which are is tested statically.
- 3.3. If the system does not deploy, perform Headform Tests with the un-deployed system.
- 4. For pedestrian airbag systems for the bonnet area, perform Legform Test or Upper Legform Test to bumper to demonstrate the deployability of the system with the same conditions as specified in item 1. Measuring TRT is not necessary in this case. The headform tests with the airbag system shall be performed dynamically at all times.
- 4. For systems with non-contact sensors, the TRT has to be considered separately.”

B. Justification

- 1. Since the current test procedure of GTR No. 9 for deployable devices is not clearly specified and suitable for a self-certification system, the test procedure for deployable devices to protect vulnerable road users should be specific so the test can be consistently carried out.
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