Pedestrian Protection

Definition of the Measuring Point

Assessment of 2D vs. 3D Impactor Positioning Methods
**Preamble:**

2D method refers to measuring point and center of gravity (CoG) of the impactor being in one vertical, longitudinal plane.

3D method refers to the positioning of the headform based on a first contact with the bonnet top without any reference to the CoG.
Introduction

Conditions to be discussed

Vehicle outer surfaces with ambiguities

Summary
Positioning of pedestrian protection impactors is currently under discussion

The 2D head impact positioning method is the agreed procedure for type approvals since pedestrian protection legislation became effective in Japan and the EU in 2005

A Regulation shall provide accountable framework of rules

Room for interpretation shall be avoided

Gtr No 9 language unintentionally provides room for (geometrical) interpretation

Data has been requested to highlight potential issues with new interpretation of impactor positioning method

Information shown in following slides is not related to safety performance
Introduction

Conditions to be discussed

Vehicle outer surfaces with ambiguities

Summary
Pedestrian Protection

Head Impact – 2D / 3D Method

• Impactor main direction of action is along its center of gravity

• Using 3D first contact, vehicle surface variation affects the impactor overall positioning; tolerances get higher influence in the whole test procedure

• Concave surfaces (radius ≤ impactor radius) lead to multiple points of contact where HIC cannot be assigned to one single point

• Areas where a test cannot be assigned to one single point are considered to be not testable

For details please refer to document GRSP-49-31
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple impactor positions by 3D method:

• To be found at edges, feature lines
• Windscreen washer nozzles

Effects:

• Undefined allocation of HIC value on bonnet top
• High impact of build and alignment tolerances on test point position

For details please refer to document GRSP-49-31
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:
• To be found at all concave (radius ≤ impactor radius) surfaces
• Windscreen washer nozzles
• Active bonnets

Effects:
• Results in areas not to be tested (no first contact)
• Undefined allocation of HIC value on bonnet top
• High impact of build and alignment tolerances on test point position

For details please refer to document GRSP-49-31

55th GRSP, 19 – 23 May 2014, Geneva
Introduction

Conditions to be discussed

Vehicle outer surfaces with ambiguities

Summary
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple impactor positions by 3D method:

70 mm variation of transversal position of the headform result in first contact and allocation of HIC within 2 mm variation
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple impactor positions by 3D method:

$36 \text{ mm}$ variation of transversal position of the headform result in first contact and allocation of HIC within $1 \text{ mm}$ variation
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple impactor positions by 3D method:

26 mm variation of transversal position of the headform result in first contact and allocation of HIC within 3 mm variation.
Pedestrian Protection
Head Impact – 2D / 3D Method

Windscreen washer nozzles: different impactor locations result in 3D HIC location within determination resolution.

Positions of head impact test form in a range of 79 mm result in same test point location on bonnet top assigned to washer nozzle.
Pedestrian Protection
Head Impact – 2D / 3D Method

Windscreen washer nozzles: different impactor locations result in 3D HIC location within determination resolution

85 mm variation of transversal position of the headform result in first contact and allocation of HIC on the washer nozzle (8 mm variation)
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact (glancing):

35 mm possible variation of transversal position of headform (alignment and build tolerances)

35 mm possible variation of transversal position of headform (alignment and build tolerances)
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact (glancing):

15 mm possible variation of transversal position of headform (alignment and build tolerances)
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

35 mm width of zone not to be tested
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

30 mm width of zone not to be tested
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

45 mm width of zone not to be tested
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

40 mm width of zone not to be tested
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

35 mm width of zone not to be tested
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

35 mm width of zone not to be tested

Areas on bonnet top which cannot be tested

Two first contact points

55th GRSP, 19 – 23 May 2014, Geneva
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:

39 mm radius zone at washer nozzle not to be tested
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact:
Pedestrian Protection
Head Impact – 2D / 3D Method

Multiple points of first contact (active hoods):

Not defined allocation of HIC value on bonnet top,
separation of HIC < 1000 / HIC < 1700 zones not possible
Pedestrian Protection
Head Impact – 2D / 3D Method

Marked zones with unclear positioning of the headform impactor represent 3 – 9% of the overall test area.

Highlighted zones are not related to safety performance.
Pedestrian Protection
Head Impact – 2D / 3D Method

Marked zones with unclear positioning of the headform impactor represent 3 – 9% of the overall test area.

Highlighted zones are not related to safety performance.
Pedestrian Protection
Head Impact – 2D / 3D Method
Pedestrian Protection
Head Impact – 2D / 3D Method

Some of the photographs are taken from the internet; none of the photographs is related to safety performance!
Pedestrian Protection
Head Impact – 2D / 3D Method

Introduction

Conditions to be discussed

Vehicle outer surfaces with ambiguities

Summary
Pedestrian Protection
Head Impact – 2D / 3D Method

• 2D head impact positioning method is the agreed procedure for type approval since 2005 when pedestrian protection legislation became effective in Japan and the EU.

• Numerous vehicles exist where the 3D method interpretation of gtr No. 9 creates issues for the determination of the test zone or the test execution.

• Resulting from the 3D method, 3 – 9% of headform test areas cannot be tested.

• Possible side effects described in this presentation and creating issues for testing do not exist when the 2D method as agreed for UNECE R127* is used.

• As pointed out, each point within the test area described in gtr No. 9 CAN be tested and a single HIC value CAN be assigned.

• The same logic applies to proposed amendments to the legform test.

* see document: ECE/TRANS/WP.29/2014/37
"3.20. "Measuring point"

The measuring point may also be referred to as "test point" or "impact point". In all cases, the result of the test shall be attributed to this point, independent of where first contact occurs.

3.20.1. "Measuring point" for the headform test means a point on the vehicle’s outer surface selected for assessment. The measuring point is where the headform’s profile contacts the vehicle’s outer surface cross section in a vertical longitudinal plane through the center of gravity of the headform (see Figure 6A).

Hard structure etc. to be assessed
Pedestrian Protection
Head Impact – 2D / 3D method

Thank You!

On behalf of OICA provided by:

Franz Roth, Audi
Winfried Schmitt, BMW
Klaus Rathje, Daimler
Benjamin Buenger, Opel
Thomas Kinsky, Opel
Jörg Kusche, Porsche
Olaf Insel, Volkswagen

55th GRSP, 19 – 23 May 2014, Geneva