

FOR SAFER CARS

# EURO NCAP

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**ICRT**  
INTERNATIONAL CONSUMER RESEARCH & TESTING

**ADAC**



**FIA** FIA Foundation  
for the Automobile and Society

# EC Task Force Legform Test Procedure

Euro NCAP Legform Testing

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4<sup>th</sup> September 2012

## ■ Current Protocol (v6.0, Feb 2012)

### 6.1 Legform to Bumper Tests

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- 6.1.2.3 The three Euro NCAP impact points should be chosen for areas which are judged to be the most likely cause of injury.
- 6.1.2.4 The impact points shall normally be between the Bumper Corners.
- 6.1.2.5 However, where there are structures outboard of the bumper corners, which are deemed to be more injurious than locations in the adjacent third, Euro NCAP will perform a test to those structures for use in the final vehicle assessment. These tests will be limited to locations between the two outermost ends of the bumper beam/lower rails/cross beam structures.
- 6.1.2.6 Points selected outside of the bumper corner will be applied to the outermost areas L1A and/or L3B in the vehicle rating. The remaining areas, L1B & L3A will remain free for nomination.

## ■ Background

- In 2006/2007, the Euro NCAP Technical Working Group (TWG) became aware that bumper test zones were becoming increasingly narrow.
- At this time, Euro NCAP was using the Regulatory bumper test zone (v4.2 June 2008)
- A study was performed to illustrate these trends.

## ■ Euro NCAP Protocol v4.2, June 2008

### 3.1 Legform to Bumper Tests

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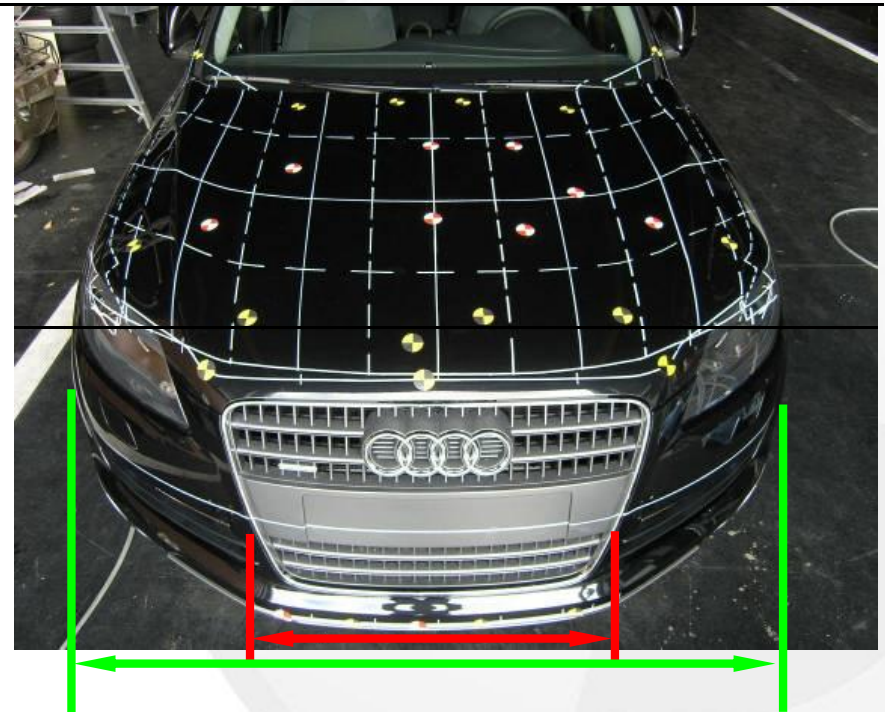
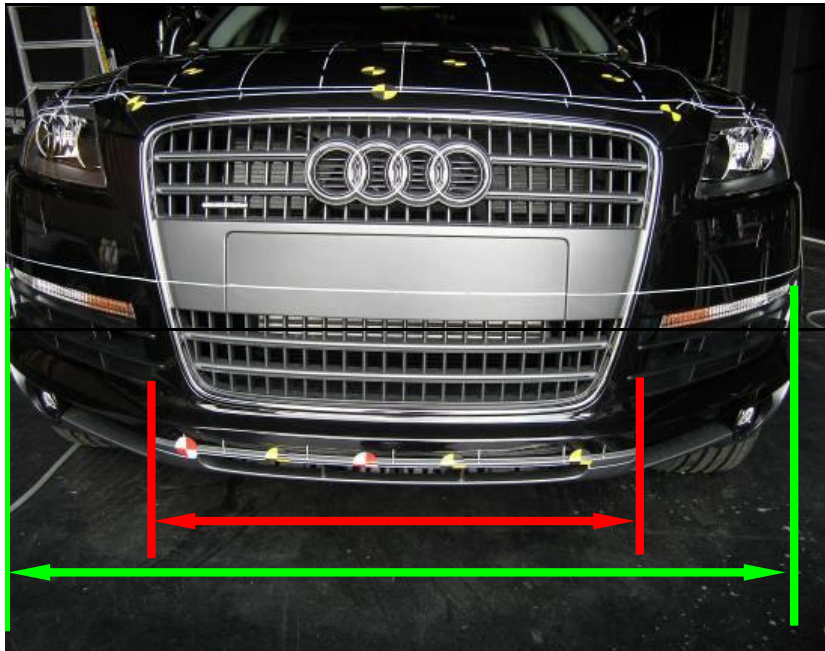
- 3.1.1.1 There shall be three Euro NCAP chosen impact points on the bumper.
- 3.1.1.2 The impact points shall be a minimum of 66mm inside the Bumper Corners. Where there are structures outboard of the corner reference points, which are deemed to be injurious, Euro NCAP reserve the right to perform a test to those structures.
- 3.1.1.3 No impact point may be closer than 132mm to any other bumper impact point.



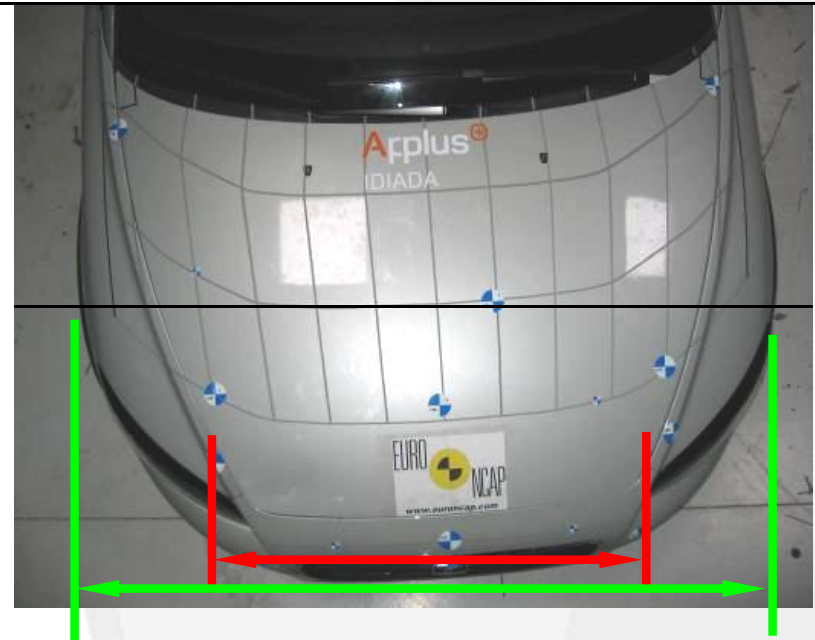
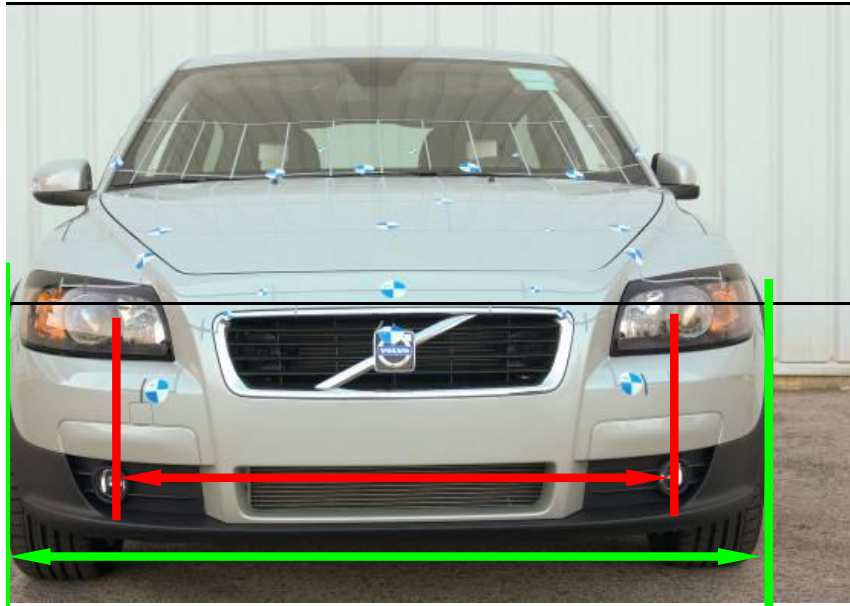
## ■ Vehicles with Narrow Bumpers

Red area = Regulatory test area

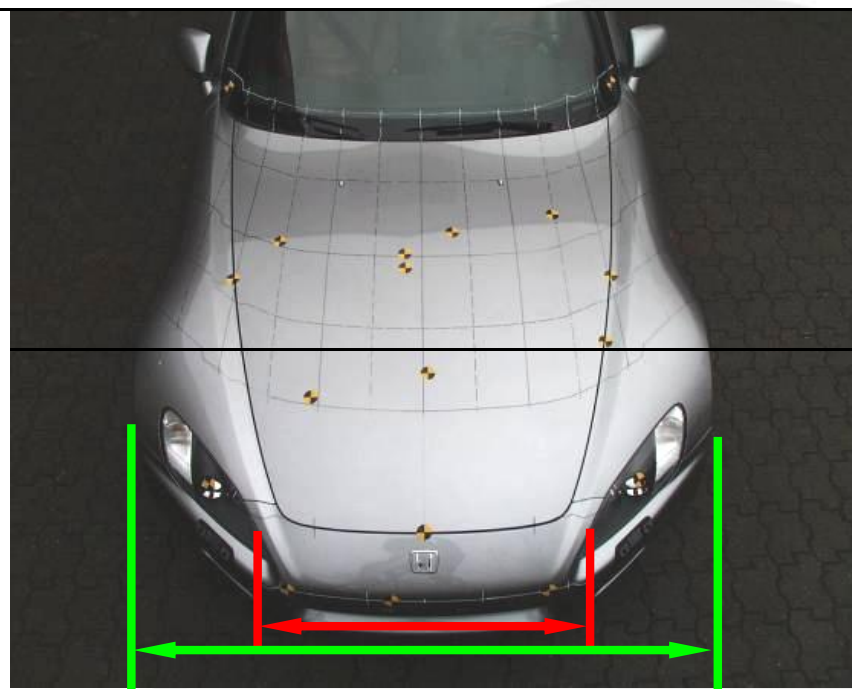
Green = bumper width



## ■ Vehicles with Narrow Bumpers



## ■ Vehicles with Narrow Bumpers





## ■ Contrasting example



## ■ Monitoring

- Euro NCAP began performing tests to injurious structures outside of the bumper corners.

## Monitoring



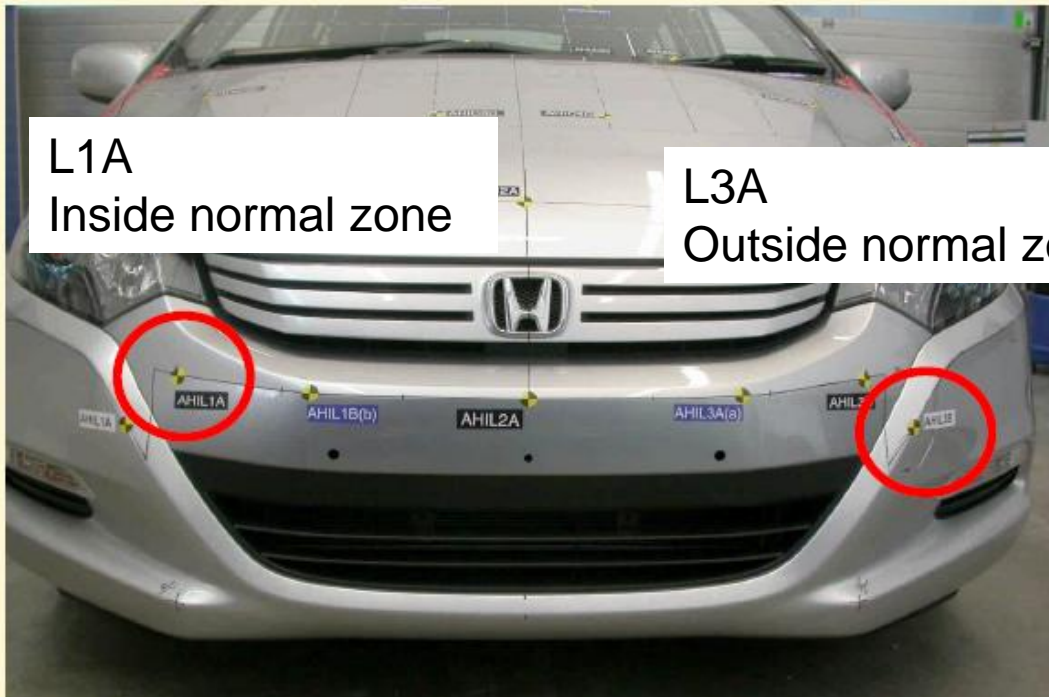
- L1A  
Limit of normal zone
- S2  
Inside bumper corner
- S1  
Outside bumper corner

### LEGFORM

	A			A			A	
Tibia acceleration - g L1	91	1.00	S1	363	0.00	S2	164	0.71
Knee shear displacement - mm	2.0	1.00		3.5	1.00		3.4	1.00
Knee bending angle - deg	9.8	1.00		25.5	0.00		14.8	1.00
<b>Legform assessment</b>		1.00			0.00			0.71



## Monitoring



LEGFORM		L1		L3	
			A		A
Tibia acceleration - g		104	1.00	329	0.00
Knee shear displacement - mm		2.5	1.00	7.5	1.00
Knee bending angle - deg		7.8	1.00	22.1	0.00
<b>Legform assessment</b>			1.00		0.00

- This issue led to a change in the Euro NCAP legform test zone, v4.3 Feb 2009:

## 3.1 Legform to Bumper Test

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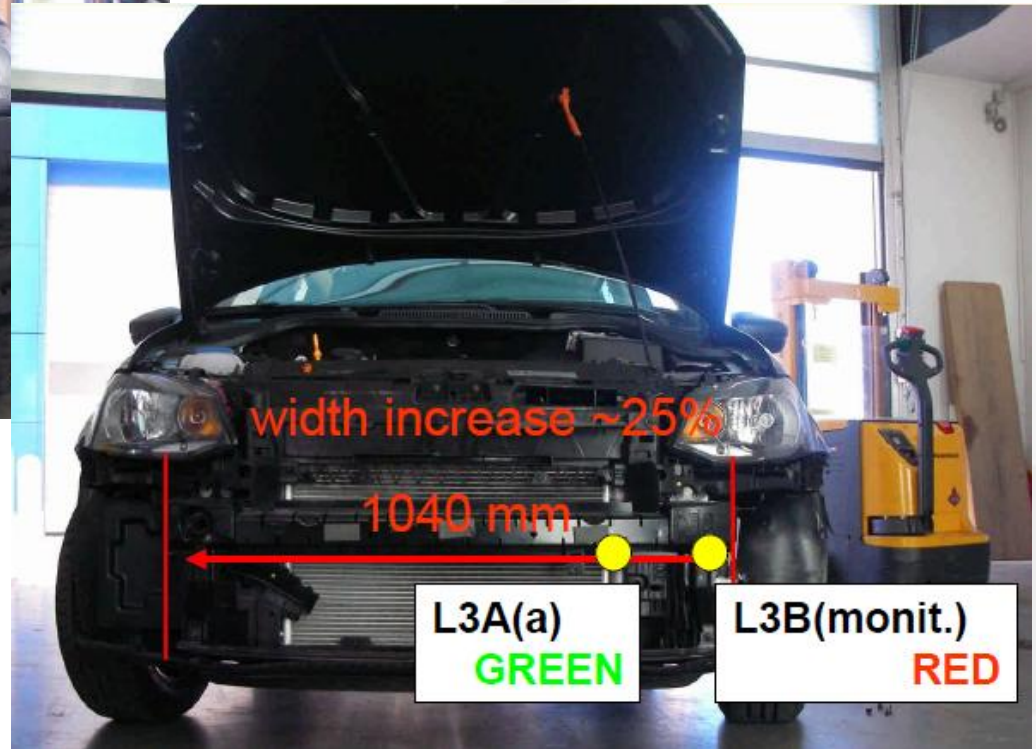
- 3.1.1.1 There shall be three Euro NCAP chosen impact points on the bumper.
- 3.1.1.2 The impact points shall be between the Bumper Corners. Where there are structures outboard of the bumper corners, which are deemed to be injurious, Euro NCAP reserve the right to perform a test to those structures for use in the final vehicle assessment.
- 3.1.1.3 No impact point may be closer than 132mm to any other bumper impact point.



- Euro NCAP Pedestrian Working Group
  - In 2009, Euro NCAP opened the Pedestrian working group.
  - A more objective definition for the bumper test zone was sought.
  - Consideration was given to allowing testing across the full width of the bumper.

- Examination of injurious structures
  - Prior to Euro NCAP testing, bumper covers were removed from vehicles and the 60 degree plane applied to the underlying bumper beam.
  - This was compared to the Regulatory test zone.

# Euro NCAP Legform Test Zone



# Euro NCAP Legform Test Zone

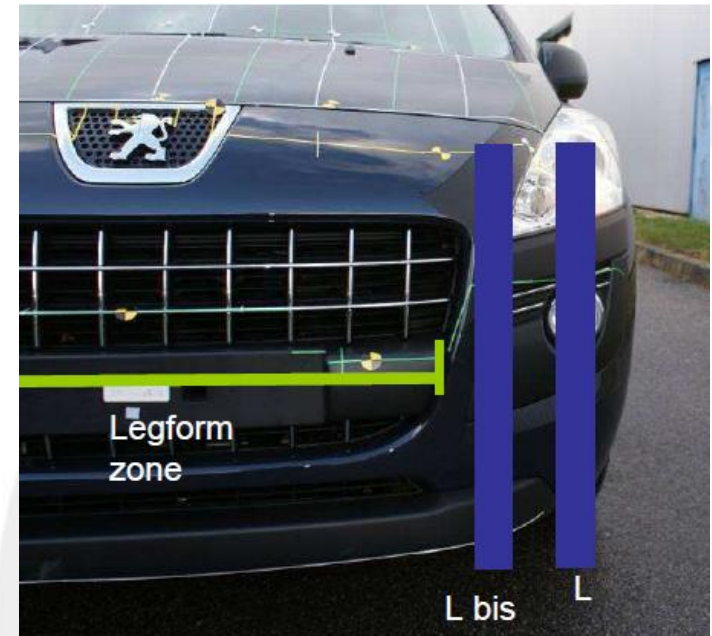
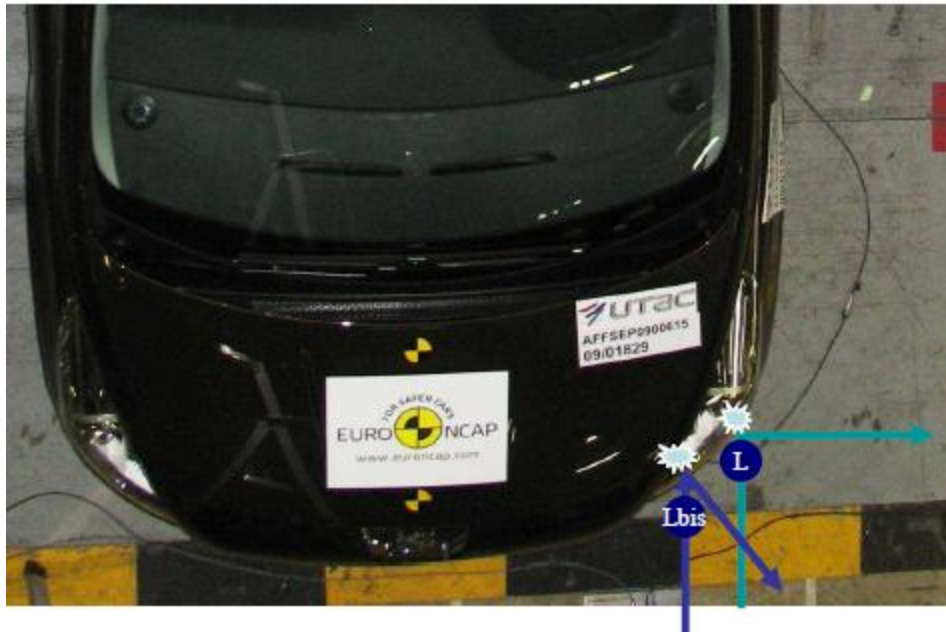




- Feasibility of testing oblique surfaces
  - Testing of the full bumper width was discounted so that Euro NCAP could avoid being forced into testing oblique structures.
  - Testing showed that some oblique surfaces do not provide reliable legform results, but others do.



## ■ Feasibility of testing oblique surfaces



Test laboratory	official				
	L1A	L2A	L3B	L3bis	L3out
Flexion – °					
<15	15_20	>20	9.43	3.55	9.43
0.3	0.11				
Displacement – mm					
<6	6_7	>7	2.24	2.69	2.24
1.49	1.57				
Acceleration – g					
<150	150_200	>200	109.6	108.1	109.6
50.2	70				

## ■ Final Outcome:

- Euro NCAP agreed that the legform bumper test zone shall be based upon the injurious structures beneath the bumper skin.
- The limits of the test zone are the outboard ends of the bumper beam.
- This change was first implemented in protocol v5.0, October 2009.

FIN

