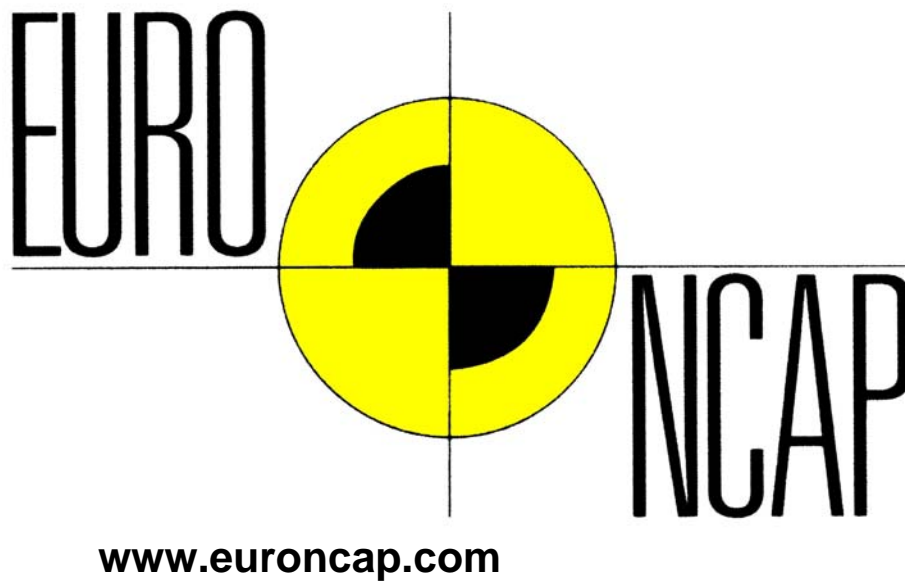


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**EUROPEAN NEW CAR ASSESSMENT PROGRAMME
(Euro NCAP)**

Euro NCAP Protocol Changes and Additions - January 2004

Frontal Impact

Changes (in italics) and additions incorporated in version 4.1, January 2004

Section 1.4 Vehicle Preparation

Now reads:

1.4.5 An emergency abort braking system may be fitted to the vehicle. This is optional, the test facility may elect to test without an abort system. *Where such a system is fitted its inclusion shall not influence the operation or function of any of the foot controls, in particular the brake, and the pedals shall operate in the same way prior to fitment of the system.* Remove as little as possible of the interior trim; any mass compensation will be made when all equipment has been fitted.

Section 2.1 Before Test

Now reads:

2.1.16 Record the position of the centre of the undepressed clutch, brake and accelerator pedals *and where applicable foot operated parking brake.* If the pedal is adjustable, set it to the mid position or a reasonable variation from this in accordance with the manufacturer's recommendations for the 50th percentile position.

Section 2.2 After Test

Now reads:

2.2.9 Working on the struck side of the vehicle, record the post-impact co-ordinates of the centre of the steering column, the centre of the clutch, brake and accelerator pedals, *and where applicable a foot operated parking brake,* with no load applied to them and in the blocked position (loaded with 200N to produce the maximum moment about the pedal pivot), the door aperture points [and the rearmost points on both the driver's side seat rails]. *Prior to the pedal measurement with 200N applied all hydraulic pressure shall be removed from the vehicle's braking system.* If the steering column has become detached during impact due to the operation of the shear capsules, reposition the column as accurately as possible before measurement. *If any of the foot pedals become detached do not take a measurement of that pedal.*

2.2.13

Now reads:

- From the pre-impact and adjusted post-impact data collected, determine
- i) the longitudinal, lateral and vertical movement of the centre of the top of the steering column.
 - ii) *the longitudinal and vertical movement of all of the foot operated pedals.*
 - iii) the rearward movement of the A-post at waist level.
 - iv) the reduction in width of the door aperture at waist and sill levels.

4.1 Dummy Instrumentation

Now reads:

TNO P1½

Location	Parameter	Minimum Amplitude	No. of Channels
Head	Accelerations, $A_x A_y A_z$	150g	3
Neck	Forces	$F_x F_y$	9kN
		F_z	14kN
	Moments, $M_x M_y M_z$	300Nm	3
Chest	Accelerations, $A_x A_y A_z$	150g	3
Total Channels per Dummy			12

TOTAL CHANNELS

1× Driver Hybrid-III	36
1× Passenger Hybrid-III	36
1× TNO P3	6
1× TNO P1½	12
1× Vehicle	4
Total Channels per Test	
	94

Section 6.4 Use of the Gabarit and Marking for Child Head Excursion Measurement

Now reads:

Position the Gabarit in all seating positions within the vehicle, excluding the driver's, as specified in ECE Regulation 16. Photographs of the installation, and in particular, the position of the lap section of the belt (both sides) and buckle tongue slot in relation to the 150mm radius shall be taken. The position of the base of the Gabarit relative to the front of the car seat base cushion should also be photographed for each seating position examined. The photograph should be taken from a point in a horizontal plane passing through the top of the car seat base cushion, to illustrate if there is an air gap between the gabarit base and car seat base cushion and any other indication of insufficient belt webbing.

The test laboratory shall specify in the test report that the three point seat belts fitted to the vehicle are in accordance with ECE Regulation 16, Section 8.2.2.5.

Section 10 Calculation of Injury Parameters

Now reads:

TNO P3

Location	Parameter	CFC³	Injury Calculation
Head	Accelerations, $A_x A_y A_z$	1000	Peak Resultant acceleration Resultant (+ve) 3msec exceedence
Chest	Accelerations, $A_x A_y A_z$	180	Peak resultant acceleration Resultant (+ve) 3msec exceedence

TNO P1½

Location	Parameter	CFC³	Injury Calculation
Head	Accelerations, $A_x A_y A_z$	1000	Peak Resultant acceleration Resultant (+ve) 3msec exceedence Vertical (+ & -ve) 3msec exceedence
Neck	Forces, $F_x F_y F_z$	1000	
	Moments, $M_x M_y M_z$	600	
Chest	Accelerations, $A_x A_y A_z$	180	Peak resultant acceleration Resultant (+ve) 3msec exceedence Vertical (+ & -ve) 3msec exceedence

Section 10.7 Child Dummies

Now reads:

- 10.7.1 *For the P3 and P1½ dummies, calculate the resultant head and chest acceleration A_R from the three components A_x , A_y , and A_z after they have been filtered and determine the maximum value of A_R*

$$A_R = \sqrt{A_X^2 + A_Y^2 + A_Z^2}$$

- 10.7.2 *For the P3 and P1½ dummies, determine the level which head and chest resultant accelerations ($+A_R$) exceed for a cumulative time of three milliseconds.*
- 10.7.3 *For the P1½ dummy, determine the level which head and chest vertical accelerations (+ & -ve A_R) exceed for a cumulative time of three milliseconds.*

Side Impact

Changes (in italics) and additions incorporated in version 4.1, January 2004

Section 5.5 Use of the Gabarit

Deleted

Section 6.3 Dummy placement

Now reads:

6.3.1 Note that the H-point of the ES-2 dummy is situated *21mm* forward of that of the H-point determined by the H-point manikin (Section 6.1). The H-point of the manikin is indicated by 'Hm' on the H-point back plate of the dummy.

6.3.1.3 Manoeuvre the dummy until its "Hm" position is in a circle with a radius of 10 mm round the H-point of the H-point Manikin as determined in Section 6.1.

Section 7 Barrier and Trolley

Now reads:

The trolley will be fitted with a deformable barrier face and ventilation frame conforming to the specifications of *Amendment 3, July 2003*, Regulation ECE R95 (lateral collision protection). See also Appendix I.

Section 10 Calculation of Injury Parameters

Now reads:

ES-2

Location	Parameter	CFC	Injury Calculation
Head	Accelerations, $A_x A_y A_z$	1000	HIC Peak acceleration 3msec exceedence (cumulative)
Shoulder	Forces, $F_x F_y F_z$	600	Peak shoulder forces <i>Resultant</i>
Thorax T1	Accelerations, $A_x A_y A_z$	180	Peak lateral acceleration on T1 and T12
Thorax T12	Acceleration, A_y	180	
Ribs - Upper	Acceleration, A_y	180	Viscous Criterion Peak rib acceleration Peak rib deflection
Middle	Deflection, D_{rib}	180	
Lower			
Abdomen - Front	Force, F_y	600	Peak of sum of 3 abdomen forces
Middle			
Rear			
Backplate	Forces, $F_x F_y$	600	Peak forces and moments <i>$F_x F_y$ Resultant</i>
	Moments, $M_y M_z$	600	
T12	Forces, $F_x F_y$	600	Peak forces and moments
	Moments, $M_x M_y$	600	
Pelvis	Accelerations, $A_x A_y A_z$	180	Peak lateral acceleration

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Pubic Symphysis	Force, F_y	600	Peak Force
Femurs (L & R)	Forces, $F_x F_y F_z$	600	Peak forces and moments
	Moments, $M_x M_y M_z$	600	

TNO P3

<i>Location</i>	<i>Parameter</i>	<i>CFC³</i>	<i>Injury Calculation</i>
Head	Accelerations, $A_x A_y A_z$	1000	Peak Resultant acceleration Resultant (+ve) 3msec exceedence
Chest	Accelerations, $A_x A_y A_z$	180	

TNO P1½

<i>Location</i>	<i>Parameter</i>	<i>CFC³</i>	<i>Injury Calculation</i>
Head	Accelerations, $A_x A_y A_z$	1000	Peak Resultant acceleration Resultant (+ve) 3msec exceedence
Chest	Accelerations, $A_x A_y A_z$	180	

Pole Impact

Changes (in italics) and additions incorporated in version 4.1, January 2004

Section 6.3 Dummy placement

Now reads:

- 6.3.1 Note that the H-point of the ES-2 dummy is situated *21mm* forward of that of the H-point determined by the H-point manikin (Section 6.1). The H-point of the manikin is indicated by 'Hm' on the H-point back plate of the dummy.

- 6.3.1.4 Manoeuvre the dummy until its *"Hm"* position is in a circle with a radius of *10 mm* round the *H-point of the H-point Manikin as determined in Section 6.1.*

Pedestrian Testing

Changes (in italics) and additions incorporated in version 4.1, January 2004

Section 6 Legform to Bumper Tests

Now reads:

- 6.1.1 The legform impactor used shall conform to that specified in EEVC WG17 Report, 'Improved Test Methods to Evaluate Pedestrian Protection Afforded by Passenger Cars', December 1998. This test shall be performed if the Lower Bumper Reference Line (see section 2.2.7) is less than 500mm above the ground at the impact point. All impact points shall be a minimum of 66mm inside the Bumper Corners (Section 2.3), and be a minimum of 132mm apart. *These minimum distances are to be set with a flexible tape held tautly along the outer surface of the vehicle.*

Section 7 Upper Legform to Bumper Tests

Now Reads:

- 7.1.1 The upper legform impactor used shall conform to that specified in EEVC WG17 Report, 'Improved test methods to evaluate pedestrian protection afforded by passenger cars', December 1998. This test shall be performed if the Lower Bumper Reference Line (see section 2.2.7) at the impact point is more than 500mm above the ground. All tests will be performed at the same lateral position of the impact points determined in Section 3.1. *The minimum distances to be used for this impactor are specified in 6.1.1, they shall be set with a flexible tape held tautly along the outer surface of the vehicle.*

Section 8 Upper Legform to Bonnet Leading Edge Tests

Now reads:

- 8.1.1 The upper legform used shall conform to that specified in EEVC WG17 Report, 'Improved Test Methods to Evaluate Pedestrian Protection Afforded by Passenger Cars', December 1998. All impact points shall be a minimum of 75mm inside the Corner Reference Points (Section 2.6), and be a minimum of 150mm apart. *These minimum distances are to be set with a flexible tape held tautly along the outer surface of the vehicle.*

Section 9 Headform testing

Now reads:

- 9.1.1 The headforms used shall conform to that specified in EEVC WG17 Report, 'Improved Test Methods to Evaluate Pedestrian Protection Afforded by Passenger Cars', December 1998. The projected points for the adult headform impactor shall be a minimum of 82.5mm inside the Side Reference Lines (Section 2.5), and a minimum of 165mm apart. The projected points for the child headform impactor shall be a minimum of 65mm inside the Side Reference Lines (Section 2.5), and a minimum of 130mm apart. *These minimum distances are to be set with a flexible tape held tautly along the outer surface of the vehicle.* Where testing on an A-pillar is involved the minimum distance inside the Side Reference Lines does not apply to either the adult or child headform tests.

Assessment Protocol

Changes (in italics) and additions incorporated in version 4.1, January 2004

Section 6 Frontal Impact Modifiers

Foot & Ankle

Pedal Blocking(additional - new section)

The score for the driver’s foot and ankle assessment is reduced if there is significant mechanical blocking of any rearward displaced pedal. A pedal is blocked when the forward movement of the intruded pedal under 200N load is <25mm. Up to 50mm rearward displacement of the blocked (loaded) pedal there is no penalty. Above 175mm there is a penalty of one point. Between these limits, the penalty is generated by linear interpolation.

Door Opening during the Impact

Now reads:

When a door opens in a frontal test, a minus one-point modifier will be applied to the score for that test. A one-point modifier will be applied for every door (including the tailgate) that opens.

Concept: The intention is to ensure that the structural integrity is maintained. The underlying principle is to minimize the risks of occupant ejection occurring.

The “door opening” modifier will be applied if any of the following have occurred:

- the latch has fully released *or shows significant partial release*, either by release of its components from one another, or effective separation of one part of the latch from its supporting structure
- the latch has moved away from the fully latched condition
- if any hinge has released either from the door or bodyshell or due to internal hinge failure
- if there is a loss of structure between the hinges and latches
if door or hinges fail whilst the door opening tests are being conducted post impact, as loading from an occupant could have a similar effect.

Section 8 Side Impact Modifiers

Backplate

Now reads:

Where the backplate load F_y exceeds 4.0kN, a two point penalty is applied *to the driver’s chest assessment*. Between 1.0kN and 4.0kN the penalty is calculated using a sliding scale from 0 to 2 points.

Higher performance limit	
F_y	1.0 kN
Lower performance limit	
F_y	4.0 kN

Section 11 Overall Assessments

Example:

Now reads:

Headform testing:

EuroNCAP test produces a HIC of 1300 = 0.07 points/quarter

Additional test produces a HIC of 1050 = 0.43 points/quarter

EuroNCAP test Score	Extra Test Score	Number of manufacturer nominated quarters	Area Score
0.07		0	$(0.07 \times 4) = 0.29$
0.07	0.43	1	$(0.07 \times 3) + (0.43 \times 1) = 0.64$
0.07	0.43	2	$(0.07 \times 2) + (0.43 \times 2) = 1.00$
0.07	0.43	3	$(0.07 \times 1) + (0.43 \times 3) = 1.36$

Legform/upper legform testing (based upon the worst result):

EuroNCAP test produces a knee bending angle of 19° = 0.2 points/half

Additional test produces a knee bending angle of $16^\circ = 0.8$ points/half

EuroNCAP test Score	Extra Test Score	Number of <i>manufacturer</i> nominated halves	Area Score
0.20		0	$0.20 \times 2 = 0.40$
0.20	0.80	1	$0.20+0.80 = 1.00$