

# HEAVY VEHICLES TEST AND ASSESSMENT PROTOCOL



Version 1.2

Euro NCAP © OCTOBER 2012

EUROPEAN NEW CAR ASSESSMENT PROGRAMME



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## 1. INTRODUCTION

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Euro NCAP first issued protocols for frontal and side impacts and for pedestrian testing in 1996. The protocols were based on the work of the EEVC which, in the case of the frontal and side impacts, formed the basis of new legislative requirements. As no side impact requirement had previously existed in legislation, Euro NCAP's protocols were unchanged from the directive. In frontal impact, where a full-width test had previously been in force, the test speed for the offset deformable barrier test was increased from 56km/h to 64km/h to cover a greater proportion of real life accidents and to ensure some discrimination in the results.

In legislation, the frontal impact test became a requirement for M1 passenger cars only, while the side impact became mandatory for M1 and N1 (light commercial) vehicles. Euro NCAP also tested only M1 passenger cars for many years, and is widely accredited with stimulating a significant increase in the safety of cars' occupants in the last ten years or so. However, the increased structural stiffness needed to provide improved occupant protection also led to the increased 'aggressivity' of cars' front ends towards other vehicles. The problem becomes acute for heavy vehicles as Euro NCAP's test against an immovable concrete block requires them to absorb their own kinetic energy.

Against this background, there was some concern that the testing of heavy vehicles, some of which were derived from commercial variants, might encourage increasingly stiff front end structures in vehicles which already behaved aggressively towards others. Also, Euro NCAP's test protocols, developed with 'normal' passenger cars in mind, might not generate meaningful data when applied to vehicles developed from other design concepts. Therefore, a subgroup was initiated in 2009 to investigate how Euro NCAP's existing protocols might be adapted to ensure that they provided sensible results when applied to heavy vehicles and at the same time mitigated any increases in aggressivity towards other cars.

This protocol details the changes from the standard Euro NCAP 2012 protocols which should be applied when testing heavy vehicles and the scope of application: the vehicles which are considered by Euro NCAP to require use of the modified protocols. It is Euro NCAP's intention that the protocol should apply only to heavy M1 vehicles derived from commercial variants. The protocol attempts to define such vehicles. However, it is recognised that it may not be possible to develop a rigid, objective definition and Euro NCAP may apply the definition judiciously.

The protocol is an interim step: it is hoped that the issue of compatibility will be addressed in more detail at a later date and that a more complete suite of tests can be developed to encourage partner protection as well as occupant safety. Moreover, no attempt has been made by the group to extend Euro NCAP's protocols to purely commercial vehicles, for which more comprehensive changes would need to be made to cover typical payloads and how they are secured.

## 2. PRINCIPLES

A vehicle type will fall within the scope of this protocol if there exists within the model range at least one variant meeting all of the following criteria:

- M1 category
- Maximum Mass (Gross Vehicle Weight) > 2500kg and <3500kg
- 8 or 9 seats, including the driver's seat.

The application of this definition and the way in which the test variant is identified is discussed in more detail in paragraph 3.1.

The above scope would normally include the group of people carriers or family vans. It is anticipated that application of the protocol may in time be extended to cover other heavy vehicles.

## 3. APPLICATION AND AMENDMENT OF PROTOCOLS

For testing vehicles which fall within the scope of this protocol, the amendments and interpretations of the following paragraphs shall be applied. In cases where no specific reference to a test protocol is given, testing remains unchanged and the original protocols of 2012 should be used (see Appendix I).

*Note: The use of the alternative font indicates text taken from the original protocol concerned. Paragraph references contained in such text refer to the numbering system of that protocol.*

### 3.1. Vehicle Specification, Selection, Testing & Retesting (CSSTR) Protocol

#### 3.1.1. Base Safety Equipment

3.1.1.1. When identifying the Basic Level Safety specification, the fitment of equipment to the following variants in the model range is considered:

**Table 1** Variants

Item of Safety Equipment	Variants to be included in sales
Electronic Stability Control (ESC)	M1 (up to 3500kg) and N1 excluding chassis cab variants of both categories
Seatbelt Reminder (driver and passenger)	
Speed Limitation Device	
Frontal airbags	
All other safety equipment	M1 only excluding chassis cab variants, <3500kg

3.1.1.2. The minimum fitment required to qualify as 'basic level safety' equipment will be as follows for vehicles tested under this protocol:

**Table 2** Minimum Fitment (in calendar year in which the result is released).

Year	Variants to be included in sales
2012	Fitted as standard in 50% of sales and at least optional on all variants defined in 3.1.1
2013	Fitted as standard in 60% of sales and at least optional on all variants defined in 3.1.1
2014	Fitted as standard in 80% of sales and at least optional on all variants defined in 3.1.1
2015	Fitted as standard in 100% of sales and at least optional on all variants defined in 3.1.1

### 3.1.2. Test Variant

3.1.2.1. The manufacturer shall identify the M1 variant (excluding chassis cabs) which sells better than any other single M1 variant (excluding chassis cabs). The test vehicle shall be the variant which is nearest to the best seller having the following characteristics:

- Is equipped only with the base safety equipment identified in 3.1.1
- Has two distinct front seats (no bench seats)

3.1.2.2. For further information on which parameters can be changed if the test variant is different from the best-selling variant, see the VSSTR protocol.

## 3.2. Euro NCAP Frontal Impact Testing Protocol (version 5.2)

### 3.2.1. Child Dummy Positioning

3.2.1.1. The original text in the protocol should be amended to read as follows:

3.1.2 A TNO/Ogle P1½ child dummy, in a suitable Child Restraint System (CRS) (see Section 7.6), shall be used in the second row passenger side seating position.

3.1.3 A TNO P3 child dummy, in a suitable CRS (see Section 7.6), shall be used in the second row outboard driver side seating position.

3.2.1.2. And the first sentence of the paragraph:

7.6 Two CRS's are to be fitted in the second row seat, one suitable for a 3 year old child, the other for an 18month old infant.

### 3.2.2. Test Speed

3.2.2.1. The original text in the protocol should be amended to read as follows:

9.2.2 This speed should be 56km/h (35mph) ± 1km/h. Record the actual test speed in the test details.

TARGET SPEED = 56km/h ± 1km/h

### 3.3. Euro NCAP Side Impact Testing Protocol (version 5.2)

#### 3.3.1. Child Dummy Positioning

##### 3.3.1.1. The original text in the protocol should be amended to read as follows:

2.1.2 A TNO/Ogle P1½ child dummy, in a suitable Child Restraint System (CRS) (see Section 6.4), shall be used in the second row driver side seating position.

2.1.3 A TNO P3 child dummy, in a suitable CRS (see Section 6.4), shall be used in the second row passenger side seating position.

##### 3.3.1.2. And the first sentence is amended as follows:

6.4 Two CRS's are to be fitted in the second row seat, one suitable for a 3 year old child, the other for an 18 month old infant.

### 3.4. Euro NCAP Whiplash Test Protocol (version 3.1)

#### 3.4.1. Sled Testing

##### 3.4.1.1. No dynamic tests are performed and references to dynamic tests shall not apply.

#### 3.4.2. Head Restraint Geometry

##### 3.4.2.1. The backset and height of the head restraint shall be determined according to the procedures detailed in (5.4) and (5.5) of the Euro NCAP Whiplash Test Protocol, Version 3.1. However a torso angle of 20° should be used instead of 25°. If the seatback angle is not adjustable, the fixed design angle should be used.

##### 3.4.2.2. The following paragraph is amended:

5.4.8 Some indexed seatback adjustments may have more than 2° between adjustments with none giving a torso angle between 20°±1°. In such cases, adjust the seatback to the most reclined position that supports a torso angle less than 19°.

##### 3.4.2.3. Backset and height should be measured in two head restraint positions (or one if no adjustment is possible): test position and 'down and back'. See section (6) of the whiplash protocol for definitions of these terms.

##### 3.4.2.4. Head restraints for the rear seats may also qualify for assessment if they are fitted as standard on all rear seating positions in at least the 'base safety specification' percentage of sales (see section 3.1). In this case, the test laboratory shall measure the geometry of the worst case seat according to section 3.4.2.

### 3.5. Pedestrian Test Protocol (version 5.3.1)

#### 3.5.1. Definitions

##### 3.5.1.1. The bonnet angle is defined as the angle to the ground reference level, of a straight edge connecting the intersection point of the Bonnet Leading Edge Reference Line and the medial longitudinal vertical plane and the intersection point of the bonnet

panel rear edge (if the vehicle has no bonnet panel, the front panel rear edge) and the medial longitudinal vertical plane. The angle designated by the manufacturer may be deemed as the bonnet angle if it deviates within  $\pm 2^\circ$  from the actual measurement.

### 3.5.2. Determination of Impact Points

#### 3.5.2.1. The following paragraphs are amended:

4.3.1 A test is not required if the calculated impact energy would be 200 J or less, nor if the height of the Bonnet Leading Edge Reference Line as defined in Section 3.4 is, at all points, greater or equal to 835 mm vertically above the ground at the vehicle's normal ride attitude.

4.4.3.3 Where test locations are on the movable/hinged bonnet top or grille/bumper area between 1500 mm and 1700 mm WAD the child/small adult impactor shall be used. Where test locations are on the windscreen/windscreen base area between 1500 mm and 1700 mm WAD the adult impactor shall be used. [...]

4.4.3.6 [...] Areas forward the bonnet (grille and bumper area): underlying stiff structures such as bumper beam, frame rail, towing eye, crumple cans, cooling components, front spoiler mounted lights, radiator/intercooler edges or fixation mounts, licence plate mounts

### 3.5.3. Headform Testing

#### 3.5.3.1. The following paragraphs are amended as follows:

10.3.4 Fit the required headform to the propulsion system. A child/small adult headform impactor shall be used for tests to the bonnet top, grille and bumper area, A-pillars, windscreen, roof (labelled C in Section 3.9), with the test locations lying between boundaries described by wrap around distances of 1000 mm and 1500 mm. An adult headform impactor shall be used for tests to the bonnet top, A-pillars, windscreen, roof, grille and bumper area (where applicable) (labelled A in Section 2.9), with the test locations lying between boundaries described by wrap around distances of 1700 mm and 2100 mm. Where test locations lie between 1500 mm and 1700 mm the structure being tested will determine the headform to be used, see Section 4.4.3.3.

10.3.8 The direction of impact shall be in the fore and aft vertical plane of the section of the vehicle to be tested. The tolerance for this direction is  $\pm 2^\circ$ . The direction of impact of headform tests shall be downward and rearward, as if the vehicle were on the ground. The angle of impact for tests rearward the Bonnet Leading Edge Reference Line shall always be  $50^\circ$  to the ground reference level. For tests forward the Bonnet Leading Edge Reference Line the impact angle shall always be  $20^\circ$  to the ground reference level. The impact angles apply likewise for both the child/small adult as well as the adult headform impactor [...]



## 4. SCORING AND OVERALL RATING

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The scores for the four areas of overall assessment – adult occupant, child occupant, pedestrian and safety assist – shall be incorporated into the overall rating scheme as defined in ‘Euro-NCAP Assessment Protocol Overall Rating’.

### 4.1. Euro NCAP Assessment Protocol – AOP (version 5.4)

The scoring for the Frontal Impact Test, Side Barrier Impact Test and Side Pole Impact test remains unchanged. Amendments have been introduced for the following sections.

#### 4.1.1. Whiplash Scoring

4.1.1.1. A flowchart in Appendix II, Figure 1 illustrates the way in which whiplash tests are scored.

4.1.1.2. A maximum of two points is available for the front seating positions. For each front seat, a maximum of two points is available: one point when measured in the test position and one point when measured in the ‘down and back’ position. For each seat the scores in these two positions are added. The score for the front seats is taken as that of the seat which scores most poorly. The minimum score possible is zero.

4.1.1.3. A maximum of two points is available for the rear seating positions, where they qualify for assessment. Each rear seat is measured, by a single HRMD drop, in the test position and the down/back position. The rear seat which scores most poorly is then measured, using an average of three HRMD drops, in the test position and in the fully down and back position. A maximum of one point can be scored in each restraint position. The scores from each position are summed. The minimum score possible is zero.

4.1.1.4. The scores of front and rear seating positions are added.

### 4.2. Euro NCAP Assessment Protocol – COP (version 5.3)

The scoring for the Child Occupant Protection remains unchanged. The ECE 94-02 sun visor label, provided colours and size are meeting the regulation, will qualify for two points under paragraph 3.5.1.1.

### 4.3. Euro NCAP Assessment Protocol – PP (version 5.1)

#### 4.3.1. Pedestrian Protection Scoring

4.3.1.1. For the assessment of pedestrian protection, if no tests have been performed to the bonnet leading edge, the maximum score available is 30, not 36. The percentage score for this box is calculated by dividing the test score by 30.

### 4.4. Euro NCAP Assessment Protocol – SA (version 5.5)

As Euro NCAP will assess vehicles with distinct front seats (no bench – see Section 3.1.2.1), and as the Assessment Protocol – SA (version 5.5) refers to seats which can be removed as part of ‘normal usage’, the scoring for front seatbelt reminder will be based only the outboard seating positions. The scoring for Safety Assist remains otherwise unchanged.

#### 4.5. Euro NCAP Assessment Protocol – Overall Rating (version 5.1)

The Overall Score and Balance Thresholds for Heavy Vehicles are shown in Table 3.

**Table 3** Thresholds for year 2011, 2012, 2013 and 2014.

2011	Box 1: AOP	Box 2: COP	Box 3: PP	Box 4: SA	Total Weighted
5 stars	80%	75%	25%	60%	70%
4 stars	65%	60%	15%	40%	55%
3 stars	35%	30%	10%	0%	45%
2 stars	30%	25%	5%	0%	35%
1 star	20%	15%	0%	0%	20%

2012	Box 1: AOP	Box 2: COP	Box 3: PP	Box 4: SA	Total Weighted
5 stars	80%	75%	40%	60%	75%
4 stars	70%	60%	25%	40%	60%
3 stars	40%	30%	15%	25%	50%
2 stars	30%	25%	10%	0%	35%
1 star	20%	15%	5%	0%	25%

2013	Box 1: AOP	Box 2: COP	Box 3: PP	Box 4: SA	Total Weighted
5 stars	80%	75%	40%	60%	75%
4 stars	70%	60%	25%	40%	60%
3 stars	40%	30%	15%	25%	50%
2 stars	30%	25%	10%	15%	35%
1 star	20%	15%	5%	0%	25%

2014	Box 1: AOP	Box 2: COP	Box 3: PP	Box 4: SA	Total Weighted
5 stars	80%	75%	60%	60%	80%
4 stars	70%	60%	50%	40%	70%
3 stars	40%	30%	25%	25%	60%
2 stars	30%	25%	15%	15%	55%
1 star	20%	15%	10%	5%	45%

## APPENDIX I

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### List of Reference Protocols

Protocol Title	Version
Euro NCAP Frontal Impact Testing Protocol	v5.2 with amendments, section 3.2
Euro NCAP Side Impact Testing Protocol	v5.2 with amendments, section 3.3
Euro NCAP Side Pole Impact Testing Protocol	v5.2
Whiplash Testing Protocol	v3.1 with amendments, section 3.4
Pedestrian Test Protocol	v5.3.1 with amendments, section 3.5
Euro NCAP ESC Test Protocol	v1.2
Euro NCAP Assessment Protocol - AOP	v5.4 with amendments, section 4.1
Euro NCAP Assessment Protocol - COP	v5.3
Euro NCAP Assessment Protocol - PP	v5.1 with amendments, section 4.3
Euro NCAP Assessment Protocol - SA	v5.5
Euro NCAP Assessment Protocol – Overall Rating	v5.1 with amendments, section 4.5

## APPENDIX II

Figure 1 Flowchart for the Calculation of the Whiplash Score

