



ANCAP Notes on the Assessment Protocol

July 2016 (v5.5)

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1 Introduction

The Australasian New Car Assessment Program (ANCAP) conducts crash tests and associated assessments in accordance with the test protocols issued by Euro NCAP (www.euroncap.com).

In 2009 Euro NCAP introduced substantial changes to its rating system. A combined star rating was introduced that covers adult occupants, child occupants, pedestrian protection and safety equipment. Therefore ANCAP star ratings will not necessarily match those of Euro NCAP for the same vehicle model.

This document sets out variations, clarifications and interpretations in the assessment process as determined by ANCAP. References in square brackets to clauses from the Euro NCAP protocol are for version 5.3 of the Euro NCAP Assessment Protocol - Adult Occupant Protection.

Apr 15 Future changes to ANCAP ratings policy are set out in two separate documents - the "ANCAP Rating Road Map 2011-2017" ("Road Map") and "ANCAP Transition to Alignment with Euro NCAP" ("Transition Arrangements"), available from <http://www.ancap.com.au/technical-protocols-and-policies>.

IMPORTANT: From 1 January 2018 ANCAP will be aligning with Euro NCAP test and assessment protocol and these Notes will not apply from that date.

2 Star ratings and crash tests

2.1 General test information

2.1.1 Minimum scores in frontal offset and side impact tests

Version 4.0 of the Euro NCAP Assessment Protocol introduced a minimum score (or "points balance") in each of the frontal offset and side impact tests in order to achieve star ratings. This was suggested by ANCAP to address imbalance between frontal offset and side impact results. The breakpoints are set out in the following table:

Table 1: Breakpoints for star ratings

Star Rating	Minimum score in frontal offset test	Minimum in side impact test	Minimum combined overall score [®]
5*	12.5	12.5	32.5
4	8.5	8.5	24.5
3	4.5	4.5	16.5
2	1.5	1.5	8.5
1	-	-	0.5

Sep 11 * To earn 5 stars a vehicle must meet additional requirements, as described in the section "Qualifiers for a 5 star rating (to 2010)".
[®] Combined score = frontal offset score (max 16) + side impact score (max 16) + pole score (max 2) + seatbelt reminder score (max 3).

In cases where the star rating is limited by an individual score, ANCAP will reduce the overall score to the maximum that is available for that star rating. For example, if a vehicle scored 25.30 overall (including seat belt reminders) but 8.15 in the frontal offset test it would be rated at three stars and its overall score would reduce to 24.49 points (i.e. a truncated score). Similarly a vehicle that had a combined score of 32.5 or more but did not achieve at least one point in the pole test would be rated at four stars and its overall score would reduce to 32.49 points.

Euro NCAP no longer applies the points balance criteria to its star rating system (Version 5 onwards). The ANCAP Road Map retains the points balance method.

Apr 15 Under the transition arrangements (2015-2017), where ANCAP uses crash test data from Euro NCAP, the resulting ANCAP star rating cannot differ by more than one star from the Euro NCAP rating where the models are deemed to be the same. Similarly, where a Euro NCAP score for child occupant protection (COP) is insufficient for a 5 star Euro NCAP rating, the ANCAP rating cannot be more than 4 stars. The truncation of the ANCAP overall score is applied in these cases.

2.1.2 Qualifiers for a 5 star rating (to 2010)

In order to be awarded a 5 star ANCAP safety rating, vehicles must meet additional ANCAP requirements, in addition to minimum scores in Table 1:

- a) Effective from 1 January 2003, vehicles must earn at least one point in the pole impact test.
- b) Effective from 1 January 2008, vehicles must be equipped with an Electronic Stability Control (ESC) system that meets the requirements set out in Appendix B. The vehicle manufacturer must provide a statement of compliance for this purpose.

In the case of a vehicle that lacks ESC but meets the other requirements for 5 stars in Table 1 ANCAP will publish a 4 star rating with an overall score of 32.49. Two ratings (4 and 5 stars) may be published in cases where ESC is optional.

For safety ratings from 2011, see Section 3 of this document.

2.1.3 Side impact and pole tests

Exemption from Side Impact Test

ANCAP has a departure from the Euro NCAP testing and assessment protocols for side impact protection for occupants of high-seat vehicles (i.e. with a seat reference height 700mm or more). ANCAP uses the definition of seating reference point (SRP) contained in Australian Design Rule 72. The seating reference height is the height of the SRP above the ground.

The Euro NCAP Mobile Deformable Barrier (MDB) side impact test is the same as the test prescribed in Australian Design Rule 72. ADR72 is not applicable to high-seat vehicles. In 2004 ANCAP identified that there was little value to consumers in continuing to conduct MDB tests on high-seat vehicles in Australia and decided to award all high-seat vehicles a default score of 16 points for this test. However, where available, Euro NCAP side impact test results will continue to be re-published.

Manufacturers are requested to provide advice to ANCAP about seat reference heights to assist with forward planning of test programs. All variants must exceed the 700mm seat height limit for the crash test exemption to apply.

Eligibility for Pole Test

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Provided that a head-protection system is fitted [4.1] and four points (pre-modifier) are scored for head protection in the side impact test, then the vehicle will be eligible for a pole test. If, in this test, the following criteria are met, the vehicle will be awarded two points (subject to airbag deployment and open door modifiers. See section 2.4):

- HIC36 <1000
- Peak Resultant Acc <80g
- No direct head contact with the pole

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From 2008 this optional pole test is only available for vehicles that have achieved at least a 4 star rating (that is, an overall score of at least 24.5 prior to the pole test and at least 8.5 scored in frontal offset and side impact tests). The pole test is conducted by ANCAP, usually at the manufacturer's expense.

Where ANCAP uses crash test data from Euro NCAP the pole test score will only be included in the overall score where the vehicle has achieved at least a 4 star rating without the pole test. A pole test cannot be used to improve a rating from 3 to 4 stars.

Unlike Euro NCAP [4.1], ANCAP does not include other body regions in the scoring for the pole test.

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In 2015 Euro NCAP introduced substantial changes to the side impact and pole test protocols and began using WorldSID dummies in these crash tests. These crash tests cannot be used for ratings under the "ANCAP Pathway" (see section 3).

2.1.4 **Seat belt reminder**

Sep 11 During 2002 Euro NCAP introduced bonus points for seat belt reminders (SBR). Under this system, which has been retained by ANCAP, one point is earned each for a driver reminder, a front passenger reminder (or both front passengers, if more than one seat) and a status indicator for all rear seats. The requirements for seat belt reminders are set out in Euro NCAP Assessment Protocol for Safety Assist (copy available from www.euroncap.com).

Manufacturers should be prepared to describe to ANCAP how the operation of the system can be verified by road test, particularly if there are interim warnings.

Prior to 2008 rear seat systems only needed to inform the driver about the status of each rear seat belt.

Apr 15 During 2007 Euro NCAP amended the protocol to require the rear seat belt system to give an audible signal if a seat belt is unbuckled while the vehicle is "in use" (e.g. travelling at more than 25km/h). ANCAP applied this requirement to rear seat belt reminders assessed from January 2008. Rear seat occupant detection is not required by ANCAP to meet this requirement but is recommended. Euro NCAP plans to introduce a requirement for rear occupant detection.

A single light may be used to indicate both driver and front passenger seat belt status. However, a separate light for each seating position is recommended.

The ANCAP Road Map includes mandatory safety features. For example, for a 5 star rating from 2013 all front seats must have SBR. This extended to 2nd row fixed seats from 2015. For the purpose of this requirement a "fixed seat" is one that is not easily removable, without tools, as part of the vehicle's normal usage (note that the Euro NCAP Safety Assist protocol sets out requirements for electrical connections for removable seats).

The ANCAP Road Map retains bonus points for seat belt reminders that contribute to the combined score (see Table 1). Where all rear seats (in all rows) have SBR a bonus point is awarded. Where only some rear seats have SBR the score is the ratio of seats with SBR divided by the total number of rear seats, including removable/optional seats.

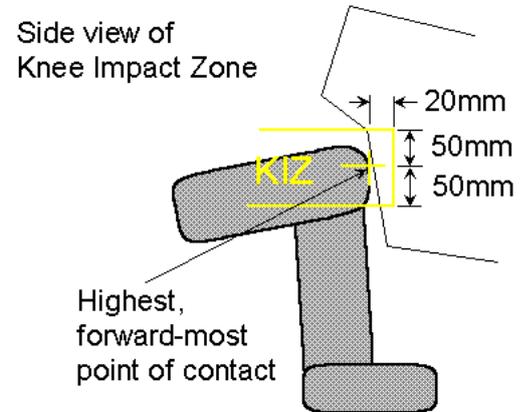
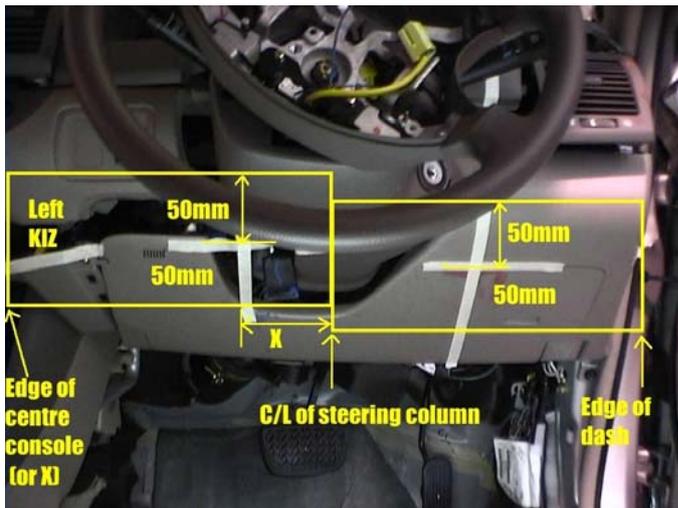
2.2 **Frontal offset modifiers**

2.2.1 **Knee impact modifiers**

The Upper Leg Score is subject to modifiers resulting from a post-crash assessment of the knee impact zone [3.2.1.3]. These zones are illustrated in the diagram below and depend on the actual points of impact of each of the dummy knees (driver and front passenger). Where there is no clear evidence of a knee contact (paint marks or deformed components) then that particular zone is not subject to a modifier (but comment may still be made about components that might present an undue hazard to the knees).

A *Variable Contact* modifier (up to 1 point deduction from leg score) applies where the component is clearly stiffer than the structure at the actual impact point and is likely to produce a femur compression in excess of 3.8kN and/or knee slider displacements greater than 6mm. Metal brackets are generally considered to be stiffer than plastic components, unless they are clearly designed to collapse during a knee impact (such as diamond shaped hollow extrusions).

Apr 11 In accordance with Version 4.2+ of the Euro NCAP protocol, the variable contact modifier will be reduced to 0.5 points where there is no concentrated load modifier for that side and the stiffer structure is confined to either the steering column (defined to be 75mm on either side of the centreline of the steering column) or the remainder of the knee impact zone for that side.



**Illustration of Knee Impact Zone
(a rectangular prism based on actual points of impact)**

Manufacturers may provide test data to show that the injury criteria (femur force and knee displacement) are unlikely to exceed the prescribed limits, if the component of concern is struck by the knee. Euro NCAP has a test procedure "Sled test procedure for assessing knee impact areas" for this purpose and ANCAP accepts Euro NCAP assessments to this procedure or manufacturer's submissions based on this procedure (note that loss of structural integrity may limit knee mapping eligibility). However ANCAP also accepts simplified technical evidence, as set out below.

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An object is regarded as a "concentrated load" if it presents an unyielding impact surface with any linear dimension less than 20mm or otherwise *exposes the knee to a risk of a penetrating knee injury*. For the purpose of this assessment an "unyielding" component is one that deflects less than 10mm when subjected to a load of 400N in the likely direction of a knee impact. An unyielding spherical impact surface with a radius of 25mm would be suitable to simulate knee loading.

Usually the Concentrated Loading modifier (1 point deduction each knee) applies where the component is also found to be a 'Variable Contact' and the two point modifier is applied. However, cases have occurred where the point of impact was found to be the stiffest structure and high injury measurements were obtained but the component was also found to be a concentrated loading. In this case only the concentrated loading modifier is applied.

Some manufacturers have treated steering column covers and fascia covers with a combination of energy absorbing foam and metal sheets which protect the knees from concentrated loads. These have generally been accepted by ANCAP, provided that they protect the knees from hazardous protrusions within the steering column. Results of manufacturer's impact tests that show load distribution and energy absorption would assist in such assessments.

Since the knee assessment depends on the actual points struck by the dummy knees it is possible for the knee impact zone to vary between tests. Several cases have been observed where a component of concern was just outside the knee impact zone but slightly different crash circumstances could have led to a different outcome. Manufacturers should consider such variations when designing steering and fascia components.

2.2.2 Knee airbags

For crash tests conducted by ANCAP no modifiers are applied in cases where a driver knee airbag is fitted, provided that the following requirements are met:

1. The airbag deploys correctly in the frontal offset crash test and the deployed bag would prevent the knees from coming into contact with fascia or steering column components in this type of crash.
2. There is no evidence of the airbag bottoming out (e.g. from femur load trace).

If these requirements are not met then the fascia and steering column will be assessed in the usual way (as described in 2.2.1 above), with an approximation made of the knee contact points from the paint marks on the knee airbag, if there are no signs of contact on these components. In these circumstances the knee airbag housing is likely to be within the knee impact zone.

In cases where Euro NCAP conducted the crash test then the Euro NCAP assessment of the knee airbag is used.

2.2.3 Re-publication of Euro NCAP frontal test results - lack of airbags

Sometimes vehicles tested by Euro NCAP have a driver knee airbag. This usually eliminates driver knee modifiers. There have been several cases where an Australasian variant of the Euro NCAP tested vehicle model does not have a knee airbag and so ANCAP has either not been able to re-publish the Euro NCAP result or has needed to conduct a frontal offset crash test of the local model without a knee airbag.

The main purpose of the knee modifiers is to take account of situations where the crash conditions are slightly different (such as a different size of occupant). Therefore ANCAP applies full knee modifiers (i.e. a 2 point deduction from upper leg injury score of the driver or front passenger) to the Euro NCAP results where a knee airbag was present in the European test but is not available on the Australasian variant.

Manufacturers have the option of funding an ANCAP frontal offset test, or providing other evidence acceptable to ANCAP, if they consider that the two point deduction is not appropriate for a variant that lacks a knee airbag.

Where the modifier is applied in this way the ANCAP datasheet will include words such as:
"The vehicle tested by Euro NCAP had a driver knee airbag but the Australasian model does not have this safety feature. ANCAP has applied a 2 point modifier to the driver leg score to take account of the extra risk of injury without the knee airbag".

Apr 11 The same method applies where the vehicle tested by Euro NCAP had a passenger airbag but this is not fitted to an Australasian variant. In this case a 2 point deduction is applied to the front passenger head score for the frontal offset test unless test evidence, acceptable to ANCAP, is provided by the manufacturer.

Apr 16 It also applies where the rear outboard seat belt of the vehicle tested by Euro NCAP has a pretensioner and/or load limiter and an Australasian variant does not have these features. In this case a 2 point deduction is applied to the rear occupant chest score for the full-width frontal test, unless test evidence acceptable to ANCAP is provided by the manufacturer.

2.2.4 Measurement of intrusion

In accordance with the Euro NCAP protocol, modifiers apply to injury scores for excessive displacement of the steering column, A-pillar and pedals. Under the protocol, displacement is measured relative to a reference point at the rear of the vehicle. The ANCAP assessment varies from this method, as described below.

In tests of utility-style vehicles during 2001 and 2002 it became evident that measurement of intrusion (steering column and pedals) from a reference point on the rear of the vehicle was not appropriate for the utilities, where there was often substantial crush in the load space. As a result ANCAP reviewed the method of assessing intrusion for all vehicles and decided to utilise a method used by the US Insurance Institute for Highway Safety (IIHS) - assessing intrusion relative to the average of the four mounting bolts of the driver's seat. This method is applied to steering column displacement and pedal displacement (in all three dimensions).

In the case of A-pillar displacement, the approach is similar to that used by IIHS (which assesses door opening width reduction) except that displacement is assessed relative to the C-pillar. This gives an indication of the integrity of the whole passenger compartment. For two-door vehicles the A-pillar displacement is assessed relative to the B-pillar and so is the same as the IIHS method.

This procedure usually results in longitudinal (X) displacements that are less than those assessed according to the Euro NCAP protocol (i.e. in the manufacturer's favour). However, it is possible that vertical (Z) displacements (e.g. upward movement of steering column) may be greater under the ANCAP system if the driver's seat drops, relative to the original frame of reference.

Where Euro NCAP results are re-published by ANCAP the Euro NCAP displacement measurements are used because seat mounting point data are not available.

2.2.5 Breakaway brake pedal

Manufacturers should advise prior to the frontal offset test if the brake pedal (and clutch pedal, if applicable) is designed to breakaway in the crash. Successful breakaway avoids a reduced foot score due to rearward displacement of the brake pedal.

2.2.6 Breakaway steering column

Manufacturers should advise prior to the frontal offset test if the steering column is designed to breakaway under load. This will affect the assessment of steering column movement (the modifier is not applied if the post-crash residual displacement cannot be reliably measured AND there is no evidence of excessive steering column movement affecting airbag performance in the crash videos).

2.2.7 Blocked pedal modifier

In 2004 Euro NCAP introduced a blocked pedal modifier for the frontal offset crash test [3.2.1.5]. After the crash the displacement of each pedal is measured with no load and with a forward horizontal load of 200N applied. The second measurement is referred to as a "blocked pedal displacement". The *unblocked* pedal displacement, compared with the pre-crash pedal position, is used to calculate a foot score, as in the previous assessment protocol (but ANCAP measures both relative to the driver's seat, as described above ("Measurement of Intrusion"). The second measurement is used to derive a modifier for the foot score. A "blocked pedal" is one that moves forward less than 25mm when the load of 200N is applied. If the *blocked* pedal displacement, compared with the pre-crash position, is less than 50mm then no modifier is applied. If the displacement is more than 175mm then one point is deducted from the foot score. A sliding scale applies between 50mm and 175mm. This is illustrated below.

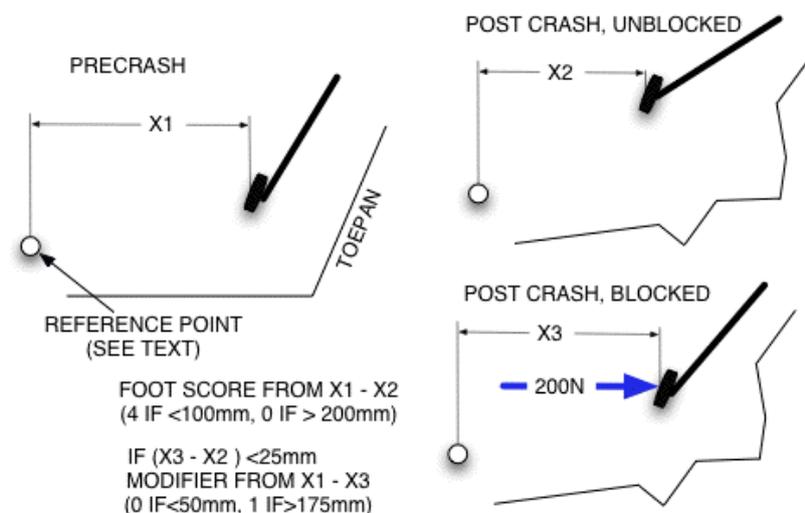


Illustration of blocked pedal modifier

This modifier also applies where the pedal mounts are designed to breakaway during the crash but the pedal still offers some resistance to blocking (successful breakaway earns a pre-modified foot score of 4 points).

ANCAP has applied this requirement to tests conducted from June 2004.

2.2.8 Restraint system integrity

Sep 11 Where a seat or seat belt component fails or does not operate in its designed manner and this might result in increased risk of injury then a one point penalty is applied to the chest score for that occupant (driver or front passenger). Examples are seat slides releasing, seat mounts detaching, seat belt pretensioners not deploying correctly and seat belt retractors allowing excessive payout of the seat belt.

Where there is obvious direct loading of the chest from the steering wheel, a one point penalty is applied to the driver chest score.

Other reasons for applying the modifier include:

- Apr 15
- a) Extreme movement or rotation of the steering column which makes chest contact likely.
 - b) Seat slide released or failed, allowing one or both sides of seat to move forward.
 - c) Seat mount failed, including partial separation with significant loss of strength.
 - d) Excessive deformation of floor pan, causing the seat to tip forward (e.g. relative vertical movement between front and rear seat mounts on one side of seat exceeds 100mm).
 - e) Seat base structure failed, including seat base frame separation.
 - f) Seat back failed, including failure of reclining mechanism in forward or rearward direction.
 - g) Seat belt failure, including separation from anchorage.
 - h) Seat belt retractor failed or did not operate as intended, including broken retractor housing and excessive payout of webbing (not being due to intended load limiter function)¹.
 - i) Seat directly rearward of occupant failed, including seat base separating from floor and seat back failure.

NOTE: This replaces the "Steering wheel contact" modifier in the Euro NCAP Assessment Protocol [3.2.1.2]. In cases where ANCAP uses a test result from Euro NCAP additional information may be sought from Euro NCAP about restraint system failures and the modifier applied, if appropriate.

2.3 Side impact modifiers

2.3.1 Backplate loads

Backplate loads are measured in side impact tests [4.2.2]. In July 2003 ANCAP began testing to Version 4 of the Euro NCAP test protocol (including the EuroSID II dummy) and the modifier has been applied to tests conducted from July 2003.

2.3.2 T12 modifier

T12 forces and moments are measured and may result in chest modifiers [4.2.3]. This was introduced in Version 4.1 of the Euro NCAP Assessment Protocol and ANCAP has applied the modifier to tests conducted from September 2004.

2.3.3 Re-publication of Euro NCAP side impact results - lack of airbags

Apr 11 Many vehicles tested by Euro NCAP have side airbags and side curtains. There have been several cases where an Australasian variant does not have these airbags and so ANCAP has either not been able to republish the Euro NCAP result for that variant or has needed to conduct a side impact crash test of the local model without the airbags.

¹ An example of 'excessive payout of the seat belt' is where the seat belt unreels to a point where occupant retention by the seat belt is compromised. That is, beyond the payout that is intended for load-limiter operation.

In 2010 ANCAP began applying a 2 point deduction to the head score where a head-protecting side airbag was present in the European side impact test but was not fitted to the base Australasian variant. Similarly a 2 point deduction is applied to the chest score where a thorax-protecting side airbag was present in the European test but is not fitted to the Australasian variant. The maximum modifier applied to any body region is 2 points.

Manufacturers have the option of funding an ANCAP side impact test, or providing other test evidence acceptable to ANCAP (such as certified ADR72 test results), if they consider that the local model will score better than when these modifiers are applied to the Euro NCAP result. Where ES2 dummy backplate or T12 data is not available a 2 point deduction is applied.

Where the modifier is applied in this way the ANCAP datasheet will include words such as:
"The vehicle tested by Euro NCAP had side airbags/curtains but the Australasian model does not have these safety features. ANCAP has applied a 2 point modifier to the head and chest scores to take account of the extra risk of injury without these airbags."

2.4 General modifiers

2.4.1 Door open modifiers

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 In accordance with the Euro NCAP Assessment Protocol, one point is deducted for each door that opens during the crash test. This applies to the frontal offset [3.2.3], MDB side impact and pole crash tests [4.2.4]. The points are deducted from the total score for that test. The conditions where an open door modifier may be applied are described in the Euro NCAP Adult Occupant Protection protocol [version 7.0.1]. It includes cases where a door panel becomes detached, exposing the door trim or occupant to exterior hazards. It also includes gaps between the window frame and the door opening that have potential risk for partial occupant ejection. From April 2011 ANCAP has applied the modifier where such a residual (post-crash) gap is sufficient to allow a hand to pass through (an unyielding 80mm diameter sphere can pass through the gap). This does not apply where a deployed airbag, such as a side curtain, would likely prevent partial ejection.

2.4.2 Airbag deployment modifiers

An airbag deployment modifier has always applied to the pole impact test [4.2.1, 6.2]. From 1 January 2008 ANCAP applied this modifier to the frontal offset and side impact crash tests. These work in the same way as the pole test modifier, where an incorrect deployment results in a one point deduction. The deduction will apply to the head score in the case of the frontal offset test, to the chest score in the case of a thorax side airbag and to the head score in the case of a head-protecting side airbag. Failed combo airbags (that are intended to provide head and thorax protection) will result in one point deducted from the head score and one point deducted from the chest score.

An airbag is regarded as incorrectly deployed if it does not fully inflate to its design position prior to the occupant loading the airbag. ANCAP only applies this modifier to the test in which the incorrect deployment occurs. For example the incorrect deployment of a side curtain would not be considered if it only occurred during the frontal offset test. This is a departure from the Euro NCAP procedure [3.2.1.1 & 4.2.1].

The hazardous airbag deployment modifier [3.2.1.1 & Technical Bulletin TB 001], introduced in Version 4.2 of the Euro NCAP protocol, is not currently applied by ANCAP. However, possible hazardous deployments are brought to the attention of the manufacturer.

2.5 Vehicle and dummy set-up

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 Only ANCAP test contractor staff are permitted to touch or move the dummies during vehicle preparation and after the crash test. If, after installation in the vehicle, the dummy is moved in a way that might cause the neck or spine to be unusually distorted, then the dummy shall be removed, the neck and spine straightened and the dummy reinstalled. Similarly only test contractor staff are permitted to make adjustments to the vehicle. Manufacturers representatives may observe the test set-up and take simple measurements and photographs, provided this does not hinder the set-up process. Manufacturer's representatives must abide by directions provided by the test contractor or ANCAP.

Sep 11 Requests by manufacturer's representatives to vary the vehicle settings from that determined by the test contractor must be made in writing to ANCAP and the test contractor prior to 1pm on the day before the test is scheduled to occur. Accommodation of such requests is at the discretion of the test contractor, provided that the set-up is still clearly within the protocol, it does not cause undue disruption to the set-up process and ANCAP has no objections.

Apr 11 ANCAP does not require the test contractor to fit a neck shield to the dummies, however neck shields may be fitted to dummies for tests. Neck shields are referred to in the Euro NCAP protocols but are not required for ADR crash tests. Manufacturers may request that a neck shield be used and this will be allowed under the following conditions:

- a) The neck shield is of the soft type that minimises any change to the loading of the neck. FTSS part 1039006 is suitable for this purpose.
- b) The lower edge of the neck shield is tucked inside the dummy flesh in a manner that does not produce any crevices or ridges that might catch the seat belt webbing.
- c) The manufacturer's representatives must not touch the seat belt once the dummy has been installed in the vehicle and the seat belt fastened.
- Sep 11 d) The request is made in writing/email to the test contractor and ANCAP no later than 1pm on the day before the crash test.

For the frontal offset test the test protocol (7.5.9.5 of V5.1) states "the seatbelt should lie in a natural position across the dummy sternum and shoulder clavicle. Where this is not the case, for example the belt is close to or in contact with the neck or the belt is above the shoulder rotation adjustment screw, and the upper belt anchorage is adjustable the anchorage should be lowered...". The following picture illustrates the limit based on the shoulder rotation adjustment screw.



Seat belt no higher than adjustment screw

Other set-up items:

- Except where approved by ANCAP, the vehicle's original battery must be the source of electrical power for the vehicle and must be located in its design position.
- Washer bottles shall be filled with water to maximum level.
- ANCAP does not currently require on-board cameras to be used.
- For the frontal offset test the towing points should not be rearward of the front axle. The tow cable will be attached to the lower control arms if there is no other suitable structure.

2.6 Post-crash inspection

ANCAP personnel conduct the post-crash inspection after the test contractor has completed the displacement measurements and post-crash photographs. This is generally the day after the crash test.

Apr 15 Manufacturer's representatives may be present at the test lab at the time of the post-crash inspection. They are not permitted to observe the entire inspection process but, from time-to-time, they may be given access to the test vehicle, when they may take photographs and ask questions. This access is at the sole discretion of the ANCAP personnel. Manufacturer's representatives must not change or remove any vehicle components during these inspections.

After the inspection is completed the ANCAP personnel may discuss the provisional results with the manufacturer's representatives. This is also at the sole discretion of the ANCAP personnel.

Detailed data and video from the test lab is not available to manufacturers until after ANCAP publishes a rating for the vehicle. There may be a charge for these data (contact the ANCAP Secretariat).

2.7 Calculation of scores

Measured parameters are rounded to a certain number of decimal places prior to calculation of scores. The number of decimal places used for each parameter are included in the ANCAP assessment report (score sheet). In general injury measurements are rounded to two decimal places but, in the side impact test, abdomen force and pubic symphysis force are rounded to three decimal places (the sliding scale is very sensitive for these injury parameters). Deformation measurements are taken to the nearest millimetre.

Resulting scores are calculated to three decimal places. These are added together to give a test score to three decimal places. The individual test scores are added together to give a combined score and this is rounded to two decimal places.

Bonus points (currently only available for seat belt reminders) are added to the combined score, if applicable.

Star ratings are assigned according to Section 2.1.1 and, from 2011, Section 3.

If the *pre-modified* injury score for the head, chest, abdomen or pelvis is zero then a warning note (e.g. "High risk of life threatening chest injury in side impact") is added to the published overall rating. ANCAP assessment reports also use a "struck star" for reference purposes, but this is not included in the final ANCAP publication.

Apr 11 Dummy injury outcomes are graded from 'Good' to 'Poor', in accordance with Table 2. Note that prior to 2011 the 'Marginal' rating was split into 'Marginal' and 'Weak' - the same as Euro NCAP.

Table 2: Descriptive ratings for Injury Scores

Body Region Score	Descriptive rating
4	Good
2.67 to 3.99	Acceptable
0.01 to 2.66	Marginal
0	Poor

For any one body region the maximum deduction due to all modifiers applying to that region is two points [3.2.1 & 4.1]. The deduction is truncated to two points if the modifiers add up to more than two.

ANCAP does not apply the "capping limit" provisions that are used by Euro NCAP and result in zero test scores in some circumstances [2.1, 4.1].

2.8 Child restraint assessment

Manufacturers are encouraged to nominate models of child restraint that have been found to suit the vehicle being tested and are available from dealers. Otherwise a default model of child restraint will be used by the test organisation.

Child dummies are instrumented and parameters are recorded but they are not currently assessed by ANCAP. The Euro NCAP protocol for assessing child restraints is not appropriate for the designs of child restraint systems (CRS) used in Australia.

Where vehicles are rated to the Euro NCAP pathway (see Section 3) the Euro NCAP Child Occupant Protection (COP) results will be used in the assessment. However the ANCAP datasheet will include a note such as:

"The child restraints tested by Euro NCAP are relevant to the European market. For Australasian consumers, this information should be used as a guide to vehicle features only."

2.9 Pedestrian ratings

Apr 11 In association with a major change to the test protocols (a change to impact headforms) in 2010, ANCAP has replaced a pedestrian star rating with a descriptive rating, as set out in Table 3.

Table 3: Descriptive ratings for pedestrian protection for Version 5+

Score	Old star rating	New descriptive rating
27.5 or more	4 stars	Good
18.5 to 27.49	3 stars	Acceptable
9.5 to 18.49	2 stars	Marginal
0.5 to 9.49	1 Star	Poor
Less than 0.5	Zero stars	Poor

In 2009 Euro NCAP ceased publishing a star rating for pedestrian protection and now reports the score as a percentage.

Jan 12 One requirement of the Euro NCAP Pedestrian Protection Protocol is that head impact points must not be closer than 165mm. Version 5.0 of the protocol removed the spacing requirement for points selected at the base of the windscreen, with the intention of preventing areas encompassing the base of the windscreen from being awarded a score from structure above or below the windscreen base. The wording of the protocol is:

"Where the spacing requirements in Section 4.4.3.4 prevent the worst case location from being tested on the windscreen base area, that quarter will be awarded the score from the most appropriate adjacent or symmetrical quarter."

It has been pointed out to ANCAP that this provision makes the scoring highly sensitive to the longitudinal location of the grid lines and does not account for the less injurious clear region of the windscreen that is normally awarded a default "pass". It is possible for the score to change by 5 points (10 grids @ 0.5 points each) through a small change in the location of the gridline (usually the 1800mm wrap-around line). In order to make the scoring less sensitive to the grid lines ANCAP has decided to add the following clause to the pedestrian test set-up, for test versions up to and including version 5.3.1:

"If a wrap line falls on the windscreen base area such that test locations can be selected on the base of the windscreen in both the zones above and below the wrap line then the zones on the windscreen shall be longitudinally split into two equal sections with each section awarded up to 0.25 points."

The effect of this provision is illustrated in the figure below:

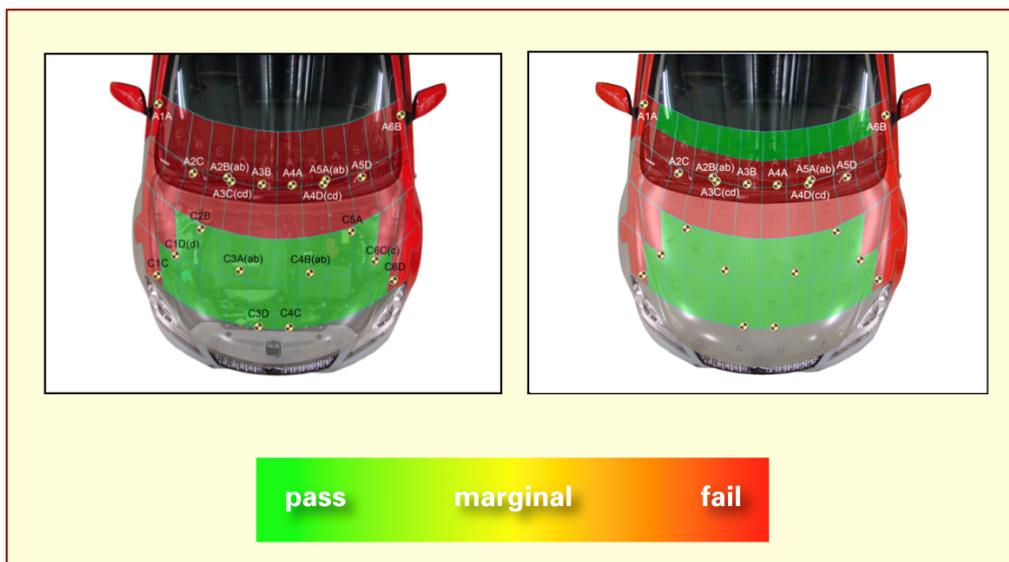


Illustration of revised scoring.
Original method on left (zero points for windscreen region)
and the revised method on the right (2.5 points for windscreen region).

Apr 15 It should be noted that any component within the defined zones (including wiper arms, pivots and motors) may be considered in the pedestrian protection assessment.

Apr 15 In 2013 Euro NCAP introduced the grid method for assessing head impact protection and this was subsequently extended to lower and upper leg impacts. Between 2013 and February 2015 some ANCAP pedestrian assessments were conducted using the grid method. In February 2015 the latest Euro NCAP protocol, Version 8.0, was introduced as the default ANCAP pedestrian protection protocol. This uses grid data (provided by the manufacturer) for head tests, the FlexPLI legform for the lower leg tests and test parameter changes for the upper leg tests. From this date pedestrian assessments are conducted to the current Euro NCAP test protocol at the time of ANCAP tests. Note that version 8.2 of the protocol included a clarification of the side reference line in relation to the corner reference point (clause 3.6.2). This clarification also applies to earlier versions of the protocol.

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From February 2015 manufacturers can request use of version 5.3.1 of the protocol (using the TRL legform) as an alternative to current version. Where grid data is not available and manufacturers have not requested testing to version 5.3.1, the tests will be conducted according to relevant sections of the current version.

The FlexPLI legform is more easily damaged than the TRL legform. At ANCAP's discretion, where there are concerns about possible damage to the FlexPLI legform due to the design of the vehicle, initial tests may be conducted with the TRL legform and proceed to using the FlexPLI where the resulting test scores are not zero. If the TRL legform results in a zero score then this will usually be used for the rating and the FlexPLI test will not proceed.

Pedestrian test logistics

The test contractor for pedestrian tests is the Centre for Automotive Safety Research (CASR) in Kent Town, South Australia. The pedestrian tests typically take 6-7 days to complete. The test vehicle is required at least four weeks before the test date to mark the vehicle and give manufacturers an opportunity to nominate additional test areas (if tested to version 5.3.1). This includes an allowance of two weeks for manufacturers to nominate test areas after the first points are selected by CASR. In any case, it is recommended that manufacturers contact CASR about the timing of preparation and tests.

Jan 12 It is best if the spare parts arrive no later than the vehicle. Manufacturers are encouraged to contact CASR to determine the likely parts and quantities needed for testing. As a guide, the spare parts typically needed are:

- 15 bonnets
- 2 sets of bonnet rubbers, liner and clips
- 3 complete bumper fascia
- 4 bumper foams
- 2 sets of bumper fascia clips
- 2 sets of head lights
- 4 grilles
- 1 full set of wipers
- 3 cowlings (plastic between the bonnet and windscreen)
- 2 windscreens

Workshop instructions for fitting these components should also be provided to CASR.

3 Safety Ratings from 2011 to 2017 (ANCAP Road Map)

Apr 15 From 2011 new requirements for the overall star rating were introduced in the form of the ANCAP Road Map 2011-2017. The Road Map sets out requirements for the period 2011 to 2017 inclusive. Reference should be made to the published Road Map for full details and updates.

The frontal offset, side impact, side pole and pedestrian tests were retained. Added to the physical test regime were whiplash protection tests. Originally roof strength tests were to be introduced but this was withdrawn in 2013.

In relation to Safety Assist Technologies (SAT), both mandatory and additional SAT are required, with the requirements generally becoming more stringent each year.

The Road Map came into effect on 18 February 2011 and the requirements for 2011 are applied to vehicles rated after that date. From 2012 onwards, the Road Map requirements for each year come into force from 1 January of that year. For example, the requirements for 2014 are only applicable to new models first released to the Australian/New Zealand market in 2014.

3.1 Transition to Euro NCAP

Apr 15 From 1 January 2015 Transition (to Euro NCAP) arrangements were introduced. Details are set out in a separate document "ANCAP Transition to Alignment with Euro NCAP". In brief, vehicles with no Euro NCAP test results available are assessed to the "ANCAP pathway", which is based on the ANCAP Road Map 2011-2017 and the default rating year is based on the year in which the model is first released in Australia or New Zealand.

Apr 15 For vehicles with a Euro NCAP result available, the technical specifications of European and Australasian models are compared and, if appropriate, the Euro NCAP rating is republished by ANCAP, using the same rating year as Euro NCAP (the "Euro NCAP pathway"). Under the transition arrangements there may be times when a vehicle is assessed to the ANCAP pathway using some ANCAP-supervised tests and some test results from Euro NCAP. At other times a vehicle may be re-assessed to the Euro NCAP pathway due to extra or missing SAT, subject to the conditions set out in the ANCAP Transition to Alignment with Euro NCAP document.

3.2 Minimum crash test scores

The minimum scores set out in Table 1 apply under the ANCAP pathway. Seat belt reminders will continue to contribute to the combined score that is required in this table. Seat belt reminders will also be assessed as SAT.

3.3 Pedestrian protection

A minimum rating is required for pedestrian protection under the ANCAP pathway, starting with a minimum 'Marginal' rating to be eligible for an overall 5 star safety rating in 2012. Some concessions apply to "high seat" or "flat front" vehicles and to vehicles with vulnerable road user AEB. See the ANCAP Road Map 2011-2017 for these concessions and pedestrian protection rating requirements.

3.4 Whiplash protection

A minimum rating is required for whiplash protection under the ANCAP pathway. For example a 'Good' whiplash rating is needed for a 5 star safety rating from 2015. The assessment is usually conducted in accordance with RCAR-IIWPG Seat/Head Restraint Evaluation Protocol (www.rcar.org/Papers/Papers.htm). The assessment involves a static geometric assessment and, if the geometric assessment is adequate, a single dynamic test of a representative seat. This differs from the Euro NCAP assessment that uses three dynamic tests. However one of the Euro NCAP dynamic tests matches the RCAR criteria and so data from that Euro NCAP test may be used by ANCAP to derive a whiplash rating according to the RCAR protocol. IIHS whiplash data (to the RCAR protocol) may also be applicable to Australasian models.

Apr 15 Where a Euro NCAP whiplash rating for the driver seat is 'Good' that rating may be used by ANCAP, without conversion to an RCAR rating.

Whiplash assessments are conducted by IAG Research Centre in Sydney and ANCAP includes these ratings on published datasheets. ANCAP might assist in this process by providing seats from vehicles acquired for crash testing.

In most cases IAG Research will need to conduct a physical inspection of the vehicle to confirm the head restraint geometry, seat design and footwell geometry for the dynamic test set-up. They will also

arrange for the dynamic test to be conducted by IIHS in the USA, where the seat is eligible and applicable dynamic test data is not already available from Euro NCAP or IIHS.

3.5 Safety Assist Technologies (SAT)

Safety Assist Technologies are technologies built into the vehicle that can help avoid a crash, reduce the risk of injury during a crash or improve post-crash survival. A wide range of SAT has been considered by ANCAP. Some have been included as mandatory requirements under the ANCAP pathway (see Table 2 in the Road Map) and others are in a list (see Appendix A of the Road Map) of SAT that can be chosen by manufacturers to reach the minimum number of "Additional SAT" set out in the Road Map. Some of the SAT are covered by current or proposed protocols for Advanced NCAP as published by Euro NCAP and, wherever possible, ANCAP intends to use Advanced NCAP definitions and protocols. Other assessment criteria are set out in the Road Map document.

SAT that are shown as mandatory can be counted as "Additional SAT" prior to them becoming mandatory. For example Emergency Brake Assist became mandatory for a 5 star rating from 2013. From 2011 to 2012 this feature could be counted as an Additional SAT but from 2013 it was not counted as Additional SAT towards a 5 star assessment.

ANCAP will assess submissions from manufacturers seeking to have new SAT listed in the Road Map. The submission should:

1. include a brief description of the SAT;
2. state how it meets the ANCAP SAT requirements, as set out in the Road Map;
3. indicate whether the SAT is standard, optional or not available for each applicable variant of the model; and
4. if not self-evident, describe how the presence of the SAT can be confirmed on the vehicle.

A spreadsheet is available from ANCAP for this purpose.

3.5.1 SAT for Euro NCAP Pathway

Where the Euro NCAP pathway is used the following SAT are assessed for the Australasian variants of the vehicle model. The Euro NCAP "Assessment Protocol - Safety Assist" is the reference for this purpose (using the same version as Euro NCAP for the particular vehicle model).

Where an Australasian variant is missing or scores less for a SAT than the variant assessed by Euro NCAP a reduced score will be calculated and used to determine the safety rating for the Australasian variant using the Euro NCAP rating protocol. That reduced score will usually be used for all variants of the model.

Apr 16 ANCAP will consider a request for a dual rating where variants with higher specifications (as standard) have the *same or better SAT scores* as the variant assessed by Euro NCAP. The dual rating is at ANCAP's discretion and depends, in part, on how it is marketed. For example it must be made clear to consumers that variants with lower safety specifications have a lower safety rating. Fitment rate requirements do not apply to ANCAP dual ratings during the transition period.

ANCAP will also consider requests to add Safety Assist feature scores that were not awarded by Euro NCAP (e.g. European fitment requirements were not met). For example, where Autonomous Emergency Braking (AEB) is standard for that model in Australasia but was not awarded points by Euro NCAP then it might be possible to arrange official AEB tests to the Euro NCAP protocol and to include the resulting score in the rating. This might result in a better star rating than that awarded by Euro NCAP or it could substitute for another Safety Assist feature to retain the same star rating.

Where, in the following sections, the OEM provides a statement to ANCAP about the specifications and performance of a safety assist system then that OEM also agrees to notify ANCAP of any significant change to the status of that advice. In particular the OEM will notify ANCAP if there is a change to vehicle specifications that might reduce the Safety Assist score.

3.5.1.1 Seat belt reminders (SBR)

Requirements are set out in Euro NCAP "ASSESSMENT PROTOCOL – ADULT OCCUPANT PROTECTION". Up to three points may be scored for seat belt reminders.

See section 2.1.4 of these Notes for additional information about seat belt reminders.

3.5.1.2 Speed assist systems (SAS)

Test requirements are set out in Euro NCAP "TEST PROTOCOL – SPEED ASSIST SYSTEMS"

Points are awarded for the following features:

- Camera-based speed limit information function (SLIF) - e.g. optical sign recognition
- Digital map-based speed limit information function (SLIF) - e.g. speed limits displayed in a sat-nav system
- Combined camera and digital map systems
- Manual speed assistance (MSA) speed warning - e.g. audible alarm
- Manual speed assistance (MSA) speed limitation function - e.g. cannot accelerate beyond the selected speed
- Intelligent speed assistance (ISA) - speed limit information function linked to a warning function and/or a speed limitation function

Scoring is in accordance with the relevant Euro NCAP protocol.

Performance of Australasian SAS

Concerns have been raised about the performance of camera-based and digital map-based SLIF in Australia and New Zealand.

During the transition period ANCAP will apply the Euro NCAP score for camera-based SLIF if the OEM provides a statement that the system fitted to the vehicle is capable of being tuned to Australian/New Zealand conditions and that the OEM is committed to doing this within two years².

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During the transition period ANCAP will apply the Euro NCAP SAS score for digital map-based SLIF if the OEM provides a statement that the system fitted to the vehicle is capable of using Australian/New Zealand digital map-based speed limit data and that they are committed to implementing this within two years². In this case the OEM should be prepared to demonstrate that the system works in at least one city in Australia or New Zealand as soon as possible after the model launch.

3.5.1.3 Autonomous emergency braking (AEB)

Three types of AEB system are assessed:

- AEB City
- AEB inter-urban
- AEB Vulnerable Road User (VRU) - from 2016

AEB City

Requirements are set out in Euro NCAP "ASSESSMENT PROTOCOL – ADULT OCCUPANT PROTECTION".

This is a series of road tests with the test vehicle approaching a stationary target at progressively higher speeds (from 10km/h up to 50km/h). Points are awarded for full avoidance and for mitigation (reduced impact speed). Points are also awarded for the human-machine-interface (HMI).

The resulting score is scaled to a maximum of 3 points, which is counted towards the Adult Occupant Protection score.

There are pre-conditions for awarding AEB city points - the front seat whiplash rating must be "good" and there must be full avoidance for test speeds up to and including 20km/h.

AEB Inter-urban

² This concession ceases from 1 January 2018

Requirements are set out in Euro NCAP "ASSESSMENT PROTOCOL – SAFETY ASSIST".

This is a series of road tests with the test vehicle approaching a moving target at progressively higher speeds (Car-to-Car Rear Moving [CCRM] from 30km/h up to 80km/h). A reduced number of tests is also conducted where the target vehicle suddenly brakes (Car-to-Car Rear Braking [CCRB]). Points are awarded for full avoidance and for mitigation (reduced impact speed). Points are also awarded for forward collision warning during road tests (including approaching a stationary target at high speed - Car-to-Car Rear Stationary [CCRS]) and for the human-machine-interface (HMI).

The resulting score is scaled to a maximum of 3 points, which is counted towards the Safety Assist score.

AEB Vulnerable Road User

Requirements are set out in Euro NCAP "ASSESSMENT PROTOCOL – PEDESTRIAN PROTECTION" and apply from 2016.

This is a series of road tests with the test vehicle approaching a moving pedestrian target at progressively higher speeds (20km/h up to 60km/h). Test scenarios are an adult pedestrian crossing from either side and a child pedestrian obscured by a parked vehicle. Points are awarded for full avoidance and for mitigation (reduced impact speed, up to 40km/h). Points are also awarded for the human-machine-interface (HMI).

The resulting score is scaled to a maximum of 6 points, which is counted towards the Pedestrian Protection score.

Performance of Australasian AEB systems

During the transition period ANCAP will apply the Euro NCAP AEB score (city, inter-urban and VRU) if the OEM provides a statement that:

- a) each system has the same or better performance than the system assessed by Euro NCAP
- b) functional components (e.g. LIDAR, radar transmitter & receiver, and mono or stereo cameras) are the same brand, model and series as tested by Euro NCAP
- c) AEB software is the same or a later version than that tested by Euro NCAP
- d) all transmitter, receiver and camera locations are the same as that tested by Euro NCAP.

Otherwise a submission with in-house AEB performance test results may be required (see the ANCAP Variant Policy - pending).

3.5.1.4 Lane Support Systems (LSS)

Two types of lane support systems are assessed:

- Lane Departure Warning (LDW) is a system designed to warn a driver when the vehicle begins to move unintentionally out of its lane (unless a turn signal is on in that direction) on highways and urban roads
- Lane Keep Assist (LKA) is designed to support a driver when the vehicle begins to move unintentionally out of its lane (unless a turn signal is on in that direction). LKA systems support the driver with a haptic vehicle cue (e.g. steering nudge) which may help to keep the vehicle in lane.

Assessment is based on tests published by U.S. NHTSA.

Scoring is in accordance with the relevant Euro NCAP protocol.

Performance of Australasian LSS systems

During the transition period ANCAP will apply the Euro NCAP LSS score if the OEM provides a statement that:

- a) each system has the same or better performance than the system assessed by Euro NCAP
- b) functional components are the same brand, model and series as tested by Euro NCAP
- c) LSS software is the same or a later version than tested by Euro NCAP
- d) all sensor/camera locations are the same.

Otherwise a submission with in-house LSS performance test results may be required (see the ANCAP Variant Policy - pending).

4 Enquiries

Enquiries in relation to test and assessment protocols should be addressed to:

ANCAP Technical Enquiries

PO Box 4041

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AUSTRALIA

ancap@ancap.com.au

Appendix A - Protocol versions and changes

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Subject to the variations described in the main part of this document, ANCAP conducts tests and assessments to the following protocols:

Euro NCAP

www.euroncap.com/en/for-engineers/protocols/

- Adult Occupant Protection (AOP) 5.3 June 2011
- Frontal Impact Test Protocol 5.1 February 2010
- Side Barrier Impact Test Protocol 5.1 February 2010
- Side Pole Impact Test Protocol 5.1 February 2010
- Assessment Protocol - Safety Assist* 5.4 June 2011
- Pedestrian Protocol Current protocol (subject to test lab capability)

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* For seat belt reminders - Euro NCAP Seat Belt Reminder Assessment Protocol Version 1.2 is also acceptable.

Research Council for Automobile Repairs

www.rcar.org/Papers/Papers.htm

- A Procedure for Evaluating Motor Vehicle Head Restraints Static Geometric Criteria Issue 3, March 2008
- RCAR-IIWPG Seat/Head Restraint Evaluation Protocol, Version 3, March 2008

Where more recent protocols are published by these organisations ANCAP, at its sole discretion, may choose to use these protocols.

The following table provides a brief historical summary of changes to test and assessment protocols used by ANCAP. This table is for the ANCAP pathway only.

**Guide to ANCAP Protocol Changes
(subject to review)**

DATE	OS VER	OS MAX SC	SI VER	SI MAX SC.	POLE VER.	POLE MAX SC	SEAT BELT REMINDER	O'ALL MAX SC.	PED. VER.	PED. MAX.	COMMENT
Nov-99	2.0	16	2.0	16	-	-	-	32	-	-	Euro NCAP protocols introduced. 50km/h SI test introduced. Full frontal dropped.
Nov-00	2.0	16	2.0	16	2.0	2	-	34	2.0	36	Pole & ped tests introduced.
Nov-01	3.0	16	3.0	16	3.0	2	-	34	3.0	36	Intrusion relative to seat mounts. Breakaway steering column provision (ANCAP only).
Dec-02	3.1	16	3.1	16	3.1	2	-	34	3.1	36	Revised ped test.
Feb-03	3.1	16	3.1	16	3.1	2	3	37	3.1	36	Seat belt reminders
Dec-03	4.0	16	3.1	16	4.0	2	3	37	4.0	36	Points balance for overall score.
Jul-04	4.0	16	4.0	16	4.0	2	3	37	4.0	36	ES2 dummy in side impact, backplate modifier.
Jan-05	4.1	16	4.1	16	4.1	2	3	37	4.1	36	OS pedal blocking. SI T12 Modifier & barrier revision.
Dec-05	4.1	16	4.1	16	4.1	2	3	37	4.1	36	Points balance limits overall score (clarification).

DATE	OS VER	OS MAX SC	SI VER	SI MAX SC.	POLE VER.	POLE MAX SC	SEAT BELT REMINDER	O'ALL MAX SC.	PED. VER.	PED. MAX.	COMMENT
Jul-06	4.1	16	4.1	16	4.1	2	3	37	4.1	36	Chest modifiers in SI score limited to 2 pt deduction.
Oct-07	4.1	16	4.1	16	4.1	2	3	37	4.1	36	ESC for 5 stars, knee modifier clarification, knee airbags, airbag deployment, rear seat belt reminder.
Jul-09	4.1	16	4.1	16	4.1	2	3	37	4.1	36	Pole test eligibility clarification. 0.5 deduction for knee modifier. Lack of curtains. ESC minimum speed 20km/h.
Jan-10	4.2	16	4.2	16	4.2	2	3	37	5.1	36	Major change to pedestrian protocol. Extra assessment modifiers.
Apr-11	4.2	16	4.2	16	4.2	2	3	37	5.2	36	Roadmap introduced. Additional requirements for star ratings. Door gap modifier.
Sep-11	5.1	16	5.1	16	5.1	2	3	37	5.3#	36	Test protocol update Clarification of ANCAP scoring. Restraint failure modifier (ANCAP).
Jan-15	5.1	16	5.1	16	5.1	2	3	37	8.0*	36	Transition arrangements apply.
Jan-18											Euro NCAP protocols apply.

Versions 6 and 7 of pedestrian protocol used for some models up to February 2015. Not permitted after that date.

* Version 8.0 of pedestrian protocol introduced from February 2015. Manufacturers may request use of version 5.3.1.

Appendix B - Electronic Stability Control

For ANCAP rating purposes an Electronic Stability Control (ESC) system is one that:

- a) as a minimum, complies with the following sections of either Global Technical Regulation (GTR) No. 8 (or equivalent sections of ADR31, as amended), or US Federal Motor Vehicle Safety Standard (FMVSS)126; or
- b) is approved by Euro NCAP to "The Dynamic Test of Car Electronic Stability Control Systems Protocol".

Global Technical Regulation (GTR) No. 8

www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29registry/gtr8.html

GTR8 Definition & Functional Requirements

"Electronic Stability Control System" or "ESC System" means a system that has all of the following attributes:

- a) That improves vehicle directional stability by at least having the ability to automatically control individually the braking torques of the left and right wheels on each axle or an axle of each axle group 1/ to induce a correcting yaw moment based on the evaluation of actual vehicle behaviour in comparison with a determination of vehicle behaviour demanded by the driver;
- b) That is computer-controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer based on the evaluation of actual vehicle behaviour in comparison with a determination of vehicle behaviour demanded by the driver;
- c) That has a means to determine directly the value of vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;
- d) That has a means to monitor driver steering inputs; and
- e) That has an algorithm to determine the need, and a means to modify propulsion torque, as necessary, to assist the driver in maintaining control of the vehicle.

An electronic stability control system shall be one that:

- a) Is capable of applying braking torques individually to all four wheels 2/ and has a control algorithm that utilizes this capability;
- b) Is operational over the full speed range of the vehicle, during all phases of driving including acceleration, coasting, and deceleration (including braking), except:
 - i. When the driver has disabled ESC;
 - ii. When the vehicle speed is below 20 km/h;
 - iii. While the initial start-up self test and plausibility checks are completed, not to exceed 2 minutes when driven under the conditions of [paragraph 7.10.2 ESC Malfunction Detection]; and
 - iv. When the vehicle is being driven in reverse;
- c) Remains capable of activation even if the antilock brake system or traction control system is also activated.

FMVSS 126

A copy of the FMVSS 126 Final Rule can be obtained by going to <http://dms.dot.gov> and searching under docket number 27662.

The reference to 20km/h below is based on the GTR.

- a) FMVSS 126 Clauses:
 - S4. *Definitions.*
Electronic Stability Control System or ESC System means a system that has all of the following attributes:

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- i. That augments vehicle directional stability by applying and adjusting the vehicle brake torques individually to a vehicle;
- ii. That is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- iii. That has a means to determine the vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;
- iv. That has a means to monitor driver steering inputs;
- v. That has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle; and
- vi. That is operational over the full speed range of the vehicle (except at vehicle speeds less than 20 km/h or when being driven in reverse).

S5.1 Required Equipment.

Vehicles to which this standard applies must be equipped with an electronic stability control system that:

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S5.1.1 Is capable of applying brake torques individually to all four wheels and has a control algorithm that utilizes this capability.

S5.1.2 Is operational during all phases of driving including acceleration, coasting, and deceleration (including braking), except when the driver has disabled ESC, the vehicle speed is below 20 km/h, or the vehicle is being driven in reverse.

S5.1.3 Remains capable of activation even if the antilock brake system or traction control system is also activated.

- b) ESC systems that can be switched off are permitted provided that:
 - i. a visual indicator is provided which activates whenever the ESC system is switched off; and
 - ii. the ESC system is activated automatically each time the ignition is switched on.
- c) Alternative symbols and words to those specified in FMVSS 126 are acceptable for instrumentation displays, provided they are clearly explained in the owner manual.

DOCUMENT NAME	ANCAP Notes on the Assessment Protocol - Version 5.5
DOCUMENT TYPE	Public
VERSION	Final
PUBLISHED	July 2016
REVISED	n/a
REVISION	Update from v5.4 published in April 2016 – clarification added for pedestrian test protocol (2.9 and Appendix A) and speed assist systems (3.5.1.2).
FILE LOCATION	P:\ANCAP CORPORATE\ANCAP POLICIES\ANCAP NOTES ON THE ASSESSMENT PROTOCOL