

ANCAP NOTES ON THE ASSESSMENT PROTOCOL



VERSION 4.9 ISSUED APRIL 2011

Contents

1.1	INTRODUCTION	2
1.2	STAR RATINGS AND CRASH TESTS	3
1.2.1	<i>Minimum scores in offset and side impact tests</i>	3
1.2.2	<i>Qualifiers for a 5-star rating (to 2010)</i>	3
1.2.3	<i>Side impact and pole tests</i>	4
1.2.4	<i>Seat belt reminder</i>	4
1.3	FRONTAL OFFSET MODIFIERS	5
1.3.1	<i>Knee impact modifiers</i>	5
1.3.2	<i>Knee airbags</i>	6
1.3.3	<i>Re-publication of Euro NCAP offset test results - lack of airbags</i>	6
1.3.4	<i>Measurement of intrusion</i>	7
1.3.5	<i>Breakaway brake pedal</i>	7
1.3.6	<i>Breakaway steering column</i>	7
1.3.7	<i>Blocked pedal modifier</i>	7
1.4	SIDE IMPACT MODIFIERS	8
1.4.1	<i>Backplate loads</i>	8
1.4.2	<i>T12 Modifier</i>	8
1.4.3	<i>Re-publication of Euro NCAP side impact results - lack of airbags</i>	9
1.5	GENERAL MODIFIERS	9
1.5.1	<i>Door open modifiers</i>	9
1.5.2	<i>Airbag deployment modifiers</i>	9
1.6	DUMMY SET-UP	10
1.7	CALCULATION OF SCORES	10
1.8	CHILD RESTRAINT ASSESSMENT	11
1.9	PEDESTRIAN RATINGS	11
2	STAR RATINGS FROM 2011	11
2.1	MINIMUM CRASH TEST SCORES	12
2.2	PEDESTRIAN PROTECTION	12
2.3	WHIPLASH PROTECTION	12
2.4	ROOF STRENGTH	12
2.5	SAFETY ASSIST TECHNOLOGIES (SAT)	12
3	ENQUIRIES	16
	APPENDIX A - SUMMARY OF PROTOCOL CHANGES	17
	APPENDIX B - ELECTRONIC STABILITY CONTROL	18

1.1 Introduction

The Australasian New Car Assessment Program (ANCAP) conducts crash tests and associated assessments in accordance with the test protocols issued by EuroNCAP (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. However the types of tests conducted and the scoring of injury measurements and modifiers are essentially unchanged. ANCAP is continuing with the adult occupant protection star rating and will continue to obtain and re-publish test results from Euro NCAP. 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 determined by the ANCAP Council. Updates are available from www.ancap.com.au

Future changes to ratings policy are set out in a separate document - the ANCAP Ratings Roadmap.

1.2 Star ratings and crash tests

1.2.1 Minimum scores in offset and side impact tests

Version 4.0 of the EuroNCAP Assessment Protocol introduced a minimum score (or "points balance") in each of the offset and side impact tests in order to achieve star ratings. This was suggested by ANCAP to address imbalance between 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 offset test	Minimum in side impact test	Minimum Combined Score (incl. Pole Test & seat belt reminders)
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

* To earn 5 stars a vehicle must meet additional requirements, as described in the section "Five Star Qualifiers".

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 offset test it would be rated at three stars and its overall score would reduce to 24.49 points. 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 new star rating system (Version 5). ANCAP has retained the points balance method due to poor offset crash test performance in some recent tests.

1.2.2 Qualifiers for a 5-star rating (to 2010)

In order to be awarded a 5 star 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 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 star ratings from 2011, see Section 2 of this document.

1.2.3 Side impact and pole tests

ANCAP has a departure from the EuroNCAP testing and assessment protocols for side impact protection for occupants of high-seat vehicles (i.e. with a seat reference height 700mm or more).

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.

For all vehicles, including high-seat vehicles, a successful pole test (i.e. score at least one point) is required to achieve 5 stars. ANCAP will publish the result of the pole test, even if the score is zero.

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 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. For example, a pole test cannot be used to improve a rating from 3 to 4 stars.

1.2.4 Seat belt reminder

During 2002 Euro NCAP introduced bonus points for seat belt reminders. In essence, one point is earned each for a driver reminder, a front passenger reminder and a status indicator for all rear seats. The requirements for seat belt reminders are set out in EuroNCAP document Seat Belt Reminder Assessment Protocol (copy available from <<http://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 inform the driver about the status of each rear seat belt.

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" (eg 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 to meet this requirement but is recommended.

If the system does not detect the presence of an occupant then ANCAP *recommends* a positive indicator that shows a green light for each rear seat belt that is being used and that displays no lights for unused seat belts. This means that the driver can easily check that there is a green light illuminated for each rear seating position that has an occupant. If one of these seat belts is unbuckled while the vehicle is in use then it is recommended that the icon flashes or turns red, in addition to the audible alarm.

Apr 11

Where the system detects an occupant (as is necessary for front passenger position) then ANCAP recommends a negative indicator that shows a red light for any seating position that has an occupant not wearing a seat belt.

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.

1.3 Frontal offset modifiers

1.3.1 Knee impact modifiers

The Upper Leg Score is subject to modifiers resulting from a post-crash assessment of the knee impact zone. 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).

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.

Apr 11

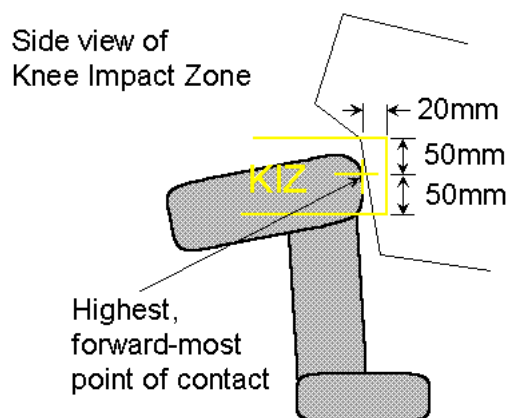
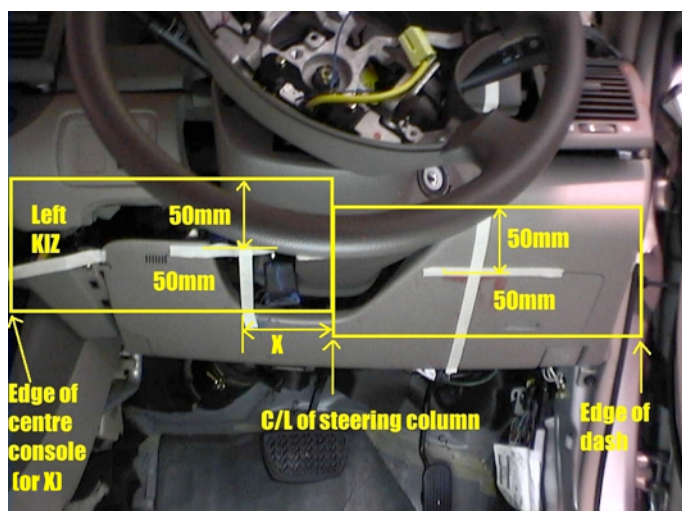


Illustration of Knee Impact Zone (a rectangular prism based on actual points of impact)

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.

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. A spherical impact surface with a radius of about 25mm would be suitable to simulate knee loading.

Apr 11

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 sandwich 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.

1.3.2 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 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 (eg from femur load trace)

If these requirements are not met then the fascia and steering column will be assessed in the usual way, 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.

1.3.3 Re-publication of Euro NCAP offset test results - lack of airbags.

Increasingly vehicles tested by Euro NCAP have a driver knee airbag. This usually eliminates knee modifiers. There have been several cases where an Australasian variant of that 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 an 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 (ie 2 point deduction from upper leg injury score) 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 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 result sheet will note:

"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".

The same method applies where the model 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 offset test, unless test evidence, acceptable to ANCAP, is provided by the manufacturer.

1.3.4 Measurement of intrusion

In accordance with the Euro NCAP, 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 for 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 EuroNCAP protocol (i.e. in the manufacturer's favour). However, it is possible that vertical (Z) displacements (eg 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.

1.3.5 Breakaway brake pedal

Manufacturers should advise prior to the 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.

1.3.6 Breakaway steering column

Manufacturers should advise prior to the 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).

1.3.7 Blocked pedal modifier

In 2004 Euro NCAP introduced a blocked pedal modifier for the offset crash test.

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.

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).

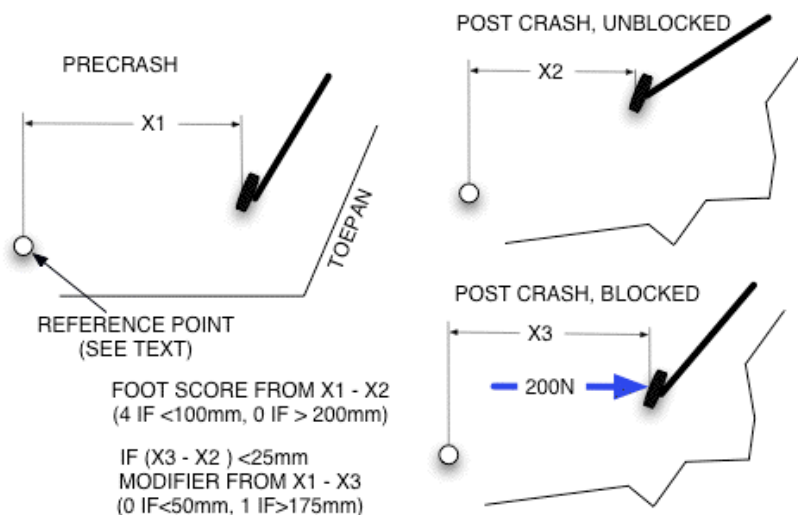


Illustration of blocked pedal modifier

ANCAP applied this requirement to tests conducted from June 2004.

1.4 Side impact modifiers

1.4.1 Backplate loads

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

1.4.2 T12 Modifier

Where the T12 loads F_y and M_x exceed 2.0kN or 200Nm respectively, a two point penalty is applied to the driver’s chest assessment. Between 1.5kN – 2.0kN or 150Nm – 200Nm the penalty is calculated using a sliding scale from 0 to 2 points. The assessment is based upon

the worst performing parameter. This was introduced in Version 4.1 of the Euro NCAP Assessment Protocol (issued March 2004) and ANCAP applied the modifier to tests conducted from September 2004.

Euro NCAP has advised that the backplate and T12 modifiers apply to the chest score but are limited to a maximum deduction of 2 points, as are all body region modifiers for all types of crash tests.

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

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.

Apr 11

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 result sheet have 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."

1.5 General modifiers

1.5.1 Door open modifiers

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, MDB side impact and pole crash tests. The points are deducted from the total score for that test. The definition of an "open" door is described in the Euro NCAP protocol. 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, such a gap sufficient to allow a hand to pass through (e.g. 80mm).

1.5.2 Airbag deployment modifiers

An airbag deployment modifier has always applied to the pole impact test. From 1 January 2008 ANCAP applied this modifier to the frontal offset and side impact crash tests. These will 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 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.

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.

Apr 11

The Hazardous airbag deployment modifier, 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.

1.6 Dummy set-up

Only 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.

ANCAP does not normally require the test contractor to fit a neck shield to the dummies. These 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 representative must not touch the seat belt once the dummy has been installed in the vehicle and the seat belt fastened.

1.7 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 1.2.1 and, from 2011, Section 2.

If the *premodified* injury score for the head, chest, abdomen or pelvis is zero then a warning note (eg "High risk of life threatening chest injury in side impact") is added to the published overall rating. Euro NCAP uses a "struck through star" to indicate this situation and ANCAP assessment reports also use a struck star for reference purposes, but this is *not included in the final ANCAP publication*.

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 or more	Good
2.67 to 3.99	Acceptable
0.01 to 2.66	Marginal
0	Poor

1.8 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. For background see the research report "Effectiveness Of Child Restraints, The Australian Experience" available from <http://tinyurl.com/yrorg9>.

Recommendations for assessing the compatibility between child restraints and vehicle are set out in the appendix to that research report. ANCAP has no plans to implement these recommendations in the short term but manufacturers should consider the issue of CRS to vehicle compatibility when designing new vehicles.

1.9 Pedestrian ratings

In association with a major change to the test protocols (a change to impact headforms), 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 Verison 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.

2 Star Ratings from 2011

In January 2011 ANCAP published a Roadmap for the period 2011 to 2015. This sets out requirements for star ratings. A summary is set out below but reference should be made to the published Roadmap for full details and updates. It is intended that the Roadmap will be reviewed each year and extended to the next year (i.e. the next review will cover 2011). The current version of the Roadmap can be downloaded from: <http://www.ancap.com.au/media>

Progressively over the life of the Road Map, ANCAP will be introducing new tests, new calculation methods and new safety assist technology ("SAT") requirements.

The offset frontal, side impact, side pole and pedestrian tests will be retained. Adding to the physical test regime will be whiplash tests (based on work currently undertaken by NRMA Insurance) and roof crush strength tests (based on work undertaken by IIHS since 2009).

In relation to SAT, both mandatory and additional SAT will be required, with the requirements generally becoming more stringent each year.

2.1 Minimum crash test scores

The minimum scores set out in Table 1 are retained. Seat belt reminders will continue to contribute to the overall score that is required in this table. Seat belt reminders will also be assessed as mandatory SAT, as detailed below.

2.2 Pedestrian protection

A minimum rating will be required for pedestrian protection, starting with a minimum Marginal rating to be eligible for an overall 5-star rating in 2012 (or 2014 for "high seat" vehicles).

2.3 Whiplash Protection

A minimum rating will be required for whiplash protection, starting with a minimum Acceptable rating to be eligible for a 5-star rating in 2012. The assessment is conducted in accordance with RCAR-IIWPG Seat/Head Restraint Evaluation Protocol (<http://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.

Whiplash ratings will continue to be conducted by NRMA Insurance and ANCAP will include these ratings on published datasheets. ANCAP might assist in this process by providing seats from vehicles acquired for crash testing.

2.4 Roof Strength

A minimum rating will be required roof strength, starting with a minimum Acceptable rating to be eligible for a 5-star rating in 2014. The roof strength rating is based on the single-sided roof crush test of US FMVSS 216 with a rating in accordance with the protocols of the Insurance Institute for Highway Safety: <http://www.iihs.org/ratings/roof/information.html>

ANCAP will acquire vehicles and arrange for roof strength test to be conducted. Where possible IIHS ratings for models sold in the USA and Australia will be used, subject to consultation with the local manufacturer/distributor.

2.5 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 (Table 4) and others are in a list of "Additional SAT" that can be chosen by manufacturers to reach the minimum number of SAT set out in the Roadmap. 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 Roadmap document and some are still under development.

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

Table 4 Mandatory SAT (subject to review)

Feature (see Roadmap for definitions)	Comment
Electronic Stability Control (ESC)	Required by ANCAP for 5-stars since 2008. To be extended to other star ratings
Seat Belt Reminders (SBR) for fixed seating positions	Common on front seats for 5-star vehicles. Proposed that it remains part of the star rating score, as well as a SAT requirement. To be extended to other star ratings and to rear seats
Head-protecting technology - side airbags (HPT)	Required by ANCAP for front seats for 5-stars since 2004 (pole test). To be extended to other star ratings and to rear seats
Emergency Brake Assist (EBA)	Common on most 5-star vehicles
3-point seat belts for all forward facing seats (3PSB)	Common on most 5-star vehicles

Refer to the Roadmap document for further details, updates and a list of Additional SAT.

Table 5 Summary of Star Rating Requirements under the ANCAP Roadmap (subject to review)

Year	Minimum Frontal Offset Score	Minimum Side Impact Score	Minimum Side Pole Score	Minimum Combined Score ⁴	Minimum Pedestrian Rating	Minimum Whiplash Rating	Minimum Roof Strength Rating	Mandatory SAT ¹	Minimum Additional SAT ²
Requirements for 5 Star Rating									
2011	12.5	12.5	1	32.5	-	-	-	ESC, 3PSB, HPT front seats	-
2012	12.5	12.5	1	32.5	Marginal ³	Acceptable	-	ESC, 3PSB, HPT front seats	2
2013	12.5	12.5	1	32.5	Marginal ³	Acceptable	-	2012 + SBR front seats, EBA	3
2014	12.5	12.5	1	32.5	Acceptable ³	Good	Acceptable	2013 + HPT 2nd row seats	4
2015	12.5	12.5	1	32.5	Acceptable	Good	Acceptable	2014 + SBR 2nd row fixed seats	5
Requirements for 4 Star Rating									
2011	8.5	8.5	-	24.5	-	-	-	-	-
2012	8.5	8.5	-	24.5	-	-	-	ESC	-
2013	8.5	8.5	-	24.5	-	-	-	ESC	1
2014	8.5	8.5	-	24.5	Marginal ³	Acceptable	-	2013 + 3PSB, HPT front seats	2
2015	8.5	8.5	-	24.5	Acceptable ³	Acceptable	-	2014 + SBR front seats, EBA	3

Requirements for 3 Star Rating									
2011	4.5	4.5	-	16.5	-	-	-		
2012	4.5	4.5	-	16.5	-	-	-	-	-
2013	4.5	4.5	-	16.5	-	-	-	ESC	-
2014	4.5	4.5	-	16.5	-	-	-	2013 + 3PSB	1
2015	4.5	4.5	-	16.5	-	-	-	"	2
Requirements for 2 Star Rating									
2011	1.5	1.5	-	8.5	-	-	-		
2012	1.5	1.5	-	8.5	-	-	-	-	-
2013	1.5	1.5	-	8.5	-	-	-	-	-
2014	1.5	1.5	-	8.5	-	-	-	ESC	-
2015	1.5	1.5	-	8.5	-	-	-	"	1
Requirements for 1 Star Rating									
2011	-	-	-	0.5	-	-	-	-	-
2012	-	-	-	0.5	-	-	-	-	-
2013	-	-	-	0.5	-	-	-	-	-
2014	-	-	-	0.5	-	-	-	-	-
2015	-	-	-	0.5	-	-	-	-	-

Notes:

1. Must be standard on the variant being assessed.
2. For additional SAT to score the full value, the particular SAT must be fitted by the manufacturer as standard equipment. SAT fitted by the manufacturer but specified as optional (extra) equipment only scores half value.
3. Vehicles with a seating reference height of 700mm or more may meet one grade less for pedestrian protection (eg “poor” instead of “marginal” and “marginal” instead of “acceptable”.)
4. The Combined Score includes up to 3 points for seat belt reminders (1 for driver, 1 for front passenger and 1 for all 2nd row seats - this is separate from the SAT scoring)

3 Enquiries

Technical enquiries about test and assessment protocols should be addressed to:

Michael Paine, Technical Manager ANCAP

Ph: 02 94514870

michael.paine@ancap.com.au

Policy and business enquiries should be addressed to

Nick Clarke, Business Manager ANCAP

Ph 02 62320232

Nicholas.Clarke@ancap.com.au

PO Box 4041 Manuka ACT 2603

Appendix A - Summary of protocol changes

This appendix provides a brief historical summary of changes to test and assessment protocols used by ANCAP.

Guide to ANCAP Protocol Changes (subject to review)

BROC. 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. 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)
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
Mar-11	4.2	16	4.2	16	4.2	2	3	37	5.2	36	Roadmap introduced. Additional requirements for star ratings

Appendix B - Electronic Stability Control

Effective from 1 January 2008, to be eligible for a 5 star rating vehicles must be equipped with an Electronic Stability Control (ESC) system that, 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

Global Technical Regulation (GTR) No. 8

GTR 8 can be downloaded from:

<http://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.

Functional requirements. 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]
 - (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:

- (1) That augments vehicle directional stability by applying and adjusting the vehicle brake torques individually to a vehicle;
- (2) That is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- (3) 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;
- (4) That has a means to monitor driver steering inputs;
- (5) 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
- (6) 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).

Apr 11

S5.1 Required Equipment.

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

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.

Apr 11

b) ESC systems that can be switched off are permitted provided that:

(a) a visual indicator is provided which activates whenever the ESC system is switched off and

(b) 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.