AUSTRALIAN NEW CAR ASSESSMENT PROGRAM

NOTES ABOUT THE ASSESSMENT PROTOCOL

VERSION 4.3, ISSUED 16 NOVEMBER 2005

Contents

Introduction

The Australian New Car Assessment Program (ANCAP) conducts crash tests and associated assessments in accordance with the protocols issued by EuroNCAP < http://www.euroncap.com >

This document sets out clarifications and interpretations determined by the ANCAP Steering Committee.

Minimum scores in offset and side impact tests

Version 4.0 of the EuroNCAP Assessment Protocol introduced a minimum score 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 – a vehicle with a good side impact score and poor offset score could reach 3 stars under the previous protocol. Advice from EuroNCAP is that the minimum scores set out in the Protocol have been rounded to the nearest integer. The breakpoints, *before rounding* 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 achieve at least 1 point in the optional pole test (maximum 2 points). This is an ANCAP requirement.

Nov05

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.

Side impact testing of high-seat vehicles

protection for occupants of high-seat vehicles (Seat reference height 700mm or more). The Euro NCAP side impact test is the same as the test prescribed in ADR72 , which exempts high-seat vehicles from testing. ANCAP decided that there was little value to consumers in testing these vehicles and therefore decided to award all high-seat vehicles a default score of 16 points. Manufacturers are requested to provide advice about seat reference heights to ANCAP during forward planning of test programs. Where the range of specifications of a variant span the 700mm limit the variant will be regarded as a "low seat" vehicle.

ANCAP also decided to conduct pole tests of vehicles with head-protecting side airbags at its discretion and expense. However the Euro NCAP arrangements, where manufacturers can request the optional pole test at their expense, are still available.

Seat belt reminder

During 2002 EuroNCAP 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 v1.0e (copy available from <http://www.euroncap.com> .

ANCAP has prepared a questionnaire to assist in the assessment of seat belt reminder systems. A copy of the questionnaire can be downloaded from <http://www.aaa.asn.au/ancap.htm>.

Manufacturers may submit a completed questionnaire, together with digital video of the system in operation, to obtain a provisional assessment of reminder systems by ANCAP.

The EuroNCAP protocol is flexible in the signal requirements for *rear* seat belt reminder systems. These systems need only inform the driver about the status of each rear seat belt. If the system does not detect the presence of an occupant then ANCAP *prefers* 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. In addition, ANCAP has recommended to Euro NCAP that the protocol be revised 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). This would not involve additional sensors or rear seat occupant detection - just some extra logic for existing systems.

Where the system detects an occupant (eg a requirement for front passenger position) then ANCAP *prefers* 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 preferred.

Knee impact modifiers

A *Variable Contact* modifier (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).

Manufacturer's 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*.

Usually the Concentrated Loading modifier (1 point deduction each knee) applies where the component is also found to be a 'Variable Contact' and the double deduction 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.

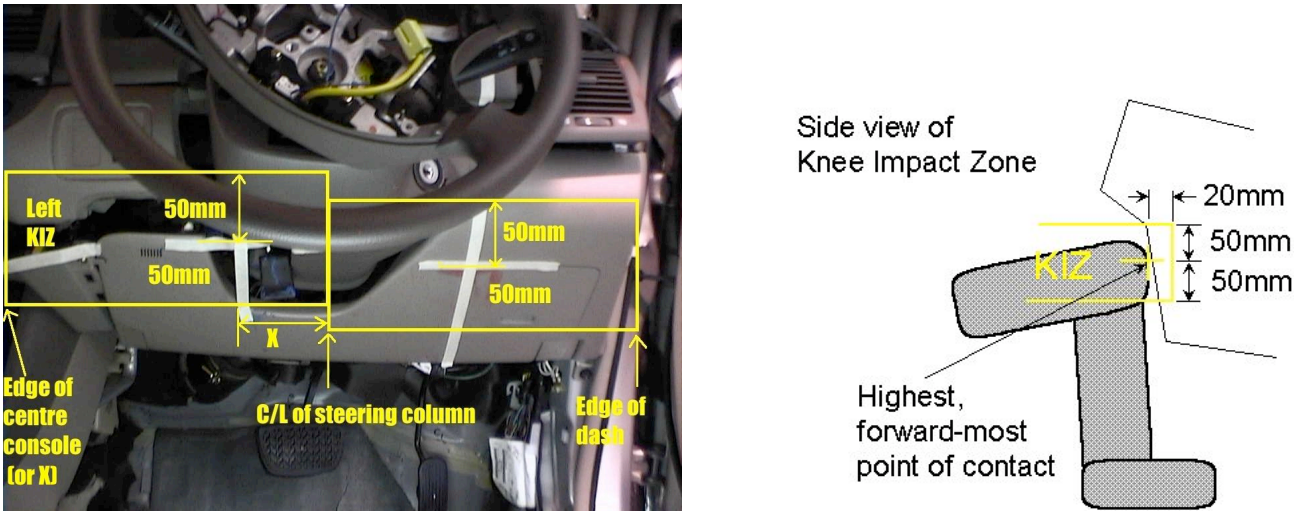

Illustration of Knee Impact Zone (a rectangular prism based on actual points of impact)

Some manufacturers have treated steering column covers and fascia covers with a sandwich of energy absorbing foam and metal sheets which protects the foam from concentrated loads. In the absence of objective performance criteria from EuroNCAP 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.

Knee airbags

Euro NCAP has been working with a group of manufacturer's representative to develop test procedures for assessing the injury potential of knee airbags. These may involve out-of-position tests conducted at the manufacturer's expense. The intention is to apply variable contact and/or concentrated load modifiers if these tests demonstrate a leg injury hazard.

Until further experience is gained with the assessment of knee airbags, including evidence of a leg injury hazard, ANCAP has decided that no modifiers will apply if 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.

Measurement of intrusion

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, intrusion was assessed relative to the rear wall of the cabin. ANCAP has reviewed the method of assessing intrusion for all vehicles and has 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 but excludes any crush to the rear of the compartment. For two-door vehicles the A-pillar displacement is assessed relative to the B-pillar and so is the same as IIHS.

In all cases assessed by ANCAP to date these requirements result in longitudinal (X) displacements that are less than those assessed according to the EuroNCAP protocol (i.e. in the manufacturer's favour). 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. It is considered that this gives a more realistic indication of the hazard from upward movement of the steering column (or brake pedal).

.

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.

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).

Modifiers in side impact test

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.

T12 Modifier

Where the T12 loads Fy and Mx 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 started to apply the modifier to tests conducted from September 2004.

Scoring

Euro NCAP has advised that the backplate and T15 modifiers apply to the chest score in the side impact test and that the Assessment Protocol will soon be amended to reflect this advice. ANCAP has applied this interpretation for tests conducted from December 2003. This means that the modifiers will not affect the side impact score if the chest score (resulting from injury measurement) is zero.

Blocked pedal modifier

For the Phase 13 tests 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).

ANCAP applied this change to tests conducted from June 2004.

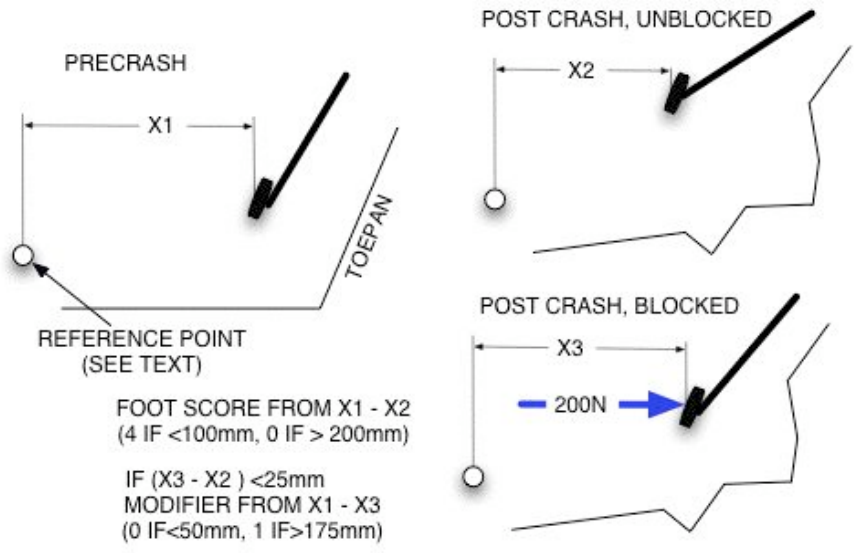

Illustration of blocked pedal modifier

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 appendix. 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.

Nov05 | Star ratings are assigned according to Table 1 and, if necessary, the overall score is adjusted to match the highest score available for the derived star rating.

Child restraint assessment

Manufacturers are encouraged to nominate models of child restraint that have been found to suit the vehicle being tested - and are preferably 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://www.aaa.asn.au/issinfo/CRS_effectiveness_Australia.pdf.

Recommendations for assessing the compatibility between child restraints and vehicle are set out in the appendix to the 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.

Future scoring factors

The following items have been suggested for consideration as possible factors in the NCAP scoring system. They are provided here for discussion purposes. If introduced they could be implemented as bonus points, as a prerequisite for a 5 star rating or as a modifier.

- Electronic stability control (with priority for high-seat vehicles)
- Side head protection (eg curtains) for rear seat occupants
- Side head protection (eg curtains) that provide improved protection in rollover crashes due to design and deployment characteristics
- Daytime running lights
- Some features of the TAC Safe Car being trialled in Melbourne by MUARC (eg speed limiter).

Enquiries

Enquiries about test and assessment protocols should be addressed to:

Ross McArthur

Chairperson, ANCAP Steering Committee

Ph: 03 9854 2642

Fax: 03 9854 2668

Ross.McArthur@roads.vic.gov.au

PO Box 1555 CANBERRA ACT 2601

Updates to this document will be posted at:

< http://www.aaa.asn.au/ancap.htm>.

APPENDIX - SUMMARY OF INJURY RATINGS

ANCAP INJURY RATINGS

INJ_DESCRIPTION	UNITS	BODYREG	MAXSCORE	POINTS0	POINTS4	SLIDE	dec...	applydate
CHEST COMPRESSION - OFFSET	mm	OFFSET - CHEST	4	50	22	1	2	1/07/1997
CHEST VISCOUS CRIT - OFFSET	m/s	OFFSET - CHEST	4	1	0.5	1	2	1/07/1997
A-PILLAR DISPLACEMENT	mm	OFFSET - CHEST	2	100	200	1	0	1/07/1997
HEAD HIC36 - OFFSET	HIC	OFFSET - HEAD	4	1000	650	1	0	1/07/1997
NECK EXTENSION	Nm	OFFSET - HEAD	4	57	42	1	2	1/07/1997
NECK SHEAR	kN	OFFSET - HEAD	4	3.1	1.9	1	2	1/07/1997
NECK TENSION	kN	OFFSET - HEAD	4	3.3	2.7	1	2	1/07/1997
STEER COL REARWARD	mm	OFFSET - HEAD	1	90	110	1	0	1/07/1997
STEER COL UP	mm	OFFSET - HEAD	1	72	88	1	0	1/07/1997
HEAD DECEL 3ms	g (3ms)	OFFSET - HEAD	4	88	72	1	1	1/07/1997
STEER COL LATERAL	mm	OFFSET - HEAD	1	80	120	1	0	1/07/1997
TIBIA COMPRESSION	kN	OFFSET - LOWER LEG	4	8	2	1	2	1/07/1997
PEDAL DISPLACEMENT - REAR	mm	OFFSET - LOWER LEG	4	200	100	1	0	1/07/1997
PEDAL DISPLACEMENT - UP	mm	OFFSET - LOWER LEG	1	72	88	1	0	1/07/1997
BLOCKED PEDAL RESIDUAL	mm	OFFSET - LOWER LEG	1	50	175	1	0	1/06/2004
FEMUR FORCE	kN	OFFSET - UPPER LEG	4	9.07	3.8	1	2	1/07/1997
KNEE DISPLACEMENT - OFFSET	mm	OFFSET - UPPER LEG	4	15	6	1	2	1/07/1997
HEAD HIC - PED	HIC	PEDESTRIAN - HEAD	2	1500	1000	1	0	1/07/1997
KNEE SHEAR DISPL - PED	mm	PEDESTRIAN - LOWER LEG	2	7.5	6	1	1	1/07/1997
ULEG BENDING MOMENT - PED	Nm	PEDESTRIAN - UPPER LEG	2	400	220	1	1	1/07/1997
ULEG FORCE (SUM) - PED	kN	PEDESTRIAN - UPPER LEG	2	7	4	1	2	1/07/1997
HEAD DECEL - POLE	g (3ms)	POLE IMPACT - HEAD	2	80	80	0	1	1/07/1997
HEAD HIC - POLE	HIC	POLE IMPACT - HEAD	2	1000	1000	0	0	1/07/1997
ABDOMEN FORCE (SUM) - SI	kN	SIDE IMPACT - ABDOMEN	4	2.5	1	1	3	1/07/1997
CHEST VISCOUS CRIT - SI	m/s	SIDE IMPACT - CHEST	4	1	0.32	1	2	1/07/1997
CHEST COMPRESSION - SI	mm	SIDE IMPACT - CHEST	4	42	22	1	2	1/07/1997
T12 FORCE - SI	kN	SIDE IMPACT - CHEST	2	1.5	2	1	2	1/09/2004
T12 MOMENT - SI	Nm	SIDE IMPACT - CHEST	2	150	200	1	2	1/09/2004
BACK PLATE FORCE - SI	kN	SIDE IMPACT - CHEST	2	1	4	1	2	1/07/2003
HEAD HIC - SI	HIC	SIDE IMPACT - HEAD	4	1000	650	1	0	1/07/1997
HEAD DECEL - SI	g (3ms)	SIDE IMPACT - HEAD	4	88	72	1	1	1/07/1997
PUBIC SYMPHYSIS FORCE - SI	kN	SIDE IMPACT - PELVIS	4	6	3	1	3	1/07/1997

GUIDE ONLY - REFER TO EURONCAP PROTOCOLS FOR FULL DESCRIPTION