ANCAP SAFETY

ANCAP Assessment Protocol.

Pedestrian Protection v9.0.3

JANUARY 2019

ANCAP SAFETY

PREFACE

During the test preparation, vehicle manufacturers are encouraged to liaise with ANCAP and to observe the way cars are set up for testing. Where a vehicle manufacturer feels that a particular feature should be altered, they should raise this with the ANCAP assessor present at the test, or in writing to the ANCAP Chief Executive Officer if no assessor is present. ANCAP will consider the matter and at their sole discretion and give direction to the test facility.

Vehicle manufacturers warrant not to, whether directly or indirectly, interfere with testing and are forbidden from making changes to any feature that may influence the test, including but not limited to dummy positioning, vehicle setting, laboratory environment etc.

Illustrations in this protocol are reproduced from Euro NCAP publications, and therefore show Euro NCAP markings on left-hand-drive vehicles. Where relevant, the layouts depicted should be adapted to right-hand-drive application.

VERSION	PUBLISHED	DETAILS
9.0	July 2017	First version of ANCAP protocol.
9.0.2	December 2017	Changes to AEB Criteria and Scoring (s1.3) and Visualisation (s1.4.3).
9.0.3	February 2019	Amendment to section 2.1 (application of correction factor)

DISCLAIMER.
ANCAP has taken all reasonable care to ensure that the information published in this protocol is accurate and reflects the current technical decisions taken by the organisation. In the event this protocol contains an error or inaccuracy, ANCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

AUSTRALASIAN NEW CAR ASSESSMENT PROGRAM (ANCAP)

ASSESSMENT PROTOCOL – PEDESTRIAN PROTECTION

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1 INTRODUCTION

The following protocol deals with the assessments made in the area of Pedestrian Protection, in particular in the adult and child head, the upper leg form, lower leg form impacts and AEB Vulnerable Road User (VRU).

2 METHOD OF ASSESSMENT

The assessment of pedestrian protection is made with the use of headform, upper legform, lower legform impact and AEB test data. In the legform areas, the bumper and front of the bonnet of the car will be marked with a grid and are assessed using the two legform impactors. ANCAP will test “worst case” grid points and manufacturers may nominate additional tests to be performed and the results will be included in the assessment.

In the headform impact area, a grid will be marked on the outer surface of the vehicle. The vehicle manufacturer is required to provide the ANCAP Secretariat with data detailing the protection offered by the vehicle at all grid locations. The data shall be provided to the ANCAP Secretariat before any test preparation begins. The predicted level of protection offered by the vehicle is verified by ANCAP by means of testing of a sample of randomly selected grid-points and the overall prediction is corrected accordingly.

For AEB testing, the vehicle manufacturer is also required to provide the ANCAP with data detailing the expected performance of the AEB VRU system for all four of the test scenarios. The expected performance will be used to as a reference to identify discrepancies between the expected results and the test results.

2.1 Points Calculation

For the legform impact areas, a sliding scale system of points scoring has been used to calculate points for each measured criterion. This involves two limits for each parameter, a more demanding limit (higher performance), below which a maximum score is obtained and a less demanding limit (lower performance), beyond which no points are scored. Where a value falls between the two limits, the score is calculated by linear interpolation. No capping is applied to any of the measurements. The maximum score for each grid point is one point for bumper and bonnet leading ledge tests. The total score will then be scaled to a maximum of six points for each impactor.

For the headform impact area, the protection predicted by the vehicle manufacturer will be compared to the outcome of the randomly selected test locations. The results at those test locations will be used to generate a correction factor, which will then be applied to the predicted score. Only data that results in a correction factor of between 0.850 and 1.150 are accepted. Where this is not the case, the cause will be investigated and the Secretariat will subsequently take a decision as to how to proceed. Where the data are accepted, the headform score will be based on the predicted data score with correction applied.

For AEB, a sliding scale based on the speed reduction is applied for test speeds up to 40 km/h/. Higher test speeds are assessed as pass/fail only.

PART I - PEDESTRIAN IMPACT ASSESSMENT

1 PEDESTRIAN IMPACT ASSESSMENT

1.1 Criteria and Limit Values

The assessment criteria used for the pedestrian impact tests, with the upper and lower performance limits for each parameter, are summarised below. Where multiple criteria exist for an individual test, the lowest scoring parameter is used to determine the performance of that test, unless indicated otherwise.

1.1.1 Headform

The manufacturer must provide predicted data for all grid points. This data shall be expressed as a colour according to the corresponding colour boundaries for the predicted HIC_{15} performance below. Alternatively, HIC_{15} values may be provided.

Green	$HIC_{15} < 650$
Yellow	$650 \le HIC_{15} < 1000$
Orange	$1000 \le HIC_{15} < 1350$
Brown	$1350 \le HIC_{15} < 1700$
Red	$1700 \le HIC_{15}$

The manufacturer is allowed to colour a limited number of grid points blue where the performance is unpredictable. These grid points will always be tested. The procedure is detailed in the Pedestrian Protection Test protocol.

1.1.2 Upper Legform

Higher performance limit

Bending Moment	285Nm
Sum of forces	5.0kN

Lower performance limit

Bending Moment	350Nm
Sum of forces	6.0kN

1.1.3 Legform

Higher performance limit

Tibia Bending Moment	282Nm
MCL Elongation	19mm
ACL/PCL Elongation	10mm

Lower performance limit

Tibia Bending Moment	340Nm
MCL Elongation	22mm
ACL/PCL Elongation	10mm

1.2 Modifiers

There are no modifiers applied.

1.3 Scoring & Visualisation

1.3.1 Scoring

A maximum of 24 points is available for the headform test zone. The total score for all grid points is calculated as a percentage of the maximum achievable score, which is then multiplied by 24 points. The bonnet leading edge and bumper test zone will be awarded a maximum of 6 points each. A total of 36 points are available in the pedestrian protection assessment.

1.3.1.1 Headform

Each of the grid points can be awarded up to one point, resulting in a maximum total amount of points equal to the number of grid points. For each predicted colour the following points are awarded to the grid point:

	HIC_{15}	<	650	*1.00 point*
650 ≤	HIC_{15}	<	1000	*0.75 points*
1000 ≤	HIC_{15}	<	1350	*0.50 points*
1350 ≤	HIC_{15}	<	1700	*0.25 points*
1700 ≤	HIC_{15}			*0.00 points*

1.3.2 Headform Correction factor

The data provided by the manufacturer is scaled using a correction factor, which is calculated based on a number of verification tests performed. The verification points are randomly selected grid points, distributed in line with the predicted colour distribution.

The actual tested total score of the verification test points is divided by the predicted total score of these verification test points. This is called the correction factor, which can be lower or higher than 1.

$$Correction\ Factor = \frac{Actual\ tested\ score}{Predicted\ score}$$

The correction factor is multiplied to all the grid points (excluding defaulted and blue points). The final score for the vehicle can never exceed 100% regardless of the correction factor.

1.3.2.1 HIC tolerance

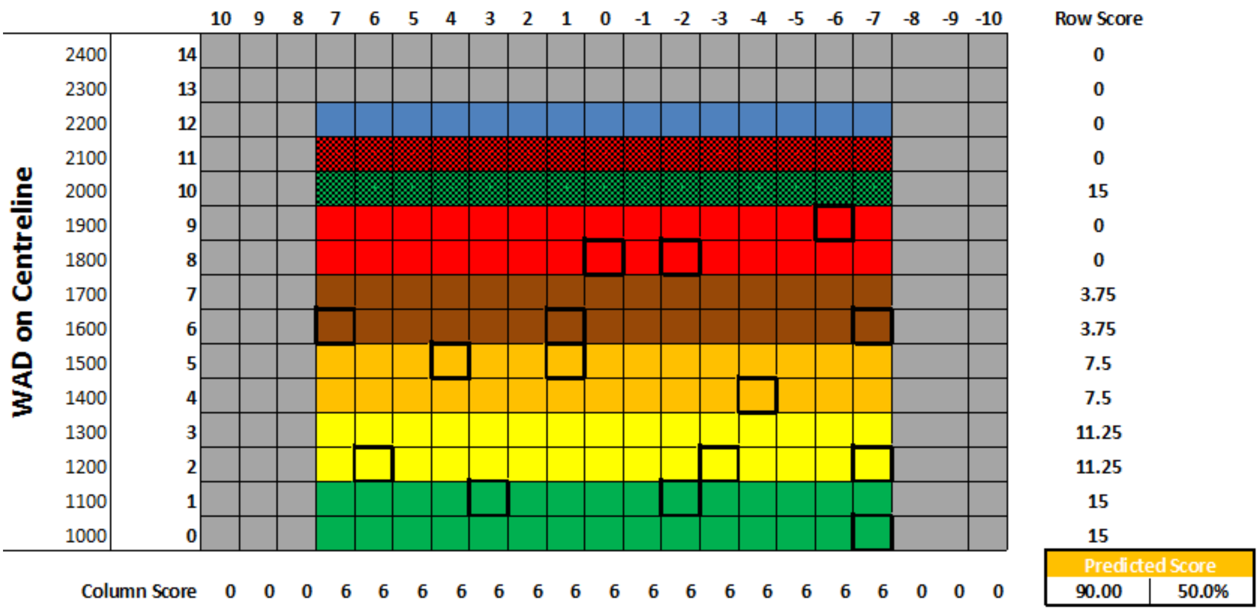
As test results can be variable between labs and in-house tests and/or simulations a 10% tolerance to the HIC value of the verification test is applied. The tolerance is applied in both directions, meaning that when a tested point scores better than predicted, but within tolerance, the predicted result is applied. The tolerance only applies to verify whether the predicted colour of the tested verification point is correct. When, including tolerance, the colour is not in line with the prediction, the true colour of the test point will be determined by comparing the actual measured HIC value with the colour band in section 1.3.1.1 without applying a tolerance to the HIC value.

Prediction	***HIC_{15} range***	***Accepted HIC_{15} range***
Green	$HIC_{15} < 650$	$HIC_{15} < 722.22$
Yellow	$650 \leq HIC_{15} < 1000$	$590.91 \leq HIC_{15} < 1111.11$
Orange	$1000 \leq HIC_{15} < 1350$	$909.09 \leq HIC_{15} < 1500.00$
Brown	$1350 \leq HIC_{15} < 1700$	$1227.27 \leq HIC_{15} < 1888.89$
Red	$1700 \leq HIC_{15}$	$1545.45 \leq HIC_{15}$

1.3.2.2 Example:

Headform testing:

Manufacturer X has provided the following prediction to ANCAP with a total score of 90 points (excluding blue) out of the possible 195:



The prediction consists of the following:

15 Default Green	*x 1.00 =*	*15.00*
30 Green	*x 1.00 =*	*30.00*
30 Yellow	*x 0.75 =*	*22.50*
30 Orange	*x 0.50 =*	*15.00*
30 Brown	*x 0.25 =*	*7.50*
30 Red	*x 0.00 =*	*0.00*
15 Default Red	*x 0.00 =*	*0.00*
15 Blue		
195 grid points		***90.00 points***

15 verification points were chosen for testing:

	Verification											Score
1-10	GRID-point	R2|C-7	R2|C-3	R1|C-2	R4|C-4	R5|C1	R5|C4	R8|C-2	R6|C-7	R2|C6	R1|C3	
	Prediction											6
	Test result (HIC)	750	600	500	1200	1492	850	2000	1400	1112	660	
	Test result (pts)	0.75	0.75	1	0.5	0.5	0.75	0	0.25	0.5	1	6
11-20	GRID-point	R8|C0	R6|C7	R0|C-7	R9|C-6	R6|C1						
	Prediction											1.50
	Test result (HIC)	2000	1822	700	1544	1450						
	Test result (pts)	0	0.25	1	0.25	0.25						1.75
											Correction factor	1.033

$$Correction\ Factor = \frac{Actual\ tested\ score}{Predicted\ score} = \frac{6.00 + 1.75}{6.00 + 1.50} = 1.033$$

8 Blue zones were tested containing 15 blue points:

	Blue points									Score
Blue	Blue Zone	1	2	3	4	5	6	7	8	
	GRID-point	12,7 12,6	12,5 12,4	12,3 12,2	12,1 12,0	12,-1 12,-2	12,-3 12,-4	12,-5 12,-6	12,-7	
	Test result (HIC)	1000	650	1700	1500	1700	1699	1350	1349	
	Test result (pts)	0.5	0.75	0	0.25	0	0.25	0.25	0.5	4.5

The final score will be:

150 Predicted	*75.00 x 1.033 = 77.475*
15 Default Green	*15.000*
15 Default Red	*0.000*
15 Blue	*4.500*
195 grid points	***96.975 points***

The score in terms of percentage of the maximum achievable score is 96.975/195 = 49.730%

The final headform score is 49.730% x 24 = **11.935 points**

1.3.2.3 Upper Legform

Each of the grid points can be awarded up to one point resulting in a maximum total of points equal to the number of grid points. A linear sliding scale is applied between the relevant limits of each parameter. The upper legform performance for each grid point is based upon the worst performing parameter.

The total score for the upper legform area will be calculated out of six by scaling the sum of grid points score by the relevant number of grid points.

Example:

For a vehicle that has 9 grid points and tests are performed to points U0, U-2 & U-4 with the following results:

Test result U0	**Score**	**Total**
Femur upper bending moment = 281.40Nm	1.000	
Femur middle bending moment = 342.60Nm	0.114 =>	**0.114**
Femur lower bending moment = 324.10Nm	0.398	
Femur sum of forces = 5.26kN	0.740	

Test result U-2	**Score**	**Total**
Femur upper bending moment = 395.81Nm	0.000	**0.000**
Femur middle bending moment = 467.69Nm	0.000	
Femur lower bending moment = 435.69Nm	0.000	
Femur sum of forces = 6.80kN	0.000	

Test result U-4	**Score**	**Total**
Femur upper bending moment = 152.00Nm	1.000	**1.000**
Femur middle bending moment = 208.00Nm	1.000	
Femur lower bending moment = 245.00Nm	1.000	
Femur sum of forces = 4.89kN	1.000	

Grid points that have not been tested will be awarded the worst result from one of the adjacent points. Given that U-1 and U-3 have not been tested, both will be awarded the result from the adjacent point U-2. Symmetry will also be applied to all grid points on the opposite side of the vehicle (U+1 to U+4).

U+4	U+3	U+2	U+1	U0	U-1	U-2	U-3	U-4
1.000	0.0	0.0	0.0	0.114	0.0	0.0	0.0	1.000

The score for each individual grid point is then summed, this produces a score in terms of the maximum achievable percentage of 2.114/9 = 23.488%

The final upper legform score is 23.488% x 6 = **1.409 points**

1.3.2.4 Legform

Each of the grid points can be awarded up to one point resulting in a maximum total of points equal to the number of grid points. A linear sliding scale is applied between the relevant limits of each parameter. The one point per grid point is divided into two independent assessment areas of equal weight:

1. Tibia injury assessment based on the worst performing of tibia moments T1, T2, T3, T4 (0.500 point).
2. Knee injury assessment based upon MCL elongation, as long as ACL/PCL elongation is smaller than the threshold (0.500 point).

The total score for the legform area will be calculated out of six by scaling down the sum of grid points scores by the relevant number of grid points.

Example:

For a vehicle that has 11 grid points and tests are performed to points L1, L+3 & L+5 with the following results:

Test result L+1	**Score**	**Total**
Tibia bending moment = 280.00Nm	0.500	0.500
ACL or PCL elongation = 10.00mm	Fail	} 0.000
MCL elongation = 15.00mm	0.500	
		= 0.500

Test result L+3	**Score**	**Total**
Tibia bending moment = 320.00Nm	0.172	0.172
ACL or PCL elongation = 9.50mm	Pass	} 0.250
MCL elongation = 20.50mm	0.250	
		= 0.422

Test result L+5	**Score**	**Total**
Tibia bending moment = 340.00Nm	0.000	0.000
ACL or PCL elongation = 10.00mm	Fail	0.000
MCL elongation = 19.00mm	0.000	
		= 0.000

Grid points that have not been tested will be awarded the worst result from one of the adjacent points. Given that L0, L+2 & L+4 have not been tested, L0 will be awarded the score from L+1, L+2 will be awarded the score from L+3 and L+4 will be awarded the score from L+5. Symmetry will also be applied to the other side of the vehicle.

L+5	L+4	L+3	L+2	L+1	L0	L-1	L-2	L-3	L-4	L-5
0.0	0.0	0.422	0.422	0.500	0.500	0.500	0.422	0.422	0.0	0.0

The score for each individual grid point is then summed, this produces a score in terms of the maximum achievable percentage of 3.188/11 = 28.981%

The final upper legform score is 28.981% x 6 = **1.739 points**

1.3.3 Visualisation of results

1.3.3.1 Headform results

The protection provided by each grid location is illustrated by a coloured area, on an outline of the front of the car. Where no grid is used in the assessment and the fallback scenario is adopted, the same 5 colour boundaries and HIC650 – HIC 1700 values will be applied. The headform performance boundaries are detailed below.

Green		*HIC_{15} < 650*
Yellow	*650 ≤*	*HIC_{15} < 1000*
Orange	*1000 ≤*	*HIC_{15} < 1350*
Brown	*1350 ≤*	*HIC_{15} < 1700*
Red	*1700 ≤*	*HIC_{15}*

1.3.3.2 Legform & upper legform results

The protection provided by each grid location is illustrated by a coloured point on an outline of the front of the car. The colour used is based on the points awarded for that test site (rounded to three decimal places), as follows:

Green		*grid point score =*	*1.000*
Yellow	*0.750 <=*	*grid point score <*	*1.000*
Orange	*0.500 <=*	*grid point score <*	*0.750*
Brown	*0.250 <=*	*grid point score <*	*0.500*
Red	*0.000 <=*	*grid point score <*	*0.250*

2 REFERENCES

1 Prasad, P. and H. Mertz. *The position of the US delegation to the ISO Working Group 6 on the use of HIC in the automotive environment.* SAE Paper 851246. 1985

2 Mertz, H., P. Prasad and G. Nusholtz. *Head Injury Risk Assessment for forehead impacts.* SAE paper 960099 (also ISO WG6 document N447)

3 EEVC WG17 Report, ‘Improved Test Methods to Evaluate Pedestrian Protection Afforded by Passenger Cars’, September 2002.

PART II - PEDESTRIAN AEB ASSESSMENT

1 ASSESSMENT OF AEB VULNERABLE ROAD USER SYSTEMS

1.1 Introduction

AEB Vulnerable Road User (VRU) systems are AEB systems that are designed to brake autonomously for pedestrian and/or cyclists crossing the path of the vehicle. For the assessment of AEB VRU systems, two areas of assessment are considered; AEB Pedestrian and AEB Cyclists.

The AEB Pedestrian system is assessed in 5 different scenarios, where in the longitudinal scenario both AEB and FCW functions are included.

For AEB Cyclist, a limited number of scenarios is assessed under this protocol. An an update in 2020 will cover additional real life scenarios.

1.2 Definitions

Throughout this protocol the following terms are used:

Autonomous Emergency Braking (AEB) – braking that is applied automatically by the vehicle in response to the detection of a likely collision to reduce the vehicle speed and potentially avoid the collision.

Forward Collision Warning (FCW) – an audiovisual warning that is provided automatically by the vehicle in response to the detection of a likely collision to alert the driver.

Vehicle width – the widest point of the vehicle ignoring the rear-view mirrors, side marker lamps, tyre pressure indicators, direction indicator lamps, position lamps, flexible mud-guards and the deflected part of the tyre side-walls immediately above the point of contact with the ground.

Car-to-Pedestrian Farside Adult 50% (CPFA-50) – a collision in which a vehicle travels forwards towards an adult pedestrian crossing its path running from the farside and the frontal structure of the vehicle strikes the pedestrian at 50% of the vehicle's width when no braking action is applied.

Car-to-Pedestrian Nearside Adult 25% (CPNA-25) – a collision in which a vehicle travels forwards towards an adult pedestrian crossing its path walking from the nearside and the frontal structure of the vehicle strikes the pedestrian at 25% of the vehicle’s width when no braking action is applied.

Car-to-Pedestrian Nearside Adult 75% (CPNA-75) – a collision in which a vehicle travels forwards towards an adult pedestrian crossing its path walking from the nearside and the frontal structure of the vehicle strikes the pedestrian at 75% of the vehicle’s width when no braking action is applied.

Car-to-Pedestrian Nearside Child 50% (CPNC-50) – a collision in which a vehicle travels forwards towards a child pedestrian crossing its path running from behind and obstruction from the nearside and the frontal structure of the vehicle strikes the pedestrian at 50% of the vehicle's width when no braking action is applied.

Car-to-Pedestrian Longitudinal Adult 25% (CPLA-25) – a collision in which a vehicle travels forwards towards an adult pedestrian walking in the same direction in front of the vehicle where the vehicle strikes the pedestrian at 25% of the vehicle's width when no braking action is applied or an evasive steering action is initiated after an FCW.

Car-to-Pedestrian Longitudinal Adult 50% (CPLA-50) – a collision in which a vehicle travels forwards towards an adult pedestrian walking in the same direction in front of the vehicle where the vehicle strikes the pedestrian at 50% of the vehicle's width when no braking action is applied.

Car-to-Bicyclist Nearside Adult 50% (CBNA-50) – a collision in which a vehicle travels forwards towards a bicyclist crossing its path cycling from the nearside and the frontal structure of the vehicle strikes the bicyclist when no braking action is applied.

Car-to-Bicyclist Longitudinal Adult 25% (CBLA-25) – a collision in which a vehicle travels forwards towards a bicyclist cycling in the same direction in front of the vehicle where the vehicle would strike the cyclist at 25% of the vehicle's width when no braking action is applied or an evasive steering action is initiated after an FCW.

Car-to-Bicyclist Longitudinal Adult 50% (CBLA-50) – a collision in which a vehicle travels forwards towards a bicyclist cycling in the same direction in front of the vehicle where the vehicle would strike the cyclist at 25% of the vehicle's width when no braking action is applied.

Vehicle under test (VUT) – means the vehicle tested according to this protocol with a pre-crash collision mitigation or avoidance system on board

Euro NCAP Pedestrian Target (EPTa) – means the adult pedestrian target used in this protocol as specified in the Articulated Pedestrian Target Specification document version 2.0.

Euro NCAP Child Target (EPTc) – means the child pedestrian target used in this protocol as specified in the Articulated Pedestrian Target Specification document version 2.0.

Euro NCAP Bicyclist and bike Target (EBT) – means the bicyclist and bike target used in this protocol as specified in the Bicyclist Target Specification document version 1.0.

Time To Collision (TTC) – means the remaining time before the VUT strikes the EPT, assuming that the VUT and EPT would continue to travel with the speed it is travelling.

T_{AEB} – means the time where the AEB system activates. Activation time is determined by identifying the last data point where the filtered acceleration signal is below -1 m/s^2, and then going back to the point in time where the acceleration first crossed -0.3 m/s^2

T_{FCW} – means the time where the audible warning of the FCW starts. The starting point is determined by audible recognition.

Vimpact – means the speed at which the profiled line around the front end of the VUT coincides with the square box around the EPTa, EPTc and EBT.

1.3 Criteria and Scoring

To be eligible for scoring points in AEB Pedestrian or AEB Cyclist, the AEB system must be default ON at the start of every journey. It may not be possible to switch off the system with a single push on a button.

For AEB Pedestrian, the system needs to operate (i.e. warn or brake) from speeds of 10 km/h in the CPNA-75 scenario in both day and night. In addition, the system must be able to detect pedestrians walking as slow as 3 km/h and reduce speed in the CPNA-75 scenario at 20 km/h, also for both day and night.

For both AEB Pedestrian as for AEB Bicyclists, the system may also not automatically switch off at a speed below 80 km/h.

The total score is also conditional to the subsystem test score, see section 1.4.

1.3.1 Autonomous Emergency Braking (AEB)

For the AEB system tests, the assessment criteria used is the (relative) impact speed. For test speeds up to 40 km/h, the available points per test speed are awarded based on the relative speed reduction achieved. Where there is no full avoidance a linear interpolation is applied to calculate the score for every single test speed.

$$Score_{\ test\ speed} = ((Vrel\_test - Vrel\_impact)/Vrel\_test) \times points_{test\ speed}$$

Where:

v_{rel_test} Theoretical relative test speed
v_{rel_impact} Measured relative impact speed

For test speeds above 40km/h points are available on a pass/fail basis. For each of these test speeds points are awarded when a speed reduction of at least 20 km/h is achieved related to the actual measured test speed.

1.3.2 Forward Collision Warning (FCW)

For the FCW system tests in the longitudinal scenarios, the assessment criteria used is the Time-To-Collision (TTC). The available points per test speed are awarded when the warning is issued at a TTC >= 1.70s.

1.4 Scoring and Visualisation

AEB Pedestrian scoring is conditional to the total points achieved in subsystem tests, i.e. the sum of pedestrian Headform, Upper Legform & Lower Legform scores:

- If the subsystem total test score is lower than 22 points, no points are available for AEB Pedestrian, regardless whether the system is fitted and would achieve a good score.

1.4.1 AEB Pedestrian

A maximum of 6 points is available for AEB Pedestrian, 3 points for daytime performance (all scenarios) and 3 points for performance at night conditions (CPNA-25, CPNA-75, CPLA-25 and CPLA-50).

For each scenario a normalised score is calculated which are averaged and multiplied with the available 3 points available for day and night conditions.

The following points are available for the different test speeds in each AEB Pedestrian scenario for both day and night conditions:

Test speed	CPFA-50	CPNA-25		CPNA-75		CPNC-50	CPLA-50	CPLA-25
	Day	Day	Night	Day	Night	Day	Day & Night	
20 km/h	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
25 km/h	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
30 km/h	2.000	2.000	1.000	2.000	1.000	2.000	1.000	
35 km/h	3.000	3.000	2.000	3.000	2.000	3.000	2.000	
40 km/h	3.000	3.000	2.000	3.000	2.000	3.000	2.000	
45 km/h	3.000	3.000	3.000	3.000	3.000	3.000	3.000	
50 km/h	2.000	2.000	3.000	2.000	3.000	2.000	3.000	3.000
55 km/h	2.000	2.000	3.000	2.000	3.000	2.000	3.000	3.000
60 km/h	1.000	1.000	2.000	1.000	2.000	1.000	2.000	2.000
65 km/h								1.000
70 km/h								1.000
75 km/h								1.000
80 km/h								1.000
Total	**18.000**	**18.000**	**18.000**	**18.000**	**18.000**	**18.000**	**30.000**	

1.4.1.1 AEB Pedestrian Scoring Example

Scenario	Daytime		Night-time	
CPFA-50	16.02	89.0%		
CPNA-25	18.00	100.0%	14.93	82.9%
CPNA-75	18.00	100.0%	15.84	88.0%
CPNC-50	14.94	83.0%		
CPLA	22.50	75.0%	24.00	80.0%
TOTAL	**89.4 % or 2.682 points**		**83.6 % or 2.509 points**	

Total AEB Pedestrian Score = 2.682 + 2.509 = 5.191 points

1.4.2 AEB Cyclist

A maximum of 6 points is available for AEB Cyclist. For both scenarios a normalised score is calculated which are averaged and multiplied with the available 6 points.

The following points are available for the different test speeds in each AEB Pedestrian scenario:

Test speed	CBNA	CBLA	
20 km/h	1.000		
25 km/h	1.000	1.000	
30 km/h	1.000	1.000	
35 km/h	1.000	2.000	
40 km/h	1.000	2.000	
45 km/h	1.000	3.000	
50 km/h	1.000	3.000	3.000
55 km/h	1.000	3.000	3.000
60 km/h	1.000	1.000	1.000
65 km/h			1.000
70 km/h			1.000
75 km/h			1.000
80 km/h			1.000
Total	**9.000**	**27.000**	

1.4.2.1 AEB Cyclist Scoring example

Test results in CBLA scenario:

Vtest	$points_{test\ speed}$		Vimpact		$Score_{test\ speed}$	
	AEB	**FCW**	**AEB**	**FCW**	**AEB**	**FCW**
25 km/h	1.000		0 km/h		1.000	
30 km/h	1.000		0 km/h		1.000	
35 km/h	2.000		0 km/h		2.000	
40 km/h	2.000		20 km/h		1.000	
45 km/h	3.000		25 km/h		3.000	
50 km/h	3.000	3.000	30 km/h	2.28s TTC	3.000	3.000
55 km/h	3.000	3.000	40 km/h	2.01s TTC	0.000	3.000
60 km/h	1.000	1.000	Not tested	1.71s TTC	0.000	1.000
65 km/h		1.000		1.70s TTC		1.000
70 km/h		1.000		1.69s TTC		0.000
75 km/h		1.000		1.41s TTC		0.000
80 km/h		1.000		1.43s TTC		0.000
Total	**27.000**				**19.000**	
Normalised score					**70.3%**	

AEB Cyclist (assumed normalized scores for this example)

- Normalized score in CBNA scenario: **45.7%**
- Normalized score in CBLA scenario: **70.3%**

Total **58.0%**

AEB Cyclist total score = 6.0 x 58.0%
= **3.480 points**

1.4.3 Visualisation

The AEB Pedestrian and AEB Cyclist scores are presented separately using a coloured top view of the different scenarios; adult crossing, child crossing and longitudinal (where applicable). The colours used are based on the scenario scores respectively, rounded to three decimal places.

Colour	**Verdict**	**Applied to Total Score**	**Applied to Scenario**
Green	‘Good’	4.501 - 6.000 points	75.0% - 100.0%
Yellow	‘Adequate’	3.001 - 4.500 points	50.0% - 75.0%
Orange	‘Marginal’	1.501 - 3.000 points	25.0% - 50.0%
Brown	‘Weak’	0.001 - 1.500 points	00.0% - 25.0%
Red	‘Poor’	0.000 points	00.0%