AEB TEST PROCEDURES

AUTONOMOUS EMERGENCY BRAKING

AEB Group
VEHICLE AND TECHNOLOGY DEVELOPMENTS REDUCE CRASHES

Real World Relative Risk

- Euro NCAP is working; 5 star cars are a lower risk in the real world
- 90% of crashes have some element of driver error
- Many due to distraction
- Advanced Driver Assistance Systems (ADAS) aim to support the driver if an error is made
- ADAS could help to reduce crashes

Real world risk study by Folksam, 2011
ADVANCED DRIVER ASSISTANCE SYSTEMS

ADAS

- ESC is an established life saver
- Other ADAS systems show potential

- ESC saves lives; an ESC equipped vehicle is 25% less likely to be involved in a serious or fatal crash in the UK
- Material damage claims show 15% reduction with ESC
AUTONOMOUS EMERGENCY BRAKING

AEB

Car-to-Car Rear (CCR)  Car-to-Pedestrian (CP)

• Forward looking sensors (RADAR, LIDAR, Camera)
• System detects an imminent collision
• Some systems issue driver warnings (acoustic, visual, haptic)
• Automatic application of the brakes if driver is unresponsive or distracted
PERSONAL INJURY AND DAMAGE SAVINGS

- Estimates based on ABI (Association of British Insurers) motor claims statistics
- Estimates project crashes forward to 2018
- Model of AEB fitment in the UK fleet is estimated based on ESC fitment rates
- Savings are estimated based on the IIHS study of XC60 effectiveness of City Safety
- Personal Injury (PI) and damage crashes combined
- Approximately 800,000 crashes could be saved in period 2012 to 2018

![AEB systems market penetration](image1)

![Potential Personal Injury and Damage Crash Reduction with AEB](image2)
“To design and implement test procedures reflecting real world data that can encourage the development of autonomous braking technology that can help prevent or mitigate the effects of car-to-pedestrian and car-to-car crashes”

- Incorporate provisional results from real world accident data to define test conditions
- Define and specify test measurement equipment
- Define test metrics and rating process
- Publish initial results/ratings to inform consumers/stakeholders of technology capability
- Integrate into existing consumer test programs (RCAR)
- Offer to Euro NCAP P-NCAP for consideration for future test program
• Low speed crashes below 50km/h
• Addresses most common traffic shunts
• Prevents whiplash injuries
• Crashes into stationary vehicles

• AEB systems operational at low speeds
  • Avoidance or mitigation
• Low speed systems currently available:
  • Ford Focus, many Volvos
  • VW Passat, Touareg,
• Expected launches:
  • Mazda CX5, Fiat Panda, VW UP
• Also other AEB systems operate into low speed ranges
  • Mercedes
AEB SYSTEMS

URBAN

- Crashes generally higher speeds >20km/h
- Dual carriageway and motorways
- Can help to mitigate the more severe damage and injuries

- AEB systems can provide warning and autobrake for avoidance and crash mitigation
- Systems available from Honda, Mercedes, Volvo for example
AEB SYSTEMS

PEDESTRIAN

- Low-medium speed crashes <60km/h
- Addresses pedestrian collisions with high risk of severe and fatal injury
- AEB systems can provide warning and autobrake for avoidance and crash mitigation
- Examples from Volvo and Subaru

Volvo: Pedestrian Detection
### AEB SYSTEMS

#### TYPICAL SPEED RANGES & SENSORS

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>Speed (km/h)</th>
<th>Typical Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>0-20</td>
<td>75% crashes are under 20mph (1)</td>
</tr>
<tr>
<td>Urban</td>
<td>0-80</td>
<td>26% of crashes are front into rear (2)</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>0-120</td>
<td>6,000 pedestrian fatalities &amp; serious injuries in UK (3)</td>
</tr>
</tbody>
</table>

1) Study by Volvo of US real world data: NASS and STO
2) Study by Thatcham of UK real world insurance claims
3) UK Department for Transport statistics
CRASH TYPES BEING ADDRESSED BY AEB

- **CITY**: Low speed shunts, low injury risk, high volume
- **URBAN**: Higher risk of injury, lower volume
- **PEDESTRIAN**: Much higher injury risk, but much smaller volume of crashes
AEB SYSTEMS

CRASH TYPES BEING ADDRESSED BY AEB

- CITY: Low speed shunts, low injury risk, high volume
- URBAN: Higher risk of injury, lower volume
- PEDESTRIAN: Much higher injury risk, but much smaller volume of crashes
CITY SAFETY REDUCES CLAIMS IN THE REAL WORLD

- Study of US insurance claims by Insurance Institute for Highway Safety (IIHS)
- 260 Volvo XC60 claims
- Comparison against other similar 4x4s
- Comparison against other Volvos (to isolate any Volvo brand effect)

<table>
<thead>
<tr>
<th>Claim</th>
<th>Frequency</th>
<th>Severity</th>
<th>Overall Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs. other similar 4x4s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third party damage</td>
<td>-27%</td>
<td>+$270</td>
<td>-$17</td>
</tr>
<tr>
<td>Third party injury</td>
<td>-51%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>First party damage</td>
<td>-22%</td>
<td>-$517</td>
<td>-$98</td>
</tr>
</tbody>
</table>

- Published study in Status Report, Vol 46, No 6, July 2011
REAL WORLD DATA

SUMMARY OF REAL WORLD STUDIES: CITY SAFETY

IIHS City Safety:
- Third party damage: -27%
- Third party injury: -51%

IIHS City Safety:
- First party damage: -22%

UDV Germany:
- Third party claims frequency (provisional): -9%

Switzerland:
- Third party damage: -31%

Average: -27%

Percentage change in claims (negative = reduction)

All crashes

Rear-ends only
LOUGHBOROUGH STUDY OF ALL UK CRASHES

Unique in-depth study commissioned by Thatcham investigating real world crashes and their causation factors to formulate realistic test scenarios that drive AEB functionalities suitable for Euro NCAP and Insurers

Aim for 4-6 clusters
≥75% of cases

REPORT AVAILABLE AT: www.thatcham.org/AEB

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**Example Cluster 1**

- 30% of cases
- Lower speeds
- At junction
- Daylight
- Fine weather
- Veh A going ahead
- Veh B stop/starting
- Following traffic
REAL WORLD DATA

INITIAL SPEEDS AT START OF COLLISION

**EDR data – AXA Switzerland**

- Initial speed prior to braking was below 50km/h for 78% of cases

**Delta-V**

- 93% of all accidents had a delta-v of less than 20km/h

**OTS case reconstructions – UK**

- Initial speed prior to braking was below 60km/h for majority of cases
REAL WORLD DATA

BRAKING LEVELS DURING COLLISION

OTS case reconstructions – UK

86% of drivers braked before the accident

Majority of drivers did not brake hard enough

EDR data – AXA Switzerland

86% of drivers braked before the accident

Mean braking in CCR crashes

Majority of drivers did not brake hard enough
REAL WORLD DATA

UK ACCIDENT CLUSTERS:
WIDE VARIETY OF ACCIDENT TYPES

- Junction, static target
- Roundabout, static target
- Junction, both cars turning
- Going ahead, dark
- Roundabout, both cars turning
- Roundabout, static target, dark
- Static target
- Moving target
- Slowing target

- Unobstructed near side, walking child
- Obstructed near side, walking child
- Unobstructed near side, walking adult, dark
- Unobstructed far side, running adult, dark
- Near side walking adult, turning car
- Adult walking along road, dark
- Unobstructed near side, running child
- Obstructed near side, running child
- Near side walking adult, turning car, dark
- Unobstructed far side, walking adult, dark
- Far side running child, turning car
- Unobstructed near side, running child
REAL WORLD DATA

UK ACCIDENT CLUSTERS: WIDE VARIETY OF ACCIDENT TYPES

<table>
<thead>
<tr>
<th>Car to Car Rear</th>
<th>OTS</th>
<th>STATS 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static target</td>
<td>Junction, static target</td>
<td>Roundabout, static target</td>
</tr>
<tr>
<td>Moving target</td>
<td>Slowing target</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Car to Pedestrian</th>
<th>OTS</th>
<th>STATS 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car to Pedestrian</td>
<td>OTS</td>
<td></td>
</tr>
<tr>
<td>Unobstructed near side, walking child</td>
<td>Obstructed near side, walking child</td>
<td></td>
</tr>
<tr>
<td>Unobstructed far side, running adult, dark</td>
<td>Near side walking adult, turning car</td>
<td>Adult walking along road, dark</td>
</tr>
</tbody>
</table>

Too many scenarios to be feasible for testing, so select scenarios based on real world frequency
### Test Scenarios Selected to Represent Greatest Frequency of Real World Crashes

<table>
<thead>
<tr>
<th>Scenario</th>
<th>UK</th>
<th>UK</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car drives into stationary vehicle</td>
<td>61%</td>
<td>56%</td>
<td>52%</td>
</tr>
<tr>
<td>Car drives into slower moving vehicle</td>
<td>30%</td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>Car drives into braking vehicle</td>
<td>14%</td>
<td></td>
<td>6%</td>
</tr>
</tbody>
</table>

In addition to real world data scenarios are also selected using engineering judgements. CCR 2 is situation noted from track testing where some AEB systems appear to fail. This scenario is under investigation, not yet tested due to limitation of 3D appearance of target.
REAL WORLD DATA

TEST SCENARIOS ALSO SELECTED ACCORDING TO ENGINEERING CONSIDERATIONS

• Detail test scenario selected due to international road layout knowledge
• CCR 2 is situation noted from track testing where some AEB performance is lower
• Scenario also relates to real world conditions
• Angles 0, 15, 30 & 45 degrees
• Test car following along the same curved path as the target
• Scenario is under investigation, but requires 3D target
#### REAL WORLD DATA

#### TEST SCENARIOS SELECTED TO REPRESENT GREATEST FREQUENCY OF REAL WORLD CRASHES

<table>
<thead>
<tr>
<th>Pedestrian Action</th>
<th>UK</th>
<th>UK</th>
<th>Germany</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian walks from nearside</td>
<td>51%</td>
<td>59%</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>Pedestrian walks out from behind obstruction</td>
<td>14%</td>
<td>7%</td>
<td>27%</td>
<td></td>
</tr>
<tr>
<td>Pedestrian runs out from the far side</td>
<td>9%</td>
<td>37%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>Pedestrian walks along in the dark</td>
<td>3%</td>
<td>5%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>Pedestrian walks out into the path of turning car</td>
<td>6%</td>
<td>Overall: going ahead 87%, Turning 13%</td>
<td>18%</td>
<td>-</td>
</tr>
</tbody>
</table>

Darkness scenarios are not yet tested, but closest possible scenario is under investigation. For example CP4 is tested as stationary pedestrian, but not in darkness.
REAL WORLD DATA

TEST SCENARIOS SELECTED FOR GREATEST FREQUENCY OF REAL WORLD CRASHES

<table>
<thead>
<tr>
<th>Combining accident data from other international sources</th>
<th>UK</th>
<th>UK</th>
<th>Germany</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATS 19 n=10,574 cluster analysis frontal collisions</td>
<td>3%</td>
<td>5%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>OTS n=175 cluster analysis frontal collisions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UDV n=234 (N=18,571) 3rd party vehicle claims 2002-2006 frontal collisions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IIHS 1997-2006 FARS &amp; GES all car-pedestrians</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Darkness scenarios are not yet tested, but closest possible scenario is under investigation
- For example CP4 is tested as stationary pedestrian, but not in darkness
- Currently only assessing the warning capability of the systems, not assessing for autobraking

- Darkness represents low frequency from all crashes; but high fatalities:

![Diagram showing non-fatal and fatal collisions in daylight, dark, and partial dark conditions](Image)
WHAT TARGET?

COMPARISON OF DIFFERENT TEST TARGETS

RADAR and Camera Systems

- Car
- Assessor - Tyres
- Assessor - Ground
- Balloon Car
- Rabbit & Assessor
- Rabbit & Suzuki
- ABsessor
- Adult
- Pedestrian target

Rabbit (Landrover Discovery with radar shielding) is not acquired as a target by the system
### Car & Pedestrian Test Targets

#### Comparison at Approach Speed ≈ 20km/h

<table>
<thead>
<tr>
<th>Target</th>
<th>Avoidance distance m</th>
<th>Distance from target m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golf</td>
<td></td>
<td>60.2</td>
</tr>
<tr>
<td>Balloon Car</td>
<td>2.7</td>
<td>52.5</td>
</tr>
<tr>
<td>Assessor</td>
<td>0.8</td>
<td>15.7</td>
</tr>
<tr>
<td>Assessor tyres</td>
<td>0.8</td>
<td>22.7</td>
</tr>
<tr>
<td>Rabbit &amp; Assessor</td>
<td>1.2</td>
<td>64.4</td>
</tr>
<tr>
<td>Rabbit &amp; Suzuki</td>
<td>1.7</td>
<td>50.6</td>
</tr>
<tr>
<td>ABsessor</td>
<td>1.5</td>
<td>78.8</td>
</tr>
<tr>
<td>Walking Man Target</td>
<td>1.5</td>
<td>7.8</td>
</tr>
<tr>
<td>Adult walking</td>
<td></td>
<td>20.7</td>
</tr>
</tbody>
</table>

- System outputs confidence level of an object based on radar and visual attributes
- Scored on a scale of 0-5 with 5 being the higher confidence (green)
- Score of 0 indicates insufficient visual detail to confirm the object (red)
WHAT TARGET?

CITY: CAR TO STATIONARY CAR

- Target identification based on RADAR and Camera sensors

ROAD

Approx 60 km/h

Target identified at 63m *

TRACK

20 km/h

Target identified at 76m

- Target was identified earlier at 180m (RADAR range is approx 190m), but the match with the camera was a low confidence level
WHAT TARGET?

TRACK: TARGET COMPARISON

REAL CAR
20 km/h
Target identified at 64m

CAR TARGET
20 km/h
Target identified at 66m
WHAT TARGET?

TARGETS UNDER DEVELOPMENT INTERNATIONALLY

- Future:
  - Considering remote controlled targets for car and pedestrian
  - Working with Harmonisation Platforms - developing latest generation of European ASSESSOR target or soft crash car.
CAR-TO-CAR REAR

CCR AEB TEST PROCEDURES

CCR1: CITY < 50km/h; URBAN > 30km/h
- Approaching a stopped vehicle at test speeds from 10 to 60km/h
- Speed increased in 10km/h increments if system avoids collision with car target
- Speed in 5km/h increments to identify collision point

CCR2: CITY
- 10km/h following a curved path behind the target car stationary at junction
- Target car at a range of angles 0, 15, 30, 45 degrees

CCR3: URBAN
- Approaching a moving target at 20km/h
- Speed starting at 60km/h and increased in 10km/h increments up to 80km/h if system avoids collision with car target
- Speed in 5km/h increments to identify collision point

CCR4: URBAN
- Approaching a decelerating target, both initially moving at 50km/h
- Target car: initial headway 12m, target deceleration at 2 and 6 m/s²
- Target car: initial headway 40m, target deceleration at 2 and 6 m/s²

Note that CCR2 is currently under development
CCR AEB TEST PROCEDURES

**CCR1: CITY < 50km/h; URBAN >30km/h**
- Approaching a stopped vehicle at test speeds from 10 to 60km/h
- Speed increased in 10km/h increments if system avoids collision with car target
- Speed in 5km/h increments to identify collision point

**CCR2: CITY**
- 10km/h following a curved path behind the target car stationary at junction
- Target car at a range of angles 0, 15, 30, 45 degrees

**CCR3: URBAN**
- Approaching a moving target at 20km/h
- Speed starting at 60km/h and increased in 10km/h increments up to 80km/h if system avoids collision with car target
- Speed in 5km/h increments to identify collision point

**CCR4: URBAN**
- Approaching a decelerating target, both initially moving at 50km/h
- Target car: initial headway 12m, target deceleration at 2 and 6 m/s²
- Target car: initial headway 40m, target deceleration at 2 and 6 m/s²

Note that CCR2 is currently under development.
**CAR-TO-PEDESTRIAN**

**CP AEB TEST PROCEDURES**

**CP1**: Unobscured pedestrian walks out from nearside
- Test speeds from 10 to 60km/h
- Speed increased in 10km/h increments if system avoids collision
- Speed in 5km/h increments to identify collision point

**CP2**: Obscured pedestrian walks out from nearside
- Test speeds from 10 to 60km/h
- Speed increased in 10km/h increments if system avoids collision
- Speed in 5km/h increments to identify collision point

**CP3**: Unobscured pedestrian runs out in front of car from far side
- Test speeds from 40 to 60km/h
- Speed increased in 10km/h increments if system avoids collision
- Speed in 5km/h increments to identify collision point

**CP4**: Pedestrian walking along the road at night
- Test speeds 50km/h and 70km/h

**CP5**: Car turns at junction and pedestrian walks out
- Test speeds 15km/h and 25km/h

Note that CP4 is currently not being tested in darkness, but a stationary target is being used to give initial investigation of the test scenario.
CP5 is currently under investigation.
CAR-TO-PEDESTRIAN

CP AEB TEST PROCEDURES

CP1: Unobscured pedestrian walks out from nearside
   - Test speeds from 10 to 60km/h
   - Speed increased in 10km/h increments if system avoids collision
   - Speed in 5km/h increments to identify collision point

CP2: Obscured pedestrian walks out from nearside
   - Test speeds from 10 to 60km/h
   - Speed increased in 10km/h increments if system avoids collision
   - Speed in 5km/h increments to identify collision point

CP3: Unobscured pedestrian runs out in front of car from far side
   - Test speeds from 40 to 60km/h
   - Speed increased in 10km/h increments if system avoids collision
   - Speed in 5km/h increments to identify collision point

CP4: Pedestrian walking along the road at night
   - Test speeds 50km/h and 70km/h

CP5: Car turns at junction and pedestrian walks out
   - Test speeds 15km/h and 25km/h

Note that CP4 is currently not being tested in darkness, but a stationary target is being used to give initial investigation of the test scenario.
CP5 is currently under investigation.
**TEST FLOW**

**EXAMPLE TEST FLOW**

**CCR1:** Approaching a stopped vehicle at test speeds from 10 to 60km/h

1. Start at 10km/h
2. If no impact proceed in 10km/h increments
3. Once impact occurs, decrease speed by 5km/h to identify collision point
4. If no collision, proceed in 5km/h increments to identify collision point
5. Continue testing at 5km/h increments to identify mitigation and warning effects
6. Stop at 60km/h

- If no automatic braking triggered at speeds under 30km/h stop testing; either system not fitted or not functioning, so consult manufacturer

**Cover range of test speeds**

- Assess range of vehicle performance
- Collisions occur over a range of speeds in the real world
  - Testing represents real world
- Safety of test drivers
  - Start at low speed and build up is safer than first test at higher speeds
- Repeated runs are not a big time burden
  - Most time is spent on set up for different scenarios
Thatcham is currently using the following equipment:

<table>
<thead>
<tr>
<th>Test Car</th>
<th>Target Car</th>
<th>Target Pedestrian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Measurement</td>
<td></td>
</tr>
<tr>
<td>• Accelerator robot (ABD)</td>
<td>• Motion pack (OXTS)</td>
<td>• Motorised rig</td>
</tr>
<tr>
<td>• Steering robot (ABD)</td>
<td>• Including RT-Range system to measure relative</td>
<td></td>
</tr>
<tr>
<td>• GPS signal and base station (OXTS)</td>
<td>data between the test and target cars (OXTS)</td>
<td></td>
</tr>
<tr>
<td>Measurement</td>
<td>• Motion pack (OXTS)</td>
<td></td>
</tr>
<tr>
<td>• Car target</td>
<td>• Electronic switch to record contact time with</td>
<td></td>
</tr>
<tr>
<td>• Pedestrian target</td>
<td>target car</td>
<td></td>
</tr>
<tr>
<td>Obscuration vehicles (Landrover Freelander and Volkswagen Golf in matt black to give clear identification)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AEB test procedures under development to allow system performance relevant to insurers to be evaluated

Five different test vehicles have been selected that represent the different technical solutions currently available

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford Focus with Active City Stop</td>
<td>LIDAR</td>
</tr>
<tr>
<td>Honda CR-V with Collision Mitigation Braking System</td>
<td>RADAR</td>
</tr>
<tr>
<td>Mercedes CLS Class with Pre-Safe Brake</td>
<td>RADAR fusion</td>
</tr>
<tr>
<td>Subaru Outback with Eye Sight</td>
<td>Stereo camera</td>
</tr>
<tr>
<td>Volvo V60 with Collision Warning with Full Auto-Brake and Pedestrian Detection</td>
<td>Camera &amp; RADAR fusion</td>
</tr>
</tbody>
</table>
**EXAMPLE TEST SCENARIO – FORD FOCUS: CCR1**

**CCR1 CAR APPROACHING REAR OF STATIC TARGET 10 TO 60 KM/H**

**CCR1**: Approaching a stopped vehicle at test speeds from 10 to 60km/h

- Speed increased in 10km/h increments if system avoids collision with car target
- If impact occurs, run test at 5km/h lower
- Speed increased in 5km/h increments to establish collision point

**AVOIDANCE**
**EXAMPLE TEST SCENARIO – FORD FOCUS: CCR1**

**CCR1 CAR APPROACHING REAR OF STATIC TARGET**

**10 TO 60 KM/H**

**CCR1**: Approaching a stopped vehicle at test speeds from 10 to 60km/h
- Speed increased in 10km/h increments if system avoids collision with car target
- If impact occurs, run test at 5km/h lower
- Speed increased in 5km/h increments to establish collision point

**MITIGATION:**

Impact speed 12km/h
CCR1 CAR APPROACHING REAR OF STATIC TARGET
10 TO 60 KM/H

CCR1: Approaching a stopped vehicle at test speeds from 10 to 60km/h
- Speed increased in 10km/h increments if system avoids collision with car target
- If impact occurs, run test at 5km/h lower
- Speed increased in 5km/h increments to establish collision point

Beyond system limit

km/h: 10 15 20 25 30 35 40 45 50 55 60
EXAMPLE TEST SCENARIO – SUBARU OUTBACK: CCR3

CCR3 CAR APPROACHING REAR OF TARGET CAR MOVING SLOWER AT 20KM/H

CCR3: Approaching a target moving at 20km/h
• Speed starting at 60km/h and increased in 10km/h increments if system avoids collision with car target
• If impact occurs, run test at 5km/h lower
• Speed increased in 5km/h increments to establish collision point

Subaru Outback CCR3 70k | run 1

AVOIDANCE

km/h

55 60 65 70 75 80
**EXAMPLE TEST SCENARIO – SUBARU OUTBACK: CCR3**

**CCR3 CAR APPROACHING REAR OF TARGET CAR MOVING SLOWER AT 20KM/H**

**CCR3:** Approaching a target moving at 20km/h
- Speed starting at 60km/h and increased in 10km/h increments if system avoids collision with car target
- If impact occurs, run test at 5km/h lower
- Speed increased in 5km/h increments to establish collision point

**MITIGATION:**
**Impact speed 48km/h**
CCR 4: Approaching a decelerating target, both initially moving at 50km/h

- Headway has 2 conditions:
  - 12m or 40m
- Braking has 2 conditions:
  - 2m/s² (normal) or 6m/s² (emergency)
- Total 4 combinations

MITIGATION:
Impact speed 25km/h

40m headway with 2m/s² braking
**EXAMPLE TEST SCENARIO – VOLVO V60: CCR4**

**CCR4 CAR APPROACHING REAR OF DECELERATING CAR**

**CCR 4:** Approaching a decelerating target, both initially moving at 50km/h
- Headway has 2 conditions:
  - 12m or 40m
- Braking has 2 conditions:
  - 2m/s² (normal) or 6m/s² (emergency)
- Total 4 combinations

<table>
<thead>
<tr>
<th>Braking m/s²</th>
<th>Headway m</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Impact speed 24km/h**

**MITIGATION:**
40m headway with 6m/s² braking
**CCR4 CAR APPROACHING REAR OF DECELERATING CAR**

**CCR 4:** Approaching a decelerating target, both initially moving at 50km/h
- Headway has 2 conditions:
  - 12m or 40m
- Braking has 2 conditions:
  - 2m/s² (normal) or 6m/s² (emergency)
- Total 4 combinations

![Diagram showing braking and headway conditions]

**Volvo V60 CCR4 12m 2ms^-2 | run 2**

**AVOIDANCE**

12m headway with 2m/s² braking
EXAMPLE TEST SCENARIO – VOLVO V60: CCR4

CCR4 CAR APPROACHING REAR OF DECELERATING CAR

CCR 4: Approaching a decelerating target, both initially moving at 50km/h
- Headway has 2 conditions:
  12m or 40m
- Braking has 2 conditions:
  2m/s² (normal) or 6m/s² (emergency)
- Total 4 combinations

MITIGATION:
Impact speed 20km/h
12m headway with 6m/s² braking

Volvo V60 CCR4 12m 6ms⁻²-2 | run 2
EXAMPLE TEST SCENARIO – VOLVO V60: CP1

CP1 UNOBSCURED NEARSIDE PEDESTRIAN
10 TO 60 KM/H

**CP1**: Unobscured pedestrian walks out from nearside
- Test speeds 10km/h to 60km/h

AVOIDANCE

Volvo V60 CP1 10k | run 3
EXAMPLE TEST SCENARIO – VOLVO V60: CP1

CP1 UNOBSCURED NEARSIDE PEDESTRIAN
10 TO 60 KM/H

**CP1**: Unobscured pedestrian walks out from nearside
- Test speeds 10km/h to 60km/h

![Image of pedestrian walking out from nearside with a Volvo V60]

Volvo V60 CP1 30k | run 4

**AVOIDANCE**

<table>
<thead>
<tr>
<th>km/h</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
</tr>
</thead>
</table>
EXAMPLE TEST SCENARIO – VOLVO V60: CP1

CP1 UNOBSCURED NEARSIDE PEDESTRIAN
10 TO 60 KM/H

**CP1**: Unobscured pedestrian walks out from nearside
- Test speeds 10km/h to 60km/h

**MITIGATION**: Impact speed 24km/h

Volvo V60 CP1 50k | run 1

km/h...10 15 20 25 30 35 40 45 50 55 60
EXAMPLE TEST SCENARIO – VOLVO V60: CP2

CP2 OBSCURED NEARSIDE PEDESTRIAN
10 TO 60 KM/H

**CP2**: Obscured pedestrian walks out from nearside

- Test speeds 10km/h to 60km/h

Volvo V60 CP2 20k | run 1

AVOIDANCE
CP2 OBSCURED NEARSIDE PEDESTRIAN
10 TO 60 KM/H

CP2: Obscured pedestrian walks out from nearside
• Test speeds 10km/h to 60km/h
EXAMPLE TEST SCENARIO – VOLVO V60: CP2

CP2 OBSCURED NEARISIDE PEDESTRIAN
10 TO 60 KM/H

**CP2**: Obscured pedestrian walks out from nearside
- Test speeds 10km/h to 60km/h

MITIGATION: Impact speed 28km/h

Volvo V60 CP2 35k | run 1

km/h: 10 15 20 25 30 35 40 45 50 55 60
## Proposed Rating Scheme

### Full AEB Test Group Proposal

<table>
<thead>
<tr>
<th>Car-to-Car Rear (CCR)</th>
<th>Car-to-Pedestrian CP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CITY</strong></td>
<td></td>
</tr>
<tr>
<td>Stationary low speed</td>
<td>CP1</td>
</tr>
<tr>
<td>&lt;50km/h</td>
<td>Unobscured</td>
</tr>
<tr>
<td>(from CCR1)</td>
<td>nearside walking</td>
</tr>
<tr>
<td></td>
<td>pedestrian</td>
</tr>
<tr>
<td><strong>URBAN</strong></td>
<td></td>
</tr>
<tr>
<td>Stationary high</td>
<td>CP2</td>
</tr>
<tr>
<td>speed &gt;30km/h</td>
<td>Obscured walking</td>
</tr>
<tr>
<td>(from CCR1)</td>
<td>nearside pedestrian</td>
</tr>
<tr>
<td><strong>URBAN</strong></td>
<td></td>
</tr>
<tr>
<td>Moving</td>
<td>CP3</td>
</tr>
<tr>
<td>Target 20km/h</td>
<td>Unobscured</td>
</tr>
<tr>
<td>Test &gt;50km/h</td>
<td>running</td>
</tr>
<tr>
<td>(from CCR3)</td>
<td>farside pedestrian</td>
</tr>
<tr>
<td><strong>URBAN</strong></td>
<td></td>
</tr>
<tr>
<td>Braking</td>
<td></td>
</tr>
<tr>
<td>50km/h</td>
<td></td>
</tr>
<tr>
<td>(from CCR4)</td>
<td></td>
</tr>
</tbody>
</table>
PROPOSED RATING SCHEME

PROPOSAL TO INSURANCE GROUP RATING

Car-to-Car Rear (CCR)

- UK insurance group rating intends to recognise AEB during 2012
- RCAR P-Safe group is developing test procedures to support insurance group rating

CITY
Stationary low speed
<50km/h
(from CCR1)
**KEY RATING AREAS OF AEB SYSTEMS**

- Whether or not the collision was avoided
- The speed reduction prior to collision
- When (if present) a warning is given
- How an appropriate driver braking response at the time of warning (if present) could have affected the outcome

<table>
<thead>
<tr>
<th>AEB Avoidance</th>
<th>AEB Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braking avoids collision</td>
<td>Braking reduces speed of collision</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning so that driver can avoid or mitigate</td>
</tr>
</tbody>
</table>

- Following ratings schemes are proposals only, not a definite decision of the group
RATING SCHEME PROPOSALS

PHILOSOPHIES FOR RATINGS PROPOSALS

1. AEB fitment is to be encouraged
2. AEB Avoidance gains most points
3. AEB Mitigation also gains points if crash occurs
4. Warning systems also to receive points since they bring the driver back into the loop
5. Autonomous braking is to be encouraged in favour of warning systems, since driver response to a warning is difficult to predict
6. No credit given to warning only systems without any brake support (EBA)

<table>
<thead>
<tr>
<th>AEB Avoidance</th>
<th>AEB Mitigation</th>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braking avoids collision</td>
<td>Braking reduces speed of collision</td>
<td>Warning so that driver can avoid or mitigate</td>
</tr>
</tbody>
</table>
AEB POINTS SCORING

AEB AVOIDANCE POINTS

- AEB Avoidance points are scored per test increment
- Points added cumulatively for each test where target is avoided
- Perfect score = maximum points awarded
### AEB AVOIDANCE POINTS

#### PRINCIPLE OF CUMULATIVE AEB AVOIDANCE POINTS

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Increment Number</th>
<th>Available Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td>1</td>
</tr>
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<td>25</td>
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<td>1</td>
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<td>30</td>
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<td>1</td>
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<td>35</td>
<td>6</td>
<td>1</td>
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<td>40</td>
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<td>45</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9 increments</strong></td>
<td><strong>9 points</strong></td>
</tr>
</tbody>
</table>

- Range of test speeds
- Each test speeds represents an increment
- Total number of test speeds = total number of increments
- Available points for each increment = 1

AEB Avoidance at all test speeds = maximum 9 points awarded
# AEB AVOIDANCE POINTS

## PRINCIPLE OF CUMULATIVE AEB AVOIDANCE POINTS

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Available Points</th>
<th>Example Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
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<td>1</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9 increments</strong></td>
<td><strong>5 points</strong></td>
</tr>
</tbody>
</table>

No restriction on speed range where points can be accumulated.
AEB POINTS SCORING

AEB MITIGATION POINTS

• AEB Avoidance points are scored per test increment
• Points added cumulatively for each test where target is avoided
• Perfect score = maximum points awarded

• For any speed where the target is not avoided, then points are available for AEB Mitigation and Warnings

• AEB Mitigation points are available per test increment
• Points scored are scaled according to the level of mitigation achieved
• Points added cumulatively for each test where impact is mitigated
• Scaled to 50% of point per increment
### AEB Mitigation Points

#### Principle of Cumulative AEB Mitigation Points

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Avoid</th>
<th>Mitigate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Avoid</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Avoid</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Avoid</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Avoid</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Avoid</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Avoid</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Avoid</td>
<td>Mitigate</td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Each test speed where there is no avoidance, points are available for AEB mitigation and warning.
- Points scored are scaled according to the speed reduction achieved.

AEB Mitigation score is scaled to 50% (x 0.5)

Available points, not scored

Speed reduced from 45km down to 15km/h, so 2/3 of available point is scored.
AEB POINTS SCORING

WARNING POINTS

- AEB Avoidance points are scored per test increment
- Points added cumulatively for each test where target is avoided
- Perfect score = maximum points awarded

- For any speed where the target is not avoided, then points are available for AEB Mitigation and Warnings

- AEB Mitigation points are available per test increment
- Points scored are scaled according to the level of mitigation achieved
- Points added cumulatively for each test where impact is mitigated
- Scaled to 50% of point per increment

- Warning points are available per test increment if the driver response could be more effective than the AEB braking
- Points scored are scaled according to the level of mitigation achieved
- Points added cumulatively for each test where impact is mitigated/avoided
- Scaled to 50% of point per increment
**WARNINGS**

**DRIVER RESPONSE TO WARNINGS: SUBARU OUTBACK**

**Warning points**
If a driver responding to warning could:
- Avoid the crash
- Or mitigate crash severity more than the AEB system

- Is calculated driver response to warning early enough to avoid or mitigate the impact?

**Current:** Post processing data
1. Test run toward target, including record of warning time
2. Additional run to record driver emergency braking (not AEB system)
3. Apply data trace of driver emergency braking at time of warning, with 1 second reaction time delay

**Future:** Warning will be represented by automatic robot braking in test vehicle in response to warning

**Assumptions:**
- 1 second reaction time
- Maximum vehicle braking applied
### WARNING POINTS

#### PRINCIPLE OF ACCRUING WARNING POINTS

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Avoid</th>
<th>Mitigate</th>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Mitigate</td>
<td>Warning</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Mitigate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Points also available for Warnings that can help the driver to avoid or to mitigate the crash more than the AEB system.
- Points scored are scaled according to the speed reduction achieved.

- AEB Mitigation score is scaled to 50%
- Speed reduced from 45km down to 15km/h, so 2/3 of available point is scored.

Available points, not scored.
AEB SYSTEMS

CRASH TYPES BEING ADDRESSED BY AEB

- CITY: Weighted for high frequency at low speeds
- URBAN: Weighted for high severity and risk at higher speeds
CCR CITY: STATIONARY LOW SPEED
PERFECT CAR – AVOIDANCE AT ALL SPEEDS

Results taken from CCR1 test runs

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
</tr>
</tbody>
</table>

<20km/h: Points only awarded for complete avoidance

Low speed points are double weighted according to crash frequency

Avoidance by AEB system at all test speeds = 14 points

No credit given for warnings in CITY Stationary Low Speed score
EXAMPLE POINTS SCORE: URBAN

CCR URBAN: STATIONARY HIGH SPEED
PERFECT CAR – AVOIDANCE AT ALL SPEEDS

Results taken from CCR1 test runs

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>55</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>2</td>
</tr>
</tbody>
</table>

High speed points are double weighted according to crash severity

AEB Mitigation 50%

If impact speed is reduced by AEB system then additional points are awarded

Warning points 50%

If driver braking in response to warning is calculated to be more effective than AEB braking then additional points are awarded

AEB Avoidance Points

Avoidance by AEB system at all test speeds = 9 points

Total Points
EXAMPLE POINTS SCORE: URBAN

CCR URBAN: MOVING
PERFECT CAR – AVOIDANCE AT ALL SPEEDS

Results taken from CCR3 test runs

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>1</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
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<tr>
<td>65</td>
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</tr>
<tr>
<td>70</td>
<td>1</td>
</tr>
<tr>
<td>75</td>
<td>2</td>
</tr>
<tr>
<td>80</td>
<td>2</td>
</tr>
</tbody>
</table>

High speed points are double weighted according to crash severity

AEB Mitigation 50%
Warning points 50%

AEB Avoidance Points

Avoidance by AEB system at all test speeds = 8 point

Calculated in same way as CCR Urban Stationary High Speed, but points are scaled according to different test speeds / increments
EXAMPLE POINTS SCORE: URBAN

CCR URBAN: BRAKING
PERFECT CAR – AVOIDANCE AT ALL SPEEDS

Results taken from CCR4 test runs

<table>
<thead>
<tr>
<th>Test Condition</th>
<th>Basic Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>40m, 2m/s²</td>
<td>1</td>
</tr>
<tr>
<td>40m, 6m/s²</td>
<td>2</td>
</tr>
<tr>
<td>12m, 2m/s²</td>
<td>2</td>
</tr>
<tr>
<td>12m, 6m/s²</td>
<td>5</td>
</tr>
</tbody>
</table>

Shorter headway and harsher braking is awarded greater points because it is a more challenging situation

AEB Mitigation 50%
Warning points 50%

Avoidance by AEB system at all test speeds = 10 points

Total Points
EXAMPLE POINTS SCORE: PEDESTRIAN

CP1: UNOBSCURED NEAR SIDE
PERFECT CAR – AVOIDANCE AT ALL SPEEDS

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
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<tr>
<td>35</td>
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<td>45</td>
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<td>50</td>
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</tr>
<tr>
<td>55</td>
<td>3</td>
</tr>
<tr>
<td>60</td>
<td>3</td>
</tr>
</tbody>
</table>

Points awarded for complete avoidance only

AEB Mitigation 50%
Warning points 50%

Over 40km/h, the impact speed must be reduced to <40km/h in order for points to be awarded; Impact speed >40km/h = 0 points

AEB Avoidance Points

Avoidance by AEB system at all test speeds = 17 points
High speeds are awarded higher points according to crash severity

Total Points
EXAMPLE POINTS SCORE: PEDESTRIAN

CP1 UNOBSCURED NEAR SIDE
EXAMPLE CAR – HIGH SPEED NO SCORE MITIGATION

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Weighting</th>
<th>Avoidance Points</th>
<th>Impact Speed Mitigation</th>
<th>Mitigation Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1</td>
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<td>50</td>
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<td>55</td>
<td>3</td>
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<td></td>
</tr>
<tr>
<td>60</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• AEB Mitigation points scored because impact speed is ≤40 km/h

• AEB Mitigation points are not scored because impact speed is >40 km/h

Warning points are also available; scored the same way as Mitigation points
### EXAMPLE POINTS SCORE: PEDESTRIAN

**CP1 UNOBSCURED NEARSIDE EXAMPLE CAR – HIGH SPEED SCORE FOR MITIGATION**

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Weighting</th>
<th>Avoidance Points</th>
<th>Impact Speed</th>
<th>Mitigation</th>
<th>Mitigation Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
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<td></td>
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<tr>
<td>20</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
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<td>24</td>
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<tr>
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<td>3</td>
<td></td>
<td>36</td>
<td>24</td>
<td>0.600</td>
</tr>
</tbody>
</table>

- **AEB Mitigation** points scored because impact speed is ≤40 km/h
- Higher weighting for high speeds, so greater points gained by reducing high speeds to ≤40km/h

Warning points are also available; scored the same way as Mitigation points.

Available points, not scored.
## Example Points Score: Pedestrian

### CP2: Obscured Nearest Car – Avoidance at All Speeds

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>10</td>
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<tr>
<td>15</td>
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<tr>
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<td>2</td>
</tr>
<tr>
<td>55</td>
<td>3</td>
</tr>
<tr>
<td>60</td>
<td>3</td>
</tr>
</tbody>
</table>

Points awarded for complete avoidance only

AEB Mitigation 50%

Warning points 50%

Over 40km/h, the impact speed must be reduced to <40km/h in order for points to be awarded; Impact speed >40km/h = 0 points

- AEB Avoidance Points
  - Avoidance by AEB system at all test speeds = 17 points
  - High speeds are awarded higher points according to crash severity

Total Points

Number of increments
### Example Points Score: Pedestrian

**CP3: Unobscured Farside Perfect Car – Avoidance at All Speeds**

<table>
<thead>
<tr>
<th>Test Speed</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
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</tr>
<tr>
<td>45</td>
<td>2</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
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<tr>
<td>55</td>
<td>3</td>
</tr>
<tr>
<td>60</td>
<td>3</td>
</tr>
</tbody>
</table>

- **AEB Mitigation 50%**
- **Warning Points 50%**

Over 40km/h, the impact speed must be reduced to <40km/h in order for points to be awarded; Impact speed >40km/h = 0 points.

High speeds are awarded higher points according to crash severity.

Avoidance by AEB system at all test speeds = 17 points.
CONCLUSION

- **Active Safety** – The ability to avoid a crash in the first place; the future of crash safety
- **ADAS** – Advance Driver Assistance Systems offer huge potential benefits
- **AEB** – Autonomous Emergency Braking; appears to be the most important and significant
- Real world data shows current generation systems are reducing crashes by 27% (Volvo)
- Next generation of systems will offer bigger potential with most manufacturers introducing systems
- Not all systems perform the same; some more relevant for low speed crash and capable of directly addressing whiplash
- Need for performance tests to measure system efficacy
- **AEB** tests under development using real world crash scenarios; designed to measure system performance and relevance
- Test procedures will be proposed to Euro NCAP for consideration as the basis of new test procedures to be introduced by 2014; to address car to car rear and car to pedestrian injuries
- UK insurance group rating intends to recognise AEB during 2012
- **RCAR P-Safe** group is developing test procedures to support insurance group rating

www.thatcham.org/AEB
AEB TEST PROCEDURES

AUTONOMOUS EMERGENCY BRAKING

AEB Group