

Establishment of Regulation for Pedestrian Safety in Japan

In Japan, about 30% of people killed in traffic accidents are pedestrians, so the government decided to establish a regulation for pedestrian head protection based on studies made by the Pedestrian Safety Working Group of IHRA.

The standard will apply to passenger cars and trucks derived from passenger cars of 2,500kg or less. It will be finalized by March 2003 and phased into practice starting September 2005.

At GRSP, the Informal Group on Pedestrian Safety has been working to establish a GTR for the protection of pedestrians. Japan plans to harmonize its pedestrians' head protection criteria with this GTR when it is finalized, while also introducing pedestrians' leg protection criteria.

Japan's regulation for pedestrian head protection is outlined as follows:

Draft Regulation for Pedestrian Safety in Japan

1. Scope of vehicles

- (1) Passenger cars having no more than 10 seats
- (2) Trucks having a GVW not exceeding 2,500kg and a similar front shape as the vehicle defined in 1. (1)

2. Effective Date

- (1) Vehicles except for vehicles defined in (2)
 - New-type vehicles : September 2005
 - Continuously-manufactured vehicles : September 2010
- (2) Low height vehicles, Vehicles requiring high endurance, such as SUVs and trucks, Full cab over vehicles, Hybrid-engine vehicles
 - New-type vehicles : September 2007
 - Continuously-manufactured vehicles : September 2012

Note: New-type vehicles, as a result of the modification on emission performance relating to “4. Kinds of engine and main construction (Only for improvement of emission performance)” and/or “13. Exhaust emission standard values stipulated in the Safety Regulations for Road Vehicles, the low

exhaust emission motor vehicle approval enforcement procedure for approval” in the “Judgment Criteria for Identity of Types of Motor Vehicles”, will be considered as continuously-manufactured vehicles.

3. Outline of the regulation (See Attachment 1)

(1) Test Procedure

a) Test area (See Attachment 2)

The child and adult head impactor test will be considered for the regulation.

Test area for child head impactor: $1,000\text{mm} \leq \text{WAD} \leq 1,700\text{mm}$

Test area for adult head impactor: $1,700\text{mm} \leq \text{WAD} \leq 2,100\text{mm}$

Note: WAD (Wrap-Around Distance) means the distance from the ground to the point on the bonnet along the vehicle front structure.

b) Impactor

Child head impactor: Diameter 165mm, weight 3.5kg

Adult head impactor: Diameter 165mm, weight 4.5kg

c) Impact speed and angle

	Child head impactor		Adult head impactor	
	Speed (km/h)	Angle (deg)	Speed (km/h)	Angle (deg)
Category 1	32	65	32	65
Category 2	32	60	32	90
Category 3	32	25	32	50

	Definition	Note
Category 1	Vehicle having a BLE height of less than 835mm	Sedan type
Category 2	Vehicle having a BLE height of not less than 835mm	SUV type
Category 3	Vehicle having a bonnet angle of not less than 30 deg.	1 Box type

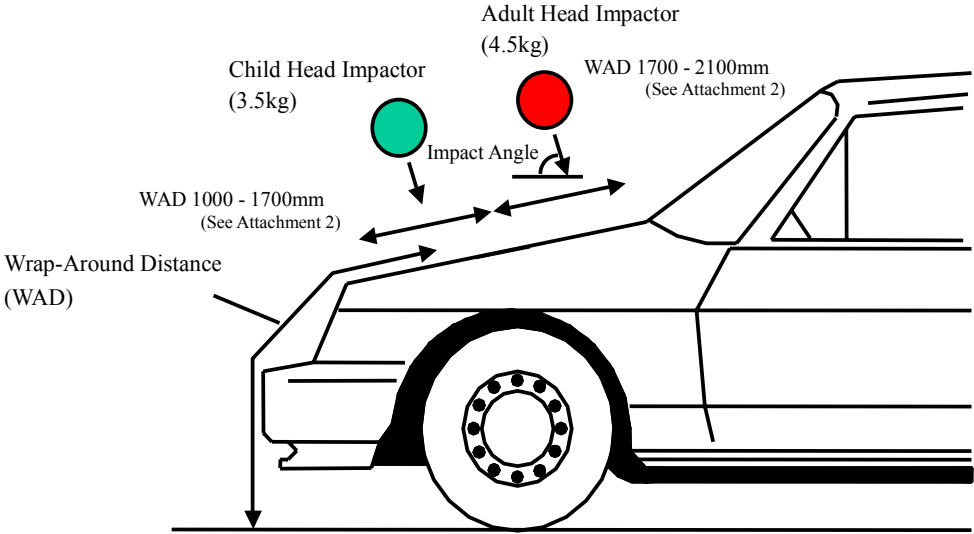
Note: BLE height: Bonnet Leading Edge height (See Attachment 2)

(2) Criteria

HIC (Head Injury Criteria), defined by the following formula, should not be exceeded by 1,000 on two-thirds or more of the test area. On the remaining area, HIC should not be exceeded by 2,000.

$$HIC = \left\{ \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} a \, dt \right\}^{2.5} (t_2 - t_1)_{\max} \quad (t_2 - t_1 \leq 15\text{msec})$$

Illustration of the draft test procedure



Procedure to determine the test area

The test area should be the area surrounded by the front test line, rear test line and side test lines.

Front test line:

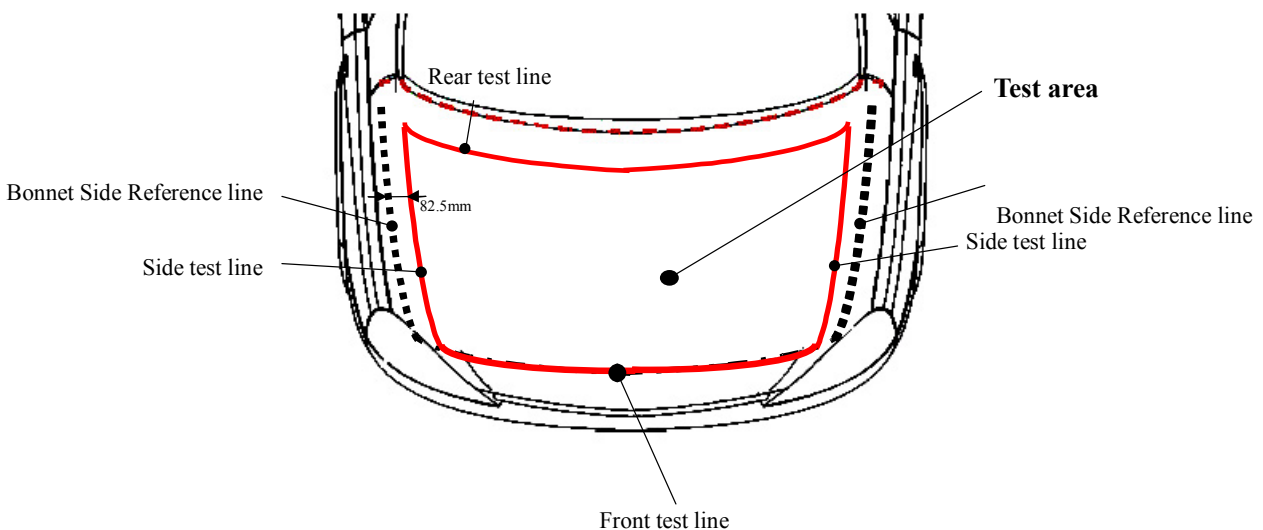
The rear side line was chosen out of two lines to be assigned to the front test line. One line was the line where WAD was 1,000mm. The other line was located 165mm backward from the Bonnet Leading Edge Reference line.

Rear test line:

The front side line was chosen out of two lines to be assigned to the rear test line. One line was the line where WAD was 2,100mm. The other line was located 82.5mm forward from the line where the impactor contacted the bonnet when the impactor contacted both the windscreen and bonnet, assuming that both the wiper arms and other equipment are removed.

Side test line:

The lines are located 82.5mm inside from the Bonnet Side Reference line.



Ground Reference Plane

A horizontal plane that passes through all tire contact points of a vehicle while the vehicle is in its normal ride state. (See Figure 1.)

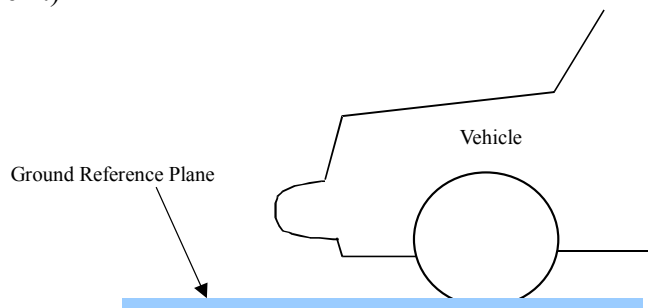


Figure 1: Ground Reference Plane

WAD

WAD (Wrap-Around Distance) is the geometrically traced distance from the contact point with the Ground Reference Plane, vertically below the front face of the bumper, to any point on the vehicle front structure. (See Figure 2.)

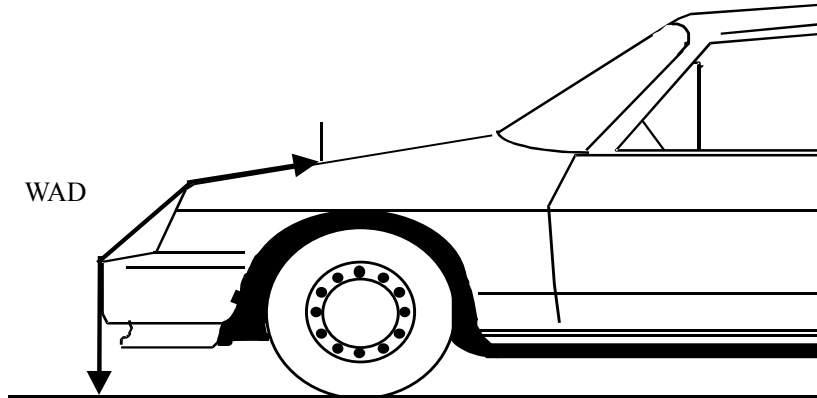


Figure 2 : WAD

Bonnet Side Reference line

The geometric trace of the highest points of contact between a straight edge, held parallel to the lateral vertical plane of the vehicle and inclined 45 deg. is traversed down the side of the front structure, and the side of the front structure.

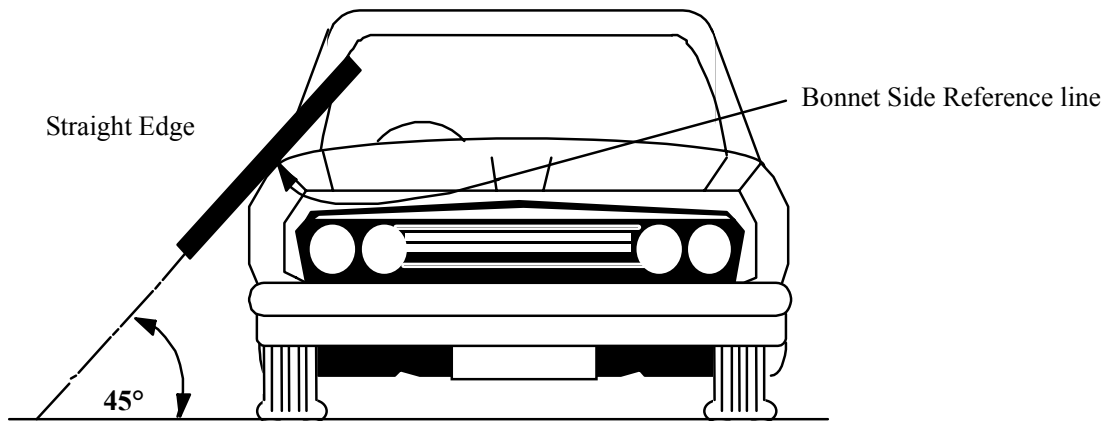


Figure 3 : Bonnet Side Reference line

Bonnet Leading Edge (BLE) Reference line

The geometric trace of the highest points of contact between the straight edge that is held parallel to the vertical fore and aft planes of the vehicle with 1m length, the bottom point is 600mm above the Ground Reference Plane, and inclined 50 deg. is traversed down the front of the front structure, and the front of the front structure.

In the cases described below, the line will be determined by the respective method given:

- (1) In the case that the straight edge is parallel with the vehicle front structure:
The angle of the straight edge should be changed to 40 deg. (See Figure 4-3.)
- (2) In the case that the top point of the straight edge contacts the vehicle front structure:
The BLE Reference line should be the line where WAD is 1000mm. (See Figure 4-4.)
- (3) In the case that the straight edge contacts the bumper:
The BLE Reference line should be determined without the bumper. (See Figure 4-5.)

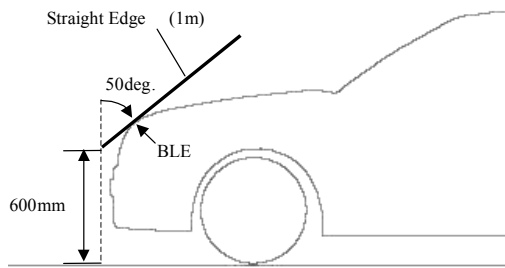


Figure 4-1 General

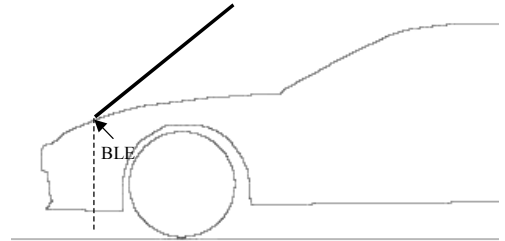


Figure 4-2 In the case that the bottom point of the straight edge contacts the vehicle front structure.

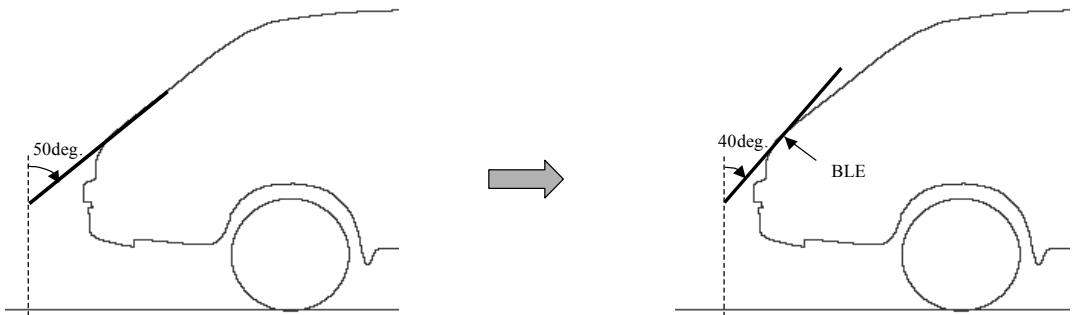


Figure 4-3 In the case that the straight edge is tangential to the vehicle front structure.

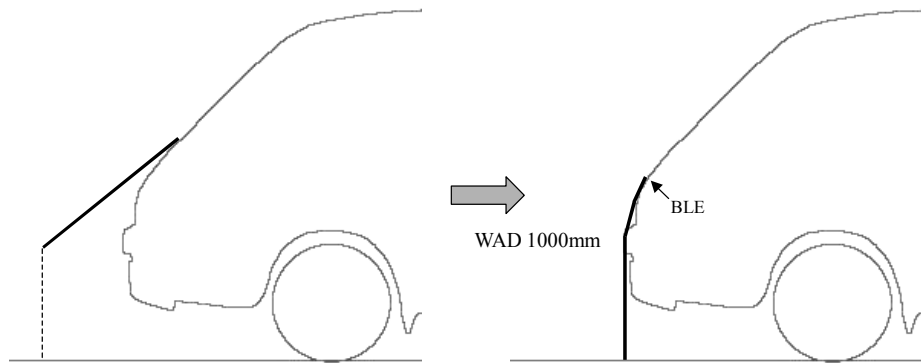


Figure 4-4 In the case that the top point of the straight edge contacts the vehicle front structure

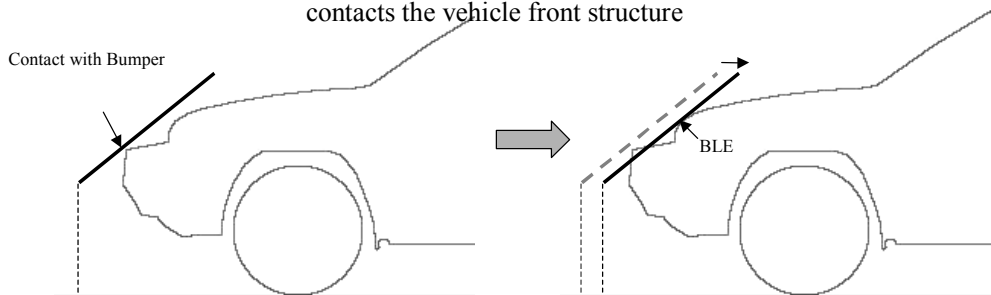


Figure 4-5 In the case that the straight edge contacts the bumper.

Specifications of Head Form Impactors

		Child Head Impactor	Adult Head Impactor
Specification	Weight	3.5 +/- [0.1] kg	4.5 +/- [0.1] kg
	Diameter	165 +/- [3.3] mm	
	Inertia moment	[0.01 kgm ²]	[0.012 kgm ²]
	Center of gravity	+/- [2mm] from the geometric center of the sphere	
	Accelerometer position	+/- [1mm] from the geometric center of the sphere	
Calibration*2	Dynamic Test Drop height: [376mm] Thickness of the dropped surface: [50mm] Size of the dropped surface: [600 mm ²] Surface condition: [0.2 – 2.0]□m Temperature: [20 +/- 2 degrees C.] Humidity: [10 – 70%]	[245 – 300] G	[225 – 275] G
	Impact Test Weight of test impactor: [1 +/- 0.1kg] Diameter of the impact surface: [70 +/- 1 mm] Curvature of the edge: [5 +/- 0.5 mm] Surface condition: [2.0]□m Temperature: [20 +/- 2 degrees C.] Humidity: [10 – 70%] Impact velocity: [7.0 +/- 0.1 m/s] Tolerance between center of impact surface and geometric center of impactor: [+/- 5 mm]	[300 – 330] G	[300 – 330] G

*1: The values in square brackets are tentative.

*2: Either the Dynamic test or Impact test could be selected as the calibration for the certification test, except for the development of the impactor.