INTERNATIONAL STANDARD

**ISO 3560**

Third edition
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# Road vehicles — Frontal fixed barrier or pole impact test procedure

*Véhicules routiers — Procédure d'essai de choc frontal contre barrière fixe ou poteau*



Reference number
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# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3560 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 10, *Impact test procedures*.

This third edition cancels and replaces the second edition (3560:2001), which has been technically revised.

# Road vehicles — Frontal fixed barrier or pole impact test procedure

## 1 Scope

This International Standard specifies a general frontal test procedure for impact on fixed barrier or pole. There are several applicable test configurations, some with specific test procedures. This International Standard describes general testing requirements for conducting accurate and uniform frontal testing.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 612, *Road vehicles — Dimensions of motor vehicles and towed vehicles — Terms and definitions*

ISO 1176:1990, *Road vehicles — Masses — Vocabulary and codes*

ISO 3784, *Road vehicles — Measurement of impact velocity in collision tests*



ISO 6487, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

ISO 6549[1)], *Road vehicles — Procedure for H- and R-point determination*



FMVSS 208:1997, *Actions to Reduce the Adverse Effects of Air Bags*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 612 and the following apply.

**3.1**
**impact angle**
angle between the longitudinal median plane (of the vehicle) and a vertical plane perpendicular to the contact plane of the barrier face

Note 1 to entry: The longitudinal median plane (of the vehicle) is also called the longitudinal plane of symmetry or zero Y plane (see ISO 4130).

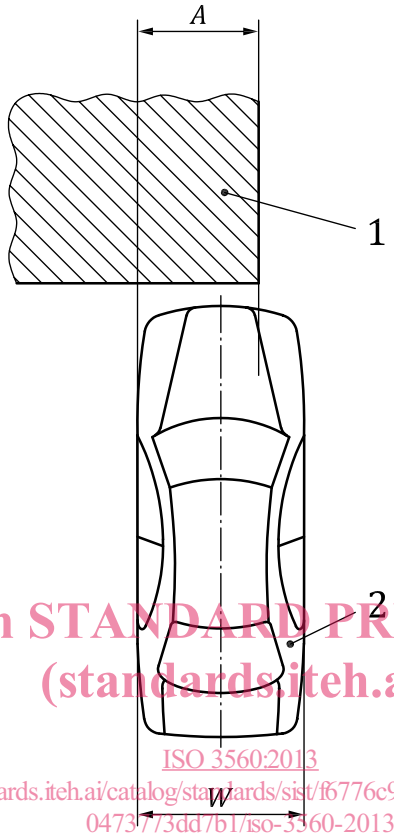
**3.2**
**vehicle width**
*W*
distance between two planes parallel to the longitudinal median plane (of the vehicle) and touching the vehicle on either side of the longitudinal median plane

Note 1 to entry: All parts of the vehicle, including any lateral projections of fixed parts (wheels, hubs, door-handles, bumpers, etc.) are contained between these two planes, except for the rear-view mirrors, side marker lamps, tyre pressure indicators, direction indicator lamps, position lights, customs seals, flexible mud-guards, door-edge guards, hinged side windows in the open position, fuel filler flaps in the open position, retractable steps, snow chains and the deflected part of the tyre walls immediately above the point of contact with the ground.

1) Withdrawn.

**3.3**
**overlap**
percentage of the vehicle width covered by the barrier face (see Figure 1)

Note 1 to entry: The overlap may be left or right. Figure 1 shows a left side overlap.






**Key**
1 Barrier
2 Vehicle

$$\text{Overlap} = \frac{A}{W} \times 100$$

**Figure 1 — Overlap**

**3.4**
**offset**
*B*
perpendicular distance between the longitudinal median plane (of the vehicle) and the centreline of the pole

Note 1 to entry: The offset may be left or right. Figure 2 shows a left side offset.

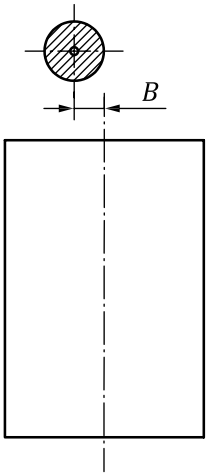



**Figure 2 — Offset**

**3.5**
**full frontal, 0° angle impact, 100 % overlap**
type of impact in which the barrier face is wider than the impacting vehicle and the direction of travel of the vehicle is perpendicular to the barrier face

**3.6**
**frontal, angled impact**
type of impact in which the barrier face is wider than the projected width of the impacting vehicle (see Figure 3) and the angle of impact is other than zero

Note 1 to entry: The barrier face can be angled so that the initial contact is to the right or left of the longitudinal median plane (of the vehicle).

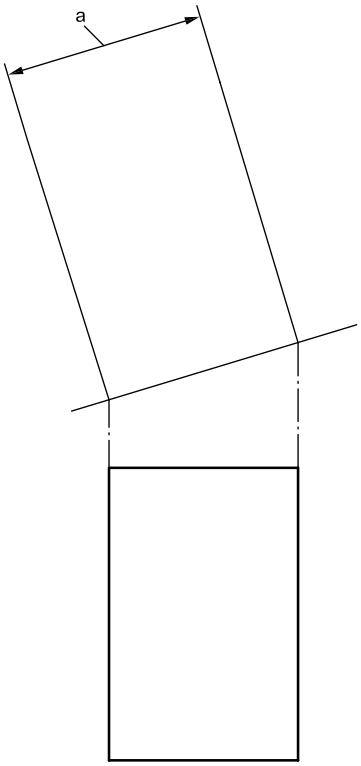


**3.7**
**offset frontal impact**
type of impact in which the vehicle impacts a barrier face with an overlap of less than 100 %

Note 1 to entry: Any angle of impact can be used.

**3.8**
**pole impact**
type of impact in which the vehicle impacts a circular pole considerably narrower than the width of the vehicle

Note 1 to entry: The pole can be offset to either side of the longitudinal median plane (of the vehicle).




a Projected width of vehicle.



**Figure 3 — Frontal, angled impact**



# 4 Impact test set-up

## 4.1 Test site

The test area shall be large enough to accommodate the run-up track, barrier and technical installations necessary for the test.

The crash site surface shall be level and rigid for a length of at least 10 m in front of the impact object, at least along the tyre path, and ideally throughout the entire test pad – to account for a potential impact of the vehicle underside structure with the ground. There shall be no more than a 1 % slope measured over any 1 m length for at least the last 10 m.

## 4.2 Barrier

### 4.2.1 Fixed barrier

The barrier shall consist of a block made of a relevant material able to resist to impact. No cracks, breakage or plastic deformation should occur to the fixed barrier. The width shall be at least 3 m and the height at least 1,5 m.

The barrier face is secured to a mass not less than 70 000 kg. Its movement at impact shall be restricted to ± 2mm. The barrier specifications given in 4.2.2 may be varied as necessary provided the barrier face is large enough to accommodate the frontal crash area of the test vehicle.

#### 4.2.2 Barrier face

##### 4.2.2.1 General

A variety of barrier faces may be used. Some are specified below.

##### 4.2.2.2 Rigid flat barrier face

The barrier face shall be flat and vertical and shall be covered with fir plywood 18 mm to 26 mm thick.

##### 4.2.2.3 Anti-slide device (ASD) on rigid flat barrier face

The ASD, which shall be 40 mm thick, 40 mm wide and at least 1 500 mm long, fabricated from steel and positioned to permit 20 mm ± 2 mm projection in front of the plywood, shall be mounted vertically at a distance of 350 mm left and right of the theoretical (projected) point of impact of the longitudinal median plane (of the vehicle).

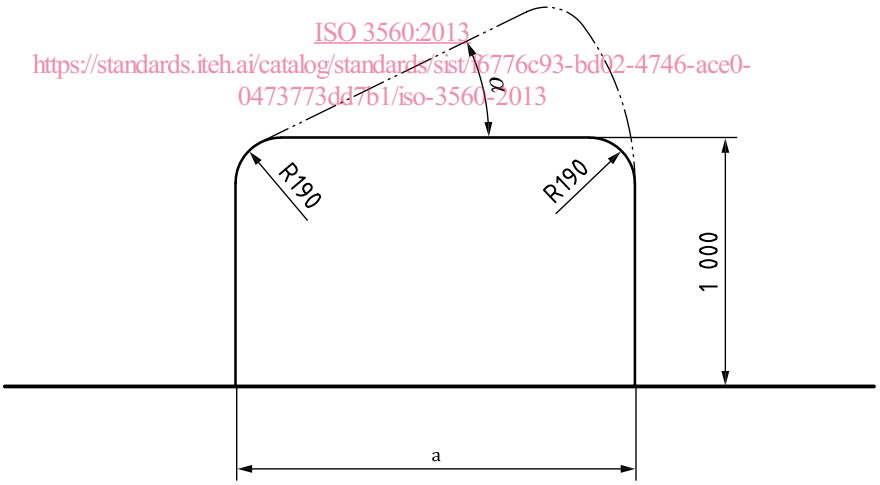
##### 4.2.2.4 Deformable barrier face

The deformable barrier face shall be vertical and either flat or with a bumper simulation. It shall have sufficient height, depth and width to allow the desired test to be carried out.

##### 4.2.2.5 Rigid offset barrier face

The offset barrier face shall have a sufficient width to allow the desired overlap, a height of at least 1 500 mm and a depth of at least 1 000 mm. The edge radius on both sides shall be 190 mm ± 2 mm. The face may be set at an angle to the barrier and may include an ASD (see Figure 4).






a As desired.

**Figure 4 — Rigid offset barrier face**

In the case of an offset deformable barrier face, the edges of this face shall be in line with the sides of the main offset barrier and fully supported.

#### 4.2.3 Ground clearance

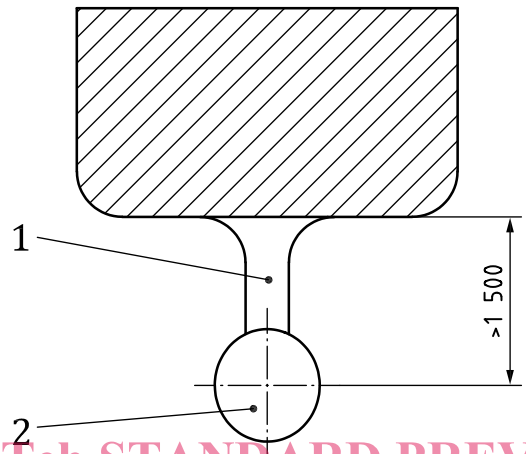
The ground clearance shall be set according to the test type, and within a tolerance of ± 5 mm.

## 4.3 Pole

The pole, designed as a vertically-oriented, circular, rigid structure, beginning no more than 100 mm above the ground and extending above the roof of the impacting vehicle, should be 254 mm ± 3 mm in diameter and set off from any vertical mounting surface (such as attachment to a fixed rigid barrier face) by at least 1 500 mm.

The pole support shall not interfere with the crashing vehicle: any secondary impact should be avoided before the rebound phase of the crash.

Dimensions in millimetres






**Key**

1 Support

2 Pole



**Figure 5 — Pole**

## 4.4 Test conditions

### 4.4.1 Propulsion of the test vehicle

The test vehicle shall be propelled to a point no closer than 0,5 m from contact with the barrier face, where it shall be released to travel freely.

The attachment to the vehicle of any external propulsion or guidance system shall not affect the vehicle's structural characteristics.

### 4.4.2 Alignment of the test vehicle

The test vehicle shall impact the barrier so that its longitudinal axis is within ± 2° of the intended angle of impact.

The optimal offset value is set within ± 20 mm.

NOTE The offset value should be kept within ± 30 mm for the test to be considered acceptable. However if the offset value is over ± 20 mm, some care should be taken in the interpretation of the results.

### 4.4.3 Velocity of the test vehicle

The velocity measurement shall be determined within the last 1,5 m of travel, but not less than 300mm prior to the impact, and in any case after the vehicle is released from the tow system.

The measurement shall be done as specified in ISO 3784.

The velocity at the time of impact shall be that specified in the applicable test requirements. The impact velocity tolerance shall be within +/- 0,5 km/h of the desired velocity.

# 5 Test vehicle

## 5.1 General state and equipment

The test vehicle shall be representative of the series production, shall include all the equipment normally fitted and shall be in normal running order. Some components may be replaced by equivalent masses where this substitution clearly has no noticeable effect on the measured results.

## 5.2 Mass of the test vehicle

$$m_t = m_k + m_l + m_d$$

where

$m_k$ is the complete vehicle kerb mass or unloaded vehicle weight (ISO-M06), as defined in ISO 1176:1990, 4.6, in kilograms ;

$m_l$ is the rated cargo and luggage mass in kilograms

The cargo mass is the maximum admissible weight minus the maximum standard occupant mass, or 136 kg, whichever is less (see 5.2.1).

$m_d$ is the mass of the selected test dummy as defined in the user manual of the dummy.



The vehicle shall be ballasted to achieve the test mass to within ± 10 kg. The ballast shall be located and secured to the vehicle so that it does not alter the structural characteristics of the parts of the vehicle expected to deform during the test.



Given that the mass distribution in the vehicle can influence the vehicle response, it is recommended that the wheel mass be documented.

The instrumentation and cameras required for testing should not change the mass distribution between the axles by more than 20 kg.

It is permissible to substitute for the fuel in the fuel tank a preferably non-flammable liquid having a density of from 0,7 kg/dm$^3$ to 1 kg/dm$^3$.

At the time of impact, the vehicle shall be at the normal height and attitude defined by the manufacturer.

### 5.2.1 Methods for calculating cargo mass ($m_l$) depending on the information available

The value ($m_l$) of the cargo mass shall be between 0 and 136 kg.