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Impact test procedures for road vehicles — Seating and positioning procedures for anthropomorphic test devices — Procedure for the WorldSID 50th percentile male side-impact dummy in front outboard seating positions

Procédures d'essai de choc pour véhicules routiers — Procédures d'installation et de positionnement des dispositifs d'essais anthropomorphes — Procédure pour le mannequin WorldSID, 50ème percentile homme, de choc latéral pour positions de conducteur et passager avant droit

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Foreword

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 10, *Impact test procedures*.

Introduction

WorldSID is a world harmonized anthropomorphic test device for the evaluation of motor vehicle side-impact protection.

The aim of this International Standard is to provide a repeatable seating and positioning procedure that can be applied across the world vehicle fleet.

Impact test procedures for road vehicles — Seating and positioning procedures for anthropomorphic test devices — Procedure for the WorldSID 50th percentile male side-impact dummy in front outboard seating positions

1 Scope

This International Standard specifies the conditions and requirements for the recommended placement of the WorldSID 50th percentile male side-impact dummy (WS50), as defined in ISO 15830-1, ISO 15830-2, ISO 15830-3, and ISO 15830-4, when used in front outboard seating positions of motor vehicles for side-impact 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 15830-1, *Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side-impact dummy — Part 1: Terminology and rationale*

ISO 15830-2, *Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side-impact dummy — Part 2: Mechanical subsystems*

ISO 15830-3, *Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side-impact dummy — Part 3: Electronic subsystems*

ISO 15830-4, *Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side impact dummy — Part 4: User's manual*

SAE J 826, *Devices for use and defining and measuring vehicle seating accommodation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

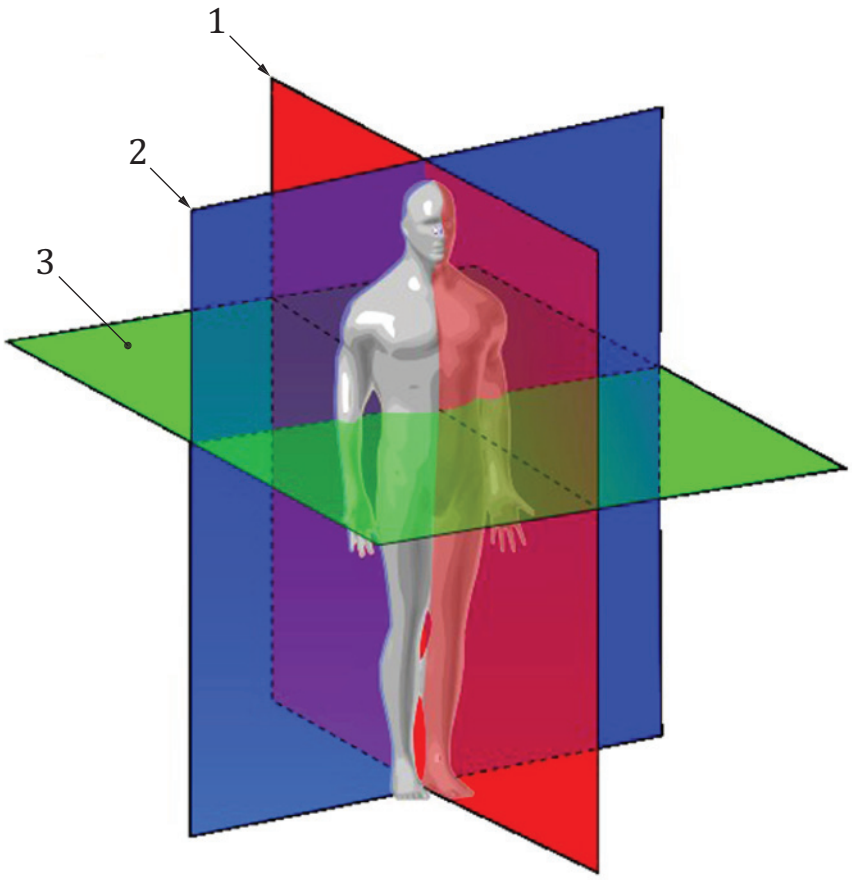
3.1
test seat
seating position, driver, or front passenger that is to be evaluated

3.2
saggital plane
vertical plane that divides the human body into left/right sections

Note 1 to entry: See Figure 1.

3.3
coronal plane
vertical plane that is perpendicular to the sagittal plane and that divides the human body into anterior/posterior sections

Note 1 to entry: See Figure 1.



Key

1 sagittal plane
2 coronal plane
3 transverse plane

Figure 1 — Anatomical planes

4 Symbols and abbreviated terms

X forward direction of the vehicle

Y lateral direction of the vehicle

Z downward direction of the vehicle

5 Requirements for vehicle seats preparation

5.1 Seat adjustments

a) Position any adjustable parts that provide additional support so that they are in the lowest or fully retracted position, e.g.:

— Position the seat's adjustable lumbar supports so that the lumbar supports are in the lowest, retracted, or deflated adjustment positions.

— Position an adjustable seat cushion length to the retracted position.

— Position an adjustable leg support system in the rearmost position.

b) Place adjustable pedals in the full forward position (towards the front of the vehicle).

c) The steering wheel is not intended to have an influence on the loading of the dummy. Therefore, set the steering wheel at the geometric highest driving position considering the full range of telescopic and tilt adjustment possibilities, in order to provide clearance for the legs and thorax.

d) Set the head restraint position to the vehicle manufacturer's nominal design position for a 50th percentile adult male occupant, or in the fully up position if no design position is available.

e) Place any adjustable seat belt anchorages at the vehicle manufacturer's nominal design position for a 50th percentile adult male occupant, or in the fully up position if no design position is available.

5.2 Seat markings

a) Define the seat reference points (markings).

— Identify and mark one seat reference point at the rear of the seat cushion.

— In case the seat cushion pitch is adjustable, identify and mark a second reference point that is at least 300 mm forward of the rear reference point and draw a line through the two reference points.

b) Define the seat centreline reference.

— *In case of bucket seats*:

Locate and mark for future reference the longitudinal centreline of the seat cushion. The intersection of the vertical longitudinal plane that passes through the seating reference point (SRP) and the seat cushion upper surface determines the longitudinal centreline of a bucket seat cushion.

— *For bench seats*:

Locate and mark for future reference the longitudinal line on the seat cushion that marks the intersection of the vertical longitudinal plane through the centreline of the steering wheel and the seat cushion upper surface.

5.3 Procedure for the test seat placement

5.3.1 Positioning of the test seat

1) Use the seat control that primarily moves the seat vertically to adjust the rearmost seat reference point defined in 5.2 (a) to the uppermost vertical location.

2) Use the seat control that primarily moves the seat fore-aft to adjust the rearmost seat reference point defined in 5.2 (a) to the rearmost location.

3) Determine and record the range of angles of the seat cushion pitch referring to the line defined in 5.2 (a) and using only the control(s) that primarily adjust(s) the cushion pitch, set cushion pitch as close as possible to the mid-angle.

4) Use the seat control that primarily moves the seat vertically to adjust the rearmost seat reference point defined in 5.2 (a) to the lowest vertical location. Verify that you are still at the rearmost seat track location. Record the X position.

5) Use the seat control that primarily moves the seat fore-aft to adjust the rearmost seat reference point defined in 5.2 (a) to the forward most location. Record the X position.

6) Measure and mark an X position 20 mm rearward of the midpoint (MP + 20 mm).

7) Use the seat control that primarily moves the seat fore-aft to adjust the rearmost seat reference point defined in 5.2 (a) to the X position marked in step 6 (−0/+2 mm) or, if not possible, to the first X possible position rearward the marked position in step 6. If the seat cannot be placed at exactly 20 mm rearward of the midpoint, select next closest available rearward setting.

NOTE For some vehicles, this final step may change the cushion pitch as established in step 3; this is acceptable.

8) Record the test seat position [for example, recording the position of the rearmost reference point defined in 5.2 (a)].

5.3.2 WS50 H-point determination

1) Using only the controls that move the seat fore-aft, return the test seat to the rearmost position to facilitate placement of the SAE H-point manikin.

2) Place the SAE H-point manikin in the seat and position the seat to the test position recorded [see 5.3.1(8)].

3) Follow the procedure as described in SAE J 826 except that the length of the lower leg and thigh segments of the SAE H-point manikin shall be adjusted to the 50th percentile (418 mm) and 10th percentile (408 mm) positions, respectively.

4) Set the seat back angle to the angle specified by the manufacturer. If the seat back design angle is not specified by the manufacturer, set the seat back angle to 23° (±1°) or as close to 23° as possible (as measured by the SAE H-point manikin).

5) Record the H-point X, Y, and Z coordinates.

6) The WS50 H-point is set 20 mm forward of SAE H-point manikin X coordinate; Y and Z coordinates of the WS50 H-point are not adjusted.

6 Procedure for the WS50 dummy placement

1) Using only the controls that move the seat fore-aft, move the test seat to the rearmost position to facilitate placement of the WS dummy.

2) Place the WS50 dummy in the seat such that the mid-sagittal plane is coincident with the centreline markings and the upper torso is resting against the seat back.

3) Apply a fore-aft and lateral rocking motion to settle the pelvis rearward in the seat.

   — To ensure a repeatable and stable pelvis position, ensure that the pelvis is in contact with the seat cushion over the whole length.

   — To ensure a repeatable placement of the lower abdominal rib, make sure it is inside the pelvis flesh (not on top of it).

4) Move the seat together with the WS50 to the test seat position defined in 5.3.1 (8). If it is not possible to reach the seat test position due to knee contact, shift the targeted test seat position rearwards in the stepwise increments to the closest position where the knee clearance is at least 5 mm. Modify the target WS50 H-point accordingly.

5) Verify that the WS50 H-point is reasonably close (±10 mm) to the target WS50 H-point 5.3.2 (6) or as defined in point 6 (4) if the target H-point has been modified. If not, repeat step 3. If it is still not possible, record the rearmost seat cushion reference point and the WS50 H-point and proceed to the next step.

6) If the **driver** position is being tested:

   — Extend the right leg without displacing the thigh from the seat cushion. Allow the sole of the foot to settle on the accelerator pedal; the heel of the shoe should be in contact with the floor pan.

— Extend the left leg without lifting the thigh from the seat cushion and allow the sole of the foot to settle on the footrest (or floor pan if no footrest is present). The heel of the shoe should be in contact with the floor pan. In case of tibia contact, slide the foot rearward toward the seat until a 5 mm clearance is obtained.

7) If the **passenger** side is being tested:

— Extend the inboard leg without displacing the thigh from the seat cushion. Allow the sole of the foot to settle on the floor pan in-line with the thigh (the heel of the shoe should be in contact with the floor pan). If the contour of the floor pan does not permit the foot to rest on a flat surface, move the foot in 5 mm increments until the foot rests on a flat surface.

— Allow the sole of the outboard foot to settle on the floor pan in the same for-aft location (alignment) as the inboard foot (the heel of the shoe should be in contact with the floor pan). If the contour of the floor-pan does not permit the foot to rest on a flat surface, move the foot in 5 mm increments until the foot rests on a flat surface.

8) Position the H-point of the dummy to match the WorldSID H-point coordinates recorded following 5.3.2 (6) to within ± 5 mm. Prioritize the X coordinate.

9) Adjust the WS50 rib angle as follows:

i) Adjust the dummy until the thorax tilt sensor coincides with the angle range specified by the manufacturer.

ii) If the rib angle is not specified by the manufacturer and the seat back is 23° ± 1°, adjust the dummy until the thorax tilt sensor reads −2° (2° downwards) ± 1°.

iii) If no rib angle is specified and the seat back angle is not 23° ± 1°, no further adjustment of rib angle is required.

10) Adjust the WS50 neck bracket to level the head at the closest position to 0° ± 1°.

11) Proceed to the final foot and leg positioning by repeating step 6 if the driver is being tested or step 7 if the passenger seat is being tested.

No distance is specified for the knee spacing. However, priority should be given to ensure the following

— 5 mm clearance between the knees/legs and the steering shroud and centre console,

— stable foot and ankle position,

— legs as parallel as possible to the sagittal plane.

12) Place both arms at the detent position corresponding to 45° from the coronal plane.

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