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Please be sure to refer to the Japanese test method if you need to be precisely correct.

SIDE COLLISION SAFETY PERFORMANCE TEST PROCEDURE

Created: April 1, 1999
Revised: May 2, 2024
April 25, 2023
March 15, 2019
March 20, 2018

1. Effective Dates

This test procedure was enacted April 1, 1999. The changes made on May 2, 2024 went into effect on May 2, 2024.

2. Scope of Application

This test procedure applies exclusively to the "Side Collision Safety Performance Test" of passenger vehicles with 9 occupants or less and commercial vehicles with a gross vehicle mass of 2.8 tons or less conducted by the National Agency for Automotive Safety and Victims' Aid (hereinafter referred to as the "NASVA") in the new car assessment program information supply project.

3. Definition of Terms

The terms in this test procedure are defined as follows:

(1) **Moving Deformable Barrier (hereinafter referred to as "MDB"):** A deformable part of a barrier attached to the front of a trolley with which the test vehicle collides. The specifications of the MDB can be found in Attachment 2.

(2) **Dummy:** Models simulating the human bodies to be placed in the test vehicle. A technical description of the dummies can be found in ISO 15830, part 1-part 5.

(3) **HIC (Head Injury Criterion):** An index showing the degree of injury to the dummy's head.

(4) **Chest Displacement:** Chest displacement generated the moment of a crash, measured on the dummy in 3 places.

(5) **Abdominal Displacement:** Abdominal displacement generated the moment of a crash, measured on the dummy in 2 places.

(6) **Pubic Symphysis Force:** The force applied to connecting part of the pubic symphysis during a crash.

(7) **Hip Point:** The vehicle manufacturer specifies where the dummy's hip points are in the test vehicle.

(8) **Design Hip Point:** A reference point determined in each seat following the procedure specified in Attachment 1.

(9) **Seating Reference Point:** The reference point corresponding to the hip point by the measurement procedure specified in Attachment 1, in which the seat position is adjusted to the lowest and most rearward position in normal driving or riding use as designed by the vehicle manufacturer. If the abovementioned position is not designated by the vehicle manufacturer, the lowest and most rearward mechanical position is used when adjusting.

If the vehicle manufacturer provides drawings and other information of the seating reference point and location of the designated hip point based on Appendix 1-9, the test institute may use this position given by the vehicle manufacturer.

(10) **Seat Cushion Reference Point:** The reference point of the seat cushion's top when it is adjusted vertically.

(11) **Side Airbag:** A system to deploy airbags to protect the occupant's torso and head during a side collision.

(12) **Side Curtain Airbag:** The category of side air bag in which the airbag system is installed in the roof rail, etc. between pillar area A and pillar area C and deploys airbags to protect the occupant's head during a side collision.

(13) **Torso Side Airbag:** The category of side air bag in which the airbag system is installed in the seat back or side door, and deploys airbags to protect the occupant's torso during a side collision.

4. Testing Conditions

4.1 Test Vehicle Conditions

4.1.1 Provision of Data from the Vehicle Manufacturer

The vehicle manufacturer shall provide NASVA with the following data necessary for the proper preparation of the test.

(1) Appendix 1

(2) Special confirmation items relating to preparation of the test (confirmation items for the test vehicle preparation of assessment testing for concerned vehicle).

4.1.2 Test Vehicle Mass

(1) The mass of the test vehicle, without installing the dummy, shall be adjusted *between 100±1% of the mass at vehicle delivery (including the mass of the measuring instruments).

(2) When removing devices (including measuring instruments) to adjust the test vehicle's weight or to change loading positions to offset the weight, position these devices so as not to impact the test results. As long as there are no special notices from the vehicle manufacturer, this will be at the discretion of the testing institute. For vehicles with spare tires and other tools, these tools are allowed to be in the vehicle during testing.

*Mass at Vehicle Delivery: Upon receiving the test vehicle, the test institute shall empty the fuel tank, then fill all fluid containers (excluding the fuel tank) to the maximum levels of the specified ranges, and fill the fuel tank to 100% capacity (see Appendix 1-3). For gasoline tanks: capacity x

0.745g/ml, for diesel tanks: capacity x 0.840g/ml. Then, measure the mass of the test vehicle. If weights and the like are mounted, their position must be above the fuel tank. The vehicle manufacturer may specify where the weights are mounted. In this case, note this in Appendix 1-3. This mass shall be regarded as the mass at vehicle delivery.

4.1.3 Fluids in the Test Vehicle

(1) Fluids such as oils (except substitute fluid filled in the fuel tank) may be drained.

(2) Battery electrolyte shall be drained (this shall not apply to cases where the battery electrolyte will not leak at the time of collision). If the test vehicle is equipped with electrically controlled restraint devices such as air bags, a substitute power supply shall be provided in a location where the test results are not affected, as required, so that these restraint devices may function properly.

(3) The fuel tank shall be filled with a substitute fluid with a specific gravity similar to that of the fuel. The fuel tank shall be filled to 90% capacity or more.

4.1.4 Collision Direction

(1) The test shall be conducted on the driver’s side. However, in case of either (2) or (3) below, this requirement shall not apply.

(2) If both sides of the side structure are asymmetrical and the front occupant protection performance differs during a lateral collision, either of the two scenarios below may be applied.

① If the vehicle manufacturer provides evidence to the NASVA showing the equality of driver protection performance and front passenger protection performance, the institute may conduct the test on the driver’s side.

② If the NASVA judges that front passenger protection performance is poor compared with driver protection performance*[1], the test shall be conducted on the opposite side of the driver. In this case, the manufacturer may request that an additional test be conducted for the driver’s side.

(3) When the driver’s seat is used for the neck protection performance test in a rear-end collision, the opposite side (front passenger side) shall be chosen as the collided side of the lateral collision test. In this case, the driver’s seat used shall be the same seat that has been used in the rear-end collision for the neck protection performance test previously conducted.

4.1.5 Adjusting the Seats

The driver’s seat and front passenger seat (hereinafter referred to as "front seats") shall be adjusted to the specified position following (1) to (6) below. Including multiple adjustment devices, the detail of the adjustment devices is shown in Attachment 3. Additionally, seats other than the front seats shall be adjusted to the design standard positions and angles.

(1) If front seats are adjustable in the fore-and-aft direction by seat rail, the seats shall be adjusted 20mm rearward from the center position, according to ① - ⑩ in Item (2) below. However, if the seat cannot be moved 20mm rearward from the center position, position the seat even further back, but as close to 20mm rearward as possible. Furthermore, as long as the vehicle manufacturer has not

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*[1] Example: without pillar B, the hip point is more than 25 mm rearward (or lower) than the driver’s side, or more than 25 mm nearer to the door outer surface, etc.

indicated otherwise, the other front seat can be in the same position as the one with the mounted dummy, or it can be positioned in a closer rearward position.

(2) If the front seats can be adjusted vertically, the seat cushion pitch angle shall be adjusted to the mid-position in its adjustable range and at its lowest height, as outlined in ① - ⑩ below.

① Identify and mark the seat cushion's first reference point (SCRP1) at the seat cushion's backside. If the seat cushion's pitch can be adjusted, identify and mark the seat cushion's second reference point (SCRP2). This should be at least 300mm in front of SCRP1.

② Move the seat vertically to SCRP1.

③ Move the seat in the fore-aft direction to SCRP1.

④ Confirm and record the seat cushion pitch's movement range (if both the front and backsides of the cushion can be moved, use only the vertical seat adjuster on the front side), and adjust the cushion pitch to its middle angle position.

⑤ Use the vertical seat adjuster to match SCRP1 to the lowest position. Confirm that SCRP1 is at its lowest position. Record this fore-aft standard reference position of SCRP1 (X Position).

⑥ Use the fore-aft seat adjuster to match SCRP1 to the rearmost position. Record this as the X-axis location of the standard reference position of SCRP1.

⑦ Use the fore-aft seat adjuster to match SCRP1 to the foremost position. Record this as the X-axis location of the standard reference position of SCRP1.

⑧ Measure and mark point-X 20mm behind the point between the two X-axis values recorded in ⑥ and ⑦.

⑨ Use the fore-aft seat adjuster to move SCRP1 to position X found in ⑧. If that is not possible, place it in the closest position behind ⑧ as possible.

⑩ With some vehicles, this will change the cushion pitch determined in ④, but this is permissible.

(3) If the seatback angle of the front seats can be adjusted, this angle shall be adjusted to the design standard angles. If the lumbar support of the seatback can be adjusted, the lumbar support shall be adjusted to the rearmost position.

(4) If the head restraint devices of the front seats can be adjusted in the vertical direction, their height shall be adjusted to the same position as the height of the center of gravity of an MA50 dummy's head. However, if the head restraint devices cannot be adjusted to the specified position, they shall be adjusted to the highest locking position in the vertical direction. Furthermore, if fore-aft adjustment is also available, put the restraint at its design position. If there is no design position, use the mid-position (and if there is no mid-position, place it behind the middle, as close as possible to the middle.)

(5) If comfort mechanisms (such as armrests) are installed on the front seat, they shall be adjusted to the manufacturer's recommended positions.

(6) If the front seats have other adjustable mechanisms not specified in items (1) to (5) above, the adjustment position or adjustment angle shall be adjusted to the mid-position. If such adjustment mechanisms cannot be positioned to the mid-position, they shall be adjusted to the nearest adjustable positions downward or to the outer position from the middle position.

4.1.6 Adjusting the Steering System

(1) If the steering system can be adjusted in the vertical direction, the steering system shall be adjusted to the highest point of the adjustment range.

(2) If the steering system can be adjusted in the fore-aft direction, the steering system shall be adjusted to the most pulled-out position.

4.1.7 Other Vehicle Conditions

4.1.7.1 The Ignition

The engine of the test vehicle shall be in a stopped state. However, the ignition switch shall be in the on position. If the test vehicle is equipped with electrically controlled restraint devices such as air bags, proper function of the devices shall be confirmed by the warning lamps, etc. when turning the ignition switch on position. Furthermore, for vehicles with electric engines, as long as the materials will not influence the device and the vehicle manufacturer and test institute have discussed it, the power supply circuit may be disconnected from the engine.

4.1.7.2 The Side Windows and Doors

The doors and windows shall be closed securely in the unlocked position. If the test vehicle is equipped with a vehicle-speed-sensitive or vehicle-speed- and engine-speed-sensitive door locking mechanism, the relevant system shall be put in the released position when it might be activated and the door might be locked during the test.

4.1.7.3 The Roof

If the vehicle's roof is removable, the roof shall be installed.

If the vehicle has a sunroof, the sunroof shall be closed.

If the vehicle is convertible, the top shall be closed.

4.1.7.4 Drive Axis, Transmission, and Parking Brake

If the drive axis can be selected, a normally used drive axis shall be selected.

The transmission shall be in neutral.

The parking brake shall be in operation.

4.1.7.5 The Tires

The air pressure for the tires shall be a pressure specified in the specification table provided by the vehicle manufacturer.

4.1.7.6 Other

(1) Installation of stroboscope, etc.

The test vehicle shall be equipped with a stroboscope, etc. for specifying the moment of collision in the photographs taken using a high-speed photographing device. However, this provision shall not apply to cases where the stroboscope, etc. is installed in the ground facilities within the visual field of the high-speed photography device.

(2) Attaching Target Marks

In order to grasp the state of deformation in the test, marks (hereinafter referred to as "target marks") shall be attached to the test vehicle at points, which are not deformed during the test.

(3) Coloring the Compartment Interior

The interior trim of the compartment shall be colored using colors other than liquid chalk colors, etc.

applied to the dummy so that the position at which the dummy collides with the interior trim can be easily identified.

(4) Adjusting Vehicle Height

If the vehicle has a mechanism for adjusting the height depending on the vehicle speed, the height of the vehicle shall be adjusted to the height when traveling at 55km/h.

(5) Collision Position Confirmation Line

To help confirm the collision position of MDB with the test vehicle, vertical lines shall be drawn on the collision side of the test vehicle, starting 250mm behind the seating reference point, and adding another vertical line every 850mm.

4.1.8 The Dummy and the Seatbelt

4.1.8.1 The Dummy

The dummy shall be as specified in ISO15830 parts 1-5 and comply with the same provisions.

4.1.8.2 Mounting the Dummy

4.1.8.2.1 The limb joints of the dummy shall be adjusted so as to be able to support the weight of the limbs extended horizontally (1 to 2g).

4.1.8.2.2 The dummy shall be clothed in a rubber suit as specified in ISO15830, parts 1-5.

4.1.8.2.3 The dummy shall be placed on the front, outer seat on the collision side.

4.1.8.2.4 The dummy's symmetrical plane shall correspond to the vertical center plane of the specified seating position.

4.1.8.2.5 When positioning the dummy's pelvis, the dummy's hip point closer to the outside of the car shall be matched up with the design hip point measured right after positioning the seat. Furthermore, both the X and Y points should be within a range of ±5 mm of a point located 20 mm forward from the design hip point. However, if this is not possible, get as close as possible, while prioritizing the X-point.

4.1.8.2.6 The upper torso tilt of the dummy shall be adjusted within ±1°of the design upper-torso tilt angle of the maker, determined by the chest tilt sensor. If the maker does not designate a design upper-torso tilt angle, and if the seat's actual torso angle is 23°±1°, adjust via the chest tilt sensor −2°(downward by 2°) within ±1°. If the maker does not designate a design upper-torso tilt angle and if the seat's actual torso angle is not 23°±1°, no further adjustments to the dummy's upper-torso angle are necessary.

4.1.8.2.7 Adjust the dummy neck's bracket horizontally as close to 0°±1°as possible.

4.1.8.2.8 Regardless of the seating position of the dummy, the angle formed by the upper arm and the base line of the arm of the dummy torso shall be adjusted to an angle of 48°±1°. The base line of the arm fitted to the dummy torso shall be defined as the cross-line of the plane in contact with the front face of the ribs and the vertical plane of the dummy including the arms.

4.1.8.2.9 If the dummy is placed in the driver's seat, it shall be positioned in such a way that, while keeping the ribs and torso unmoved, the right leg is put on the acceleration pedal without pressing down on it, with the heel kept on the floor as forward as possible. The left leg shall be placed on the footrest (if there is no footrest, approximate this position.) There should be a distance of 5mm or more between the tibia and the instrument panel or center console. If that is not possible, adjust the seat backwards until this is possible.

4.1.8.2.10 If the dummy is placed on a seat other than the driver's seat in the test vehicle, it shall be positioned in such a way that, while keeping the pelvis and torso unmoved, the heels of both legs are located on the floor as forward as possible so that the dummy does not press the seat cushion other than under the legs' weight. There should be a distance of 5mm or more between the tibia and the instrument panel or center console. If that is not possible, adjust the seat backwards until this is possible.

4.1.8.3 Fastening the Seatbelt

After placing the dummy in the front seat of the test vehicle, the seatbelt and other restraint devices shall be properly adjusted so that the routing position is the manufacturer's recommended position. If the vehicle manufacturer does not give any recommendation, then the height of the shoulder harness shall be in the highest (sic) position.

4.1.8.4 Temperature Conditions for the Dummy

The dummy shall be allowed to stand in a room at a temperature of 20.6～22.2°C for four hours or more just before conducting the test, to stabilize the temperature of the dummy. Operations such as placement of the dummy may be carried out during this period of time. The temperature shall be measured by the thermometer inside the dummy. It is recommended that the temperature shall be measured from the spine at rib-1 on the non-collision side to the farthest place from it.

4.1.8.5 The Dummy's Coloring

Coloring shall be applied to the dummy as specified in Appendix 6. Paint such as liquid chalk may also be applied to the interior compartments of the test vehicle.

4.1.9 Mounting the Electric Measuring Devices

4.1.9.1 Installing the Accelerometer

Accelerometers shall be installed at the following points in the test vehicle to measure acceleration during the collision.

(1) Tunnel: 3 axes (fore-aft, lateral, and vertical directions)

(2) Inside of lower position of B pillar to the collision side of vehicle: 1 axis (lateral direction)

(3) Inside of side sill to the opposite of collision side of vehicle: 1 axis (lateral direction)

The positions of the accelerometers shall be recorded in Appendix 5.

4.1.9.2 Installing the Measuring Devices

(1) The measuring instruments shall be firmly secured to the test vehicle at locations where the measuring instruments will not be affected by deformation caused by the collision test.

(2) Wiring connecting a transducer (apparatus which transforms physically amount to be measured into electric signals) and the measuring instruments secured in the test vehicle shall have an adequate margin so that the movement of the dummy is not affected during the collision test.

5. Testing Facilities, etc.

5.1 MDB

The MDB shall be according to Attachment 2. The MDB may be equipped with a proper braking system to avoid secondary collision of the MDB.

5.2 The Test Track

The testing site surface including the approach path and vehicle crash zone shall be a flat, horizontal, clean and dry surface.

5.3 The Towing Device

The towing device shall be capable of causing the MDB specified in Paragraph 5.1 to collide perpendicularly against the side face of the test vehicle at a coasting speed of 55.0 ± 1km/h.

5.4 Lighting Devices

Lighting devices shall be capable of emitting light sufficient for high-speed photography and cause no halation.

5.5 High-Speed Photography Device

The photographing speed of the high-speed photography device shall be set at 500 frames/second or more. The time intervals between reference time's signals (timing pulse, etc.) shall be 10ms or less.

The camera may be equipped with polarizing filters to reduce unnecessary light.

5.6 3-Dimensional Measuring Device

The accuracy of the 3-D measuring device used to measure the dimensions of the test vehicle, seating position of the dummy, and routing of the seat belts shall be 0.5mm/m or less.

5.7 The Speed Measuring Device

The speed measuring device shall be capable of measuring the time required for the MDB to pass through the speed measuring zone in unites of 0.1ms or less.

When converting the time into the speed (km/h) of the MDB, the speed-measuring device shall indicate the speed to the first decimal place.

The speed-measuring device shall be installed so as to be able to measure the speed of the MDB traveling within 2m from the collision point.

5.8 Temperature Measuring Device

The temperature of the dummy before conducting the test and the temperature at the time of dummy verification shall be recorded at intervals of five minutes or less using an automatic recorder. The minimum graduations of the thermometer shall be 0.1°C.

5.9 Electric Measuring Devices

The measuring device shall comply with the requirements of ISO 6487:2002**[2] under the condition in which all the devices between the constituent devices and the output devices (including a computer for analytical use) are connected (measuring device under this condition is referred to as "measurement channel.")

(1) The measurement channel shall measure acceleration, load, moment, and displacement according to the following channel classes.

① For collision tests, refer to the following:

(a) Head acceleration shall be 1,000.

(b) Neck load shall be 1,000.

(c) Neck moment shall be 600.

**[2] ISO 6487:2000 is considered as the same requirement

(d) Shoulder load shall be 600.

(e) Shoulder displacement shall be 180.

(f) Chest displacement shall be 180.

(g) Abdominal displacement shall be 180.

(h) The #12 thoracic vertebrae acceleration shall be 180.

(i) Abdominal acceleration shall be 600.

(j) The ilium load shall be 600.

(k) The femoral neck load shall be 600.

(l) Pillar B acceleration shall be 60.

(m) Side sill acceleration shall be 60.

(n) Tunnel acceleration shall be 60.

(o) MDB acceleration shall be 60.

② For dummy verification, channel classes shall be as follows in addition to the provisions of ① above.

(a) Neck pendulum acceleration shall be 60.

(b) Displacement of the neck rotator shall be 1,000.

(c) Acceleration of the shoulder impactor shall be 180.

(d) Shoulder displacement shall be 600.

(e) Acceleration of the chest impactor shall be 180.

(f) Acceleration of the #4 thoracic vertebrae shall be 180.

(g) Acceleration of the #12 thoracic vertebrae shall be 180.

(h) Chest displacement shall be 600.

(i) Acceleration of the abdominal impactor shall be 180.

(j) Abdominal displacement shall be 600.

(k) Acceleration of the ilium impactor shall be 180.

(l) Abdominal acceleration shall be 180.

(2) When covering analog values into digital values in the measurement channel, the number of samples per second shall be 8,000 or more in the collision test. For dummy verification, the number of samples shall be at least 8 times as many as the channel classes specified in ②.

(3) The HIC shall be calculated with the sampling time (time intervals of data samples to be conducted according to the above described provision) set to the minimum time interval. The range of this calculation shall be between the collision and 150ms after the collision.

(4) Deletion (filtering) of the high-frequency components in accordance with the channel classes shall be performed before calculating the head resultant acceleration, HIC, and the like.

5.10 The Transducer

5.10.1 Measurement Items of Dummy, Test Vehicle, and MDB

The measurement channels shall be acceleration, load, moment and displacement according to the channel classes specified in Table 1. The minimum measurement capacity shall be as follows.

Table 1: Sensor in the Dummy and Measurement Channel

Dummy

Measuring Position	Item to be Measured		Min. Meas. Amount	No. of Meas. Channels
Head	Accelerometer	Ax・Ay・Az	250G	3
Neck	Load Meter	Fx・Fy・Fz	5kN	3
	Moment Meter	Mx・My・Mz	300Nm	3
Shoulder (collision side)	Load Meter	Fx・Fy・Fz	8kN	3
	IR-TRACC	Drib &Drot	100mm	2
Chest (Upper / Mid / Lower)	IR-TRACC	Drib &Drot	100mm	6
Abdomen (Upper / Lower)	IR-TRACC	Drib &Drot	100mm	4
Rib 12 (T 12)	Accelerometer	Ax・Ay・Az	200G	3
Lower Back	Accelerometer	Ax・Ay・Az	200G	3
Pelvis	Load Meter	Fy	5kN	1
Femoral Head (collision side)	Load Meter	Fx・Fy・Fz	5kN	3
Dummy's Total # of Channels				34

Test Vehicle

Measuring Position	Item to be Measured		Min. Meas. Amount	No. of Meas. Channels
Tunnel	Accelerometer	Ax・Ay・Az	100G	3
Collision Side Pillar B, lower, inner	Accelerometer	Ay	200G	1
Non-Collision Side Side Sill, lower, inner	Accelerometer	Ay	100G	1
Vehicle's Total # of Channels				5

MDB

Measuring Position	Item to be Measured		Min. Meas. Amount	No. of Meas. Channels
MDB (front)	Accelerometer	Ax	100G	1
MDB (center)	Accelerometer	Ax・Ay・Az	200G	3
MDB's Total # of Channels				4

5.10.2 Recording the Electrical Measurement Results on Recording Medium

The measurement results of acceleration and load shall be recorded on a recording medium with a channel class of 1,000 or more.

6. Testing Procedure

The traveling speed of a trolley equipped with a barrier face (MDB) shall be 55 ± 1km/h and it shall collide with the test vehicle (dummy side) which is situated perpendicularly to the MDB.

In this case, the deviation between 250mm rearward from the front seat's seating reference point (adjacent to the deviation center of the barrier face of the MDB and the test vehicle's collision side) and the perpendicular vertical section to the vehicle's center face shall be within ±25mm. The horizontal center section will be between 2 horizontal planes 25mm above the horizontal surface measured before the test at the moment of collision.

7. Recording, Items to be Measured

7.1 Recording Prior to the Test

7.1.1 Confirming and Recording of Received Vehicle for Test

After receiving a vehicle for the test, the test institute shall check the following items and recor d the results in Appendix 2. At the same time, must make sure that vehicle complies specificatio ns of the vehicle provided from NASVA.

(1) Name, model, and classification
(2) Frame number
(3) Shape of body
(4) Engine model
(5) Drive system
(6) Type of transmission
(7) Type of steering system (steering wheel, presence or absence of steering column adjustment, presence or absence of airbag)
(8) Types of Seat belt, retractor, and anchorage (driver's seat and front passenger seat)
(9) Presence or absence of side airbags (driver's seat and front passenger seat, side curtain airbags, torso airbags, and other types)
(10) Type of seat (driver seat, front passenger seat, adjustable mechanism)
(11) Presence or absence of air conditioner
(12) Presence or absence of power steering
(13) Presence or absence of vehicle speed sensing door lock system
(14) Presence or absence of ABS and traction control system
(15) Presence or absence of sunroof
(16) Presence or absence of footrest

7.1.2 Recording the Verification Results for Dummy and Barrier Face

(1) The test institute shall record the verification results for the dummy and the deformable barrier conducted before the test. The verification results for the deformable barrier may be replaced by the performance certification issued by the manufacturer.
(2) The dummy shall be re-verified after conducting the test four times. If the injury criterion reaches or exceeds the acceptable limit (ex. HIC_{15} 700), the part of the dummy concerned shall be re-verified. If a component of the dummy is damaged, the component concerned shall be replaced by a verified component.

7.1.3 Recording the Measuring Instrument Calibration Results

(1) The calibration results of the measuring instruments (each measurement channel including transducer) conducted before the test shall be recorded. The valid period for the measuring instrument calibration shall be one year. The measuring instruments may be used during that period.
If any abnormalities, etc. are found in the measuring instruments, the measuring instruments shall be re-calibrated at that time.
(2) To determine whether or not the injury criteria are calculated correctly, verifications shall be made

using a calibration signal generation device.

7.1.4 Recording Measurement Results for Dimensions of Vehicle and Barrier Face before Test

The test institute shall measure and record the position of each part of the vehicle and the ba rrier face before conducting the test using a three-dimensional measuring device, which is specifi ed in Appendix 3.

7.1.5 Recording Measurement Results for Seating Position of Dummy

(1) The test institute shall place the dummy according to Paragraph 4.1.8.2 and measure and record the seating position of the dummy according to Appendix 1 (7.2).

(2) The test institute shall color the dummy according to Appendix 6 after placing the dummy and recording its position.

(3) The test institute shall confirm the seating position of the dummy after the above-mentioned works.

7.1.6 Recording Final Vehicle Conditions prior to Test

After preparing the test vehicle, the test institute shall confirm and record the following:

(1) Mass of the test vehicle

(2) Names and masses of parts removed, and mass after adjustment

(3) Inclination of the test vehicle (fore-and-aft direction and lateral direction)

(4) Adjusted position of the seats

(5) Adjusted position of steering system

(6) Adjusted position of seat belt anchorage

(7) Positions of accelerometers in each part of vehicle body

(8) Positions of target marks attached to vehicle body

(9) Reference positions for measurement of vehicle dimensions

(10) Location of seating reference points

7.1.7 Recording the Dummy Temperature

The test institute shall record the start time and the finish time of the dummy soak and the te mperatures.

7.2 Recording During the Test

7.2.1 Recording Collision Speed and Deviation of MDB

The test institute shall record the speed of the MDB at a point just before the collision with the test vehicle. The test institute shall measure and record the deviations at the moment of collision between the vertical and horizontal center cross sections of the moving barrier face respectively from the horizontal and vertical center sections which pass through the seating reference point on the collision side of the test vehicle and are perpendicular to the vehicle's center cross section.

"Just before the moment of collision" means that the MDB is traveling at the specified coasting speed and is within 2m from the test vehicle.

7.2.2 Recording Electrical Measurement Results for Each Part of Dummy, Vehicle Body, etc.

The test institute shall record the electrical measurement results for the accelerometers, load meters, and displacement meters installed in each section of the dummy, vehicle body, etc., for a period of time from 20ms before the collision to 150ms or more after the collision.

(1) Acceleration of the head of the dummy in the fore-and-aft direction

(2) Acceleration of the head of the dummy in the lateral direction

(3) Acceleration of the head of the dummy in the vertical direction

(4) Load applied to the neck of the dummy in the fore-and-aft direction

(5) Load applied to the neck of the dummy in the lateral direction

(6) Load applied to the neck of the dummy in the vertical direction

(7) Moment of the dummy neck in the fore-aft direction

(8) Moment of the dummy neck in the lateral direction

(9) Moment of the dummy neck in the vertical direction

(10) Load applied to the shoulder of the dummy in the fore-and-aft direction

(11) Load applied to the shoulder of the dummy in the lateral direction

(12) Load applied to the shoulder of the dummy in the vertical direction

(13) Displacement of the dummy shoulder

(14) Rotation of the dummy shoulder

(15) Displacement of the upper rib of the dummy

(16) Rotation of the upper rib of the dummy

(17) Displacement of the middle rib of the dummy

(18) Rotation of the middle rib of the dummy

(19) Displacement of the lower rib of the dummy

(20) Rotation of the lower rib of the dummy

(21) Displacement of the upper abdomen of the dummy

(22) Rotation of the upper abdomen of the dummy

(23) Displacement of the lower abdomen of the dummy

(24) Rotation of the lower abdomen of the dummy

(25) Acceleration of the 12th rib of the dummy in the fore-aft direction

(26) Acceleration of the 12th rib of the dummy in the lateral direction

(27) Acceleration of the 12th rib of the dummy in the vertical direction

(28) Acceleration of the lumbar of the dummy in the fore-aft direction

(29) Acceleration of the lumbar of the dummy in the lateral direction

(30) Acceleration of the lumbar of the dummy in the vertical direction

(31) Load applied to the pubic symphysis of the dummy in the lateral direction

(32) Load applied to the femur of the dummy in the fore-aft direction (collision side)

(33) Load applied to the femur of the dummy in the lateral direction (collision side)

(34) Load applied to the femur of the dummy in the vertical direction (collision side)

(35) Tunnel Acceleration in the fore-aft direction

(36) Tunnel Acceleration in the lateral direction

(37) Tunnel Acceleration in the vertical direction

(38) Acceleration of the collision side lower part of B pillar in the lateral direction

(39) Acceleration of the non-collision side's side sill in the lateral direction

(40) Acceleration of the MDB front in the fore-aft direction

(41) Acceleration of the MDB center in the fore-aft direction

(42) Acceleration of the MDB center in the lateral direction

(43) Acceleration of the MDB center in the vertical direction

7.2.3 Recording the Injury Criteria

The injury criteria for the dummy shall be calculated from the obtained in Paragraph 7.2.2 according to the following method and shall be recorded.

(1) HIC (Head Injury Criterion)

The maximum value among the values calculated according to the following formula shall be determined using the head resultant acceleration of the dummy.

$$HIC = \left[\frac{1}{t_2 - t_1}\int_{t_1}^{t_2}\frac{a_R}{9.80665}dt\right]^{2.5}(t_2 - t_1)$$

Where,

a_R is the resultant acceleration of accelerations of the head in the fore-and-aft direction, in the lateral direction and in the vertical direction (a_X, a_Y, a_Z) (Unit: m/s^2)

$$a_R = \sqrt{a_X{}^2 + a_Y{}^2 + a_Z{}^2}$$

t_1 and t_2: Any two points in time during collision (unit: s)

But $|t_2 - t_1| \leq 0.015s$

(2) Shoulder Injury Criterion

The highest value of the lateral shoulder load.

(3) Thorax injury criterion

- Take the displacement and rotation angles of the dummy's upper, mid, and lower chest measured by IR-TRACC, then use the following formula to calculate the highest value.

$$Dy_{thorax} = \max(Dy(t) - Dy(0))$$

Where,

$$Dy(t) = R(t) \cdot \sin(\Phi(t))$$

R(t) : IR-TRACC displacement

Φ(t) : IR-TRACC rotation angle

Dy(0) : chest displacement in regards to t=0

(4) Abdominal Peak Deflection: APD

Take the displacement and rotation angles of the dummy's upper, and lower abdomen measu red by IR-TRACC, then use the following formula to calculate the highest value.

$$Dy_{abdo\min al} = \max(Dy(t) - Dy(0))$$

Where,

$$Dy(t) = R(t) \cdot \sin(\Phi(t))$$

R(t) : IR-TRACC displacement

Φ(t) : IR-TRACC rotation angle

Dy(0) : abdominal displacement in regards to t=0

(5) Pubic Symphysis Peak Force: PSPF

The maximum lateral load on the compressed side at the pubic symphysis of the pelvis.

7.2.4 High-Speed Photography

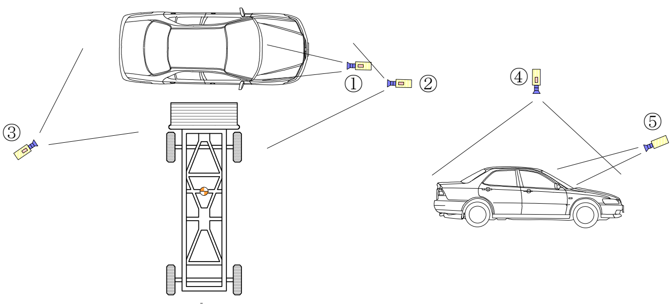
The test institute shall photograph the movement of the test vehicle, and the dummy as indicated in Table 2 using a high-speed VTR. Strobe flashes, etc., which indicate the moment of collision, shall be included in each camera angle. However, if all cameras with a digital photographing system are synchronized, it is permissible to confirm the strobe light by one of these cameras.

Table 2: High-speed Photographing Range

Camera No.	Filming Position
①	Dummy head behavior
②	Vehicle and MDB behavior (frontwards)
③	Vehicle and MDB behavior (oblique rear)
④	Vehicle and MDB behavior (birds-eye view)
⑤	Dummy chest behavior

High-Speed Camera Position

(1) From the top (2) From the right



7.3 Recording After the Test

7.3.1 Photographing Test Vehicle Conditions Immediately after the Test

Distinctive sections for safety performance shall be carefully observed and recorded (photographed) both immediately after the test and after confirming the opening capability of the side doors as prescribed in Paragraph 7.3.4.

7.3.2 Confirmation of Turning-Over of the Test Vehicle Immediately after Collision

The test institute shall record the occurrence of turning-over of the test vehicle immediately after the test:

(1) Vehicle turning-over occurred

(2) Vehicle turning-over did not occur

7.3.3 Confirmation and Recording of Door Opening during Test

The test institute shall confirm and record doors that opened during the test by analyzing high-speed video, etc. and the occurrence of separation of side doors from the installation parts and latch releasing immediately after the test (if the test vehicle turned over sideways, it shall be kept in that condition). In this case, door opening means that the door opened about its hinge during the collision.

7.3.4 Confirmation and Recording of Opening Capability of Side Doors

The test institute shall confirm the opening capability of all the side doors (excluding the side door on the collision side) of the test vehicle. At this time, a record shall be made as to how the door could be opened using any of the methods given below and the position of the door lock shall be confirmed. If the test vehicle turned over sideways during the collision, the confirmation and record shall be made after righting the vehicle.

(1) The door could be opened using one hand.

(2) The door could be opened using both hands.

(3) The door had to be opened using tools.

7.3.5 Confirmation and Recording of Removability of Dummy

After confirming the opening capability of the side doors as prescribed in the previous paragraph, the test institute shall confirm removability of the dummy from the test vehicle. At this time, confirmation and a record shall be made as to how the dummy could be removed from the test vehicle using any of the methods given below.

(1) No tool was used. No adjustment mechanism for the seat or the steering system, etc. was operated.

(2) No tool was used. However, the adjustment mechanism for the seat or the steering system, etc. was operated.

(3) Tools were used.

When operating the adjustment mechanism for the steering system, marks shall be made indicating the conditions before the operation. The adjustment mechanism shall then be returned to the original position before measuring the vehicle dimensions after the test as prescribed in Paragraph 7.3.8.

7.3.6 Confirmation and Recording of Vehicle Interior

(1) Confirmations shall be made as to whether parts have detached from devices or components in the vehicle, which have sharp edges and clearly increase harm to the occupants.

(2) Confirmations shall be made as to breakage of devices or components in the vehicle due to permanent deformation of hard metal body parts such as the frame, which clearly increase harm to the occupants.

7.3.7 Recording of Measurement Results for Dimensions of Test Vehicle and Barrier Face after the Test

The test institute shall measure and record the dimensions of the test vehicle and barrier face after the test at the same points as measured before the test specified in Paragraph 7.1.4 using a three-dimensional measuring device. Any difference in the measured values before and after the test shall be calculated and recorded.

7.3.8 Recording of Measurement Results for Fuel Leakage

The presence or absence of fuel flowing or dripping from each part of the vehicle after collision shall be confirmed and recorded.

7.3.9 Calibration and Recording of Accelerometer

The accelerometer used in the test shall be calibrated after collision, and the calibration results shall be recorded.

7.4 Handling of Measured Values

The measured values, etc. shall be handled as follows:

(1) The measured values for speed (km/h) shall be rounded off to the first decimal place.

(2) The measured values for distance (mm) shall be rounded off to the nearest whole number.

(3) The measured values for acceleration (m/s^2) shall be rounded off to the second decimal place.

(4) The measured values for load (kN) shall be rounded off to the second decimal place.

(5) The measured values for moment (Nm) shall be rounded off to the second decimal place.

(6) The measured values for chest displacement (mm) shall be rounded off to the second decimal place.

(7) The measured values for abdomen displacement (mm) shall be rounded off to the second decimal place.

(8) The measured values for HIC15 shall be rounded off to the first decimal place.

Appendix 1: Test Vehicle Specification Data Sheet

【To be filled in by the Manufacturer】

For Side Collisions

1. Adjustment of Seat and Seat Belt

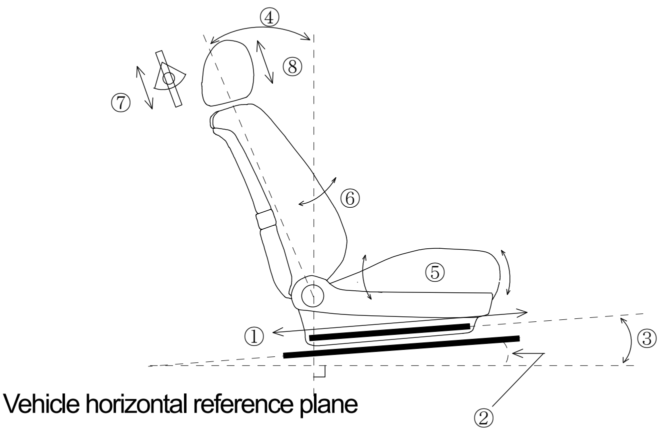
Row 1

				Driver's Seat	Front Passenger's Seat
①Adjustment of seat in fore-and-aft direction		Adjustment amount per stage		mm	mm
		Total Adjustment		mm	mm
		Mid position	From front edge	mm(stage)	mm(stage)
			From rear edge	mm(stage)	mm(stage)
②Adjustment of seat-slide-rail in attaching angle				°	°
③Adjustment of seat lower and seatback at once		Middle Position		°	°
		Adjustment Method			
④ Adjustment of seatback angle		Design Standard Angle		° (stage)	° (stage)
⑤Adjust-ment of seat in vertical direction	Tilt	Middle Position	From the lowest	mm	mm
	Lifter			mm	mm
	Other			mm	mm
⑥Adjustment of lumbar support		From the Release Position			
⑦Adjustment of anchorage for seat belt shoulder webbing		Adjustment Range		mm(stage)	mm(stage)
		Design Standard Position		[From top position] mm(stage)	[From top position] mm(stage)
⑧Adjustment of headrest height		Adjustment Range		mm(stage)	mm(stage)
		Design Standard Position		[From top position] mm(stage)	[From top position] mm(stage)
⑨Other Adjustments ( )		Design Standard Position			

Rows 2 and 3

			Row #2	Row #3
① Adjustment of seat in fore-and-aft direction	Adjustment amount per stage		mm	mm
	Total Adjustment		mm	mm
	Design Standard	From front edge	mm(stage)	mm(stage)
		From back edge	mm(stage)	mm(stage)
④Adjustment of seatback angle	Design Standard Angle		° (stage)	° (stage)
⑦Adjustment of anchorage for seat belt shoulder webbing	Adjustment Range		mm(stage)	mm(stage)
	Design Standard Position		[From top position] mm(stage)	[From top position] mm(stage)
⑧ Adjustment of headrest height	Adjustment Range		mm(stage)	mm(stage)
			[From top position] mm(stage)	[From top position] mm(stage)
⑨ Other Adjustments ( )	Design Standard Position			

(Note) The number of stages for adjustment position shall start from the first locking position ("stage 0").



(Note) position of ⑨ other adjustable mechanism shall be shown on the above drawing.

2. Adjustment of Steering System

(1) Vertical direction: (present, absent)

Adjustment range: ° ~ ° (stage)

Vertical adjustment position: From uppermost position ° (stage)

(2) Fore-aft direction:

Adjustment range: mm(stage)

Fore-and-aft adjustment position: From most forward position mm(stage)

(Note) The number of stages for adjustment position in the vertical directions and the fore-and-aft directions shall start from the uppermost position and front position ("stage 0"), respectively.

(3) Distance between steering pad center and forward end of steering shaft: mm

3. Fuel Tank Capacity: ________L

If noting the position of the mounted weights when measuring mass at vehicle delivery, indicate below.

A sketch or photograph is acceptable.

4. Reference Points of Measurement of Vehicle Inclination

(Enter inclination of unloaded vehicle with a dummy placed.)

(1) Fore-and-aft directions

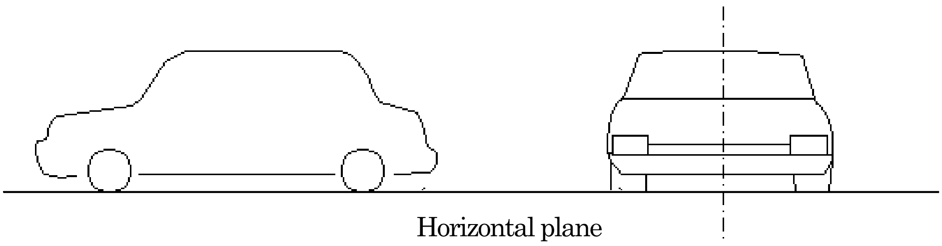
Reference points (Number of points): ___________ (Points indicated in the figure below.)

Angle to horizontal surface: __________°

(2) Lateral directions

Reference points (Number of points): _____________(Points indicated in the figure below.)

Angle to horizontal surface: __________°



5. Location and Method for Installation of Vehicle Accelerometer (reference)

Entry shall be made using Appendix 5.

6. Removable Parts (reference)

Entry shall be made using Appendix 7

7-1. Design Specifications for Dummy's Seating Position

For Side Collisions	To be filled in by manufacturer

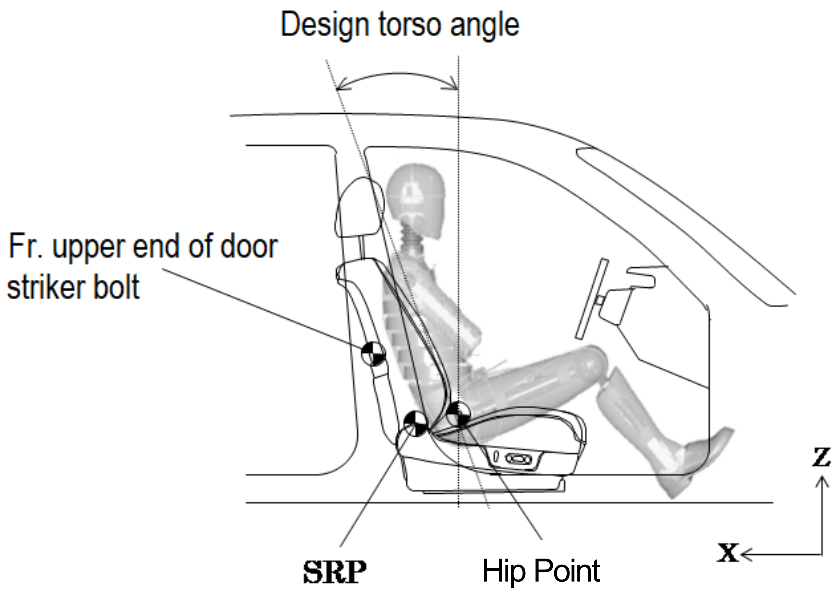
① **3-D measuring device recording sheet**

Model name and type:____________________

Frame No.: ____________________

Type of Dummy: ____________________

Dummy Number: ____________________ Notes: ______________________



Unit: mm

Measurement Items	Driver's Seat (Right seat / Left seat)			Passenger Seat (Right / Left)		
	X	Y	Z	X	Y	Z
Fr Upper end of door striker bolt						
SRP (Seating Reference Point)						
Design Hip Point (R)						
Hip Point						
Dummy Center (ref.)						
Design Torso Angle	°			°		

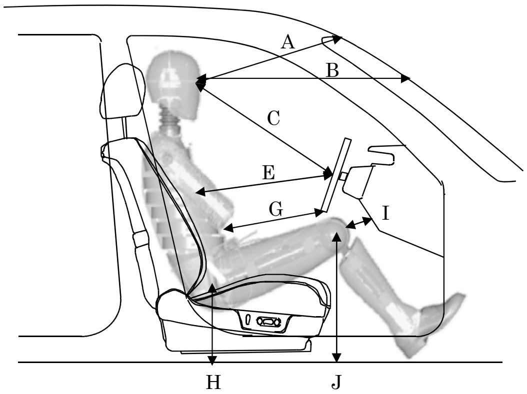
※The coordinates in the seat position at the time of the test, shall be recorded in Design Hip Point(R)

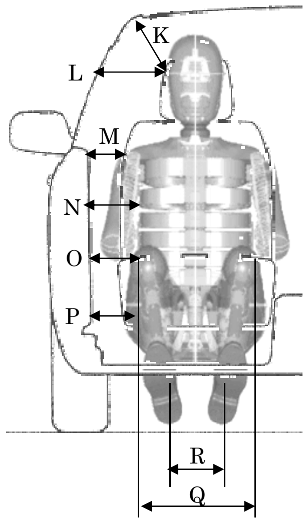
※To determine the vehicle posture, vehicle manufacturer shall provide reference points of marking information for specified test vehicle. To determine the mark of reference points, the vehicle manufacturer may provide necessary drawings including the information specified mark of reference points on the drawing.

②−1 Record sheet for simple measurement use (for Driver's seat)

Vehicle name/model: ______________	Data: (d d / m m / y y y y) ______________
Frame No. ______________	Test Site: ______________
Type of Dummy: ______________	Oversees: ______________
Dummy No. ______________	Notes : ______________

Driver's Seat





Measurement Items (unit: mm)	
A : Head to windshield header (from the middle of the forehead*1 to glass surface)	
B: Head to windshield (horizontal distance)	
C: Head to steering STG-wheel (from the middle of the forehead*1 to the center of wheel)	
D: Head angle (tilt sensor)	X: Y:
E: MID rib to the center of STG-wheel (from MID rib to the center of wheel)	
F : Chest angle (tilt sensor)	X: Y:
G: Upper end of abdomen to STG-wheel (from the upper end of abdomen*2 to the center of wheel)	
H: H. P to floor (vertical distance to floor mat)	
I: Knee to dashboard (shortest distance)	Right: Left:
J: Height of knee*4 (vertical distance to floor mat)	Right: Left:
K: Center of gravity of head to side roof (shortest distance)	
L: Center of gravity of head to side window (shortest distance)	
M: Arm to door (horizontal distance from the skin through the center of bolt hole)	
N: MID rib to door (horizontal distance)	
O: Upper end of abdomen*2 to door (horizontal distance)	
P: H.P*3 to door (horizontal distance with a waist pad attached)	
Q: Interval between knees*4 (between outside the flange bolts)	
R: Interval between ankles (the center of ankles)	

*1: the same height as the head's center of gravity

*2: above the first abdominal rib

*3: mark the HP position on the suit

*4: a measurement with the suit open

②−2 For simple measurement use (front passenger seat)

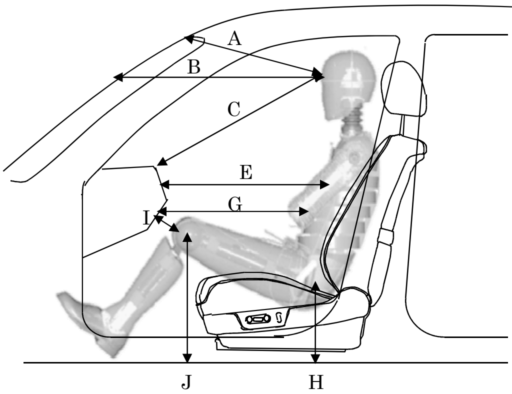
Vehicle name/model:______________________ Date: (dd/mm/yyyy)____________

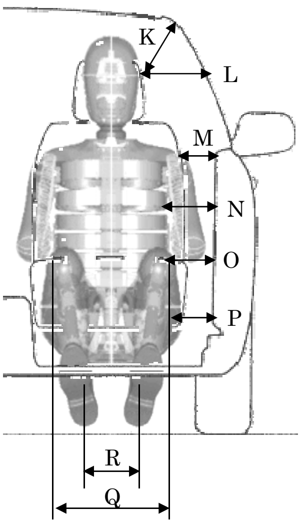
Frame No. ______________________ Test Site: ________________________

Type of Dummy ______________________ Overseer: ________________________

Dummy No. ______________________ Notes: ________________________

Front Passenger Seat





Measurement Items (unit: mm)	
A : Head to windshield header (from the middle of the forehead*1 to glass)	
B: Head to windshield (horizontal distance)	
C: Head to tip of dashboard (from the center brow*1 to the tip of dashboard)	
D: Head Angle (Tilt sensor)	X: Y:
E: MID Rib to tip of dashboard (from MID to dashboard tip)	
F: Chest Angle (Tilt sensor)	X: Y:
G: Upper end of abdomen to dashboard (from the upper end of abdomen*2 to the center of dashboard)	
H: H. P to floor (vertical distance to floor mat)	
I: Knee to dashboard (shortest distance	Right: Left:
J: Height of knee*4 (vertical distance to floor mat)	Right: Left:
K: Center of gravity of head to side roof (shortest distance)	
L: Center of gravity of head to side window (shortest distance)	
M: Arm to door (horizontal distance from the skin through the center of bolt hole)	
N: MID rib to door (horizontal distance)	
O: Upper end of abdomen*2 to door (horizontal distance)	
P: H.P*3 to door (horizontal distance with a waist pad attached)	
Q: Interval between knees*4 (between outside the flange bolts)	
R: Interval between ankles (the center of ankles)	

*1: the same height as the head's center of gravity

*2: above the first abdominal rib

*3: mark the HP position on the suit

*4: a measurement with the suit open

*The vehicle manufacturer shall submit the measurement values to install the dummy as specified in ②−1 (Driver's Seat) and ②−2 (Fr. Passenger seat)

7-2. Measurement Results Record Sheet of Dummy Seating Position

For Side Collision

To be filled in by testing institute

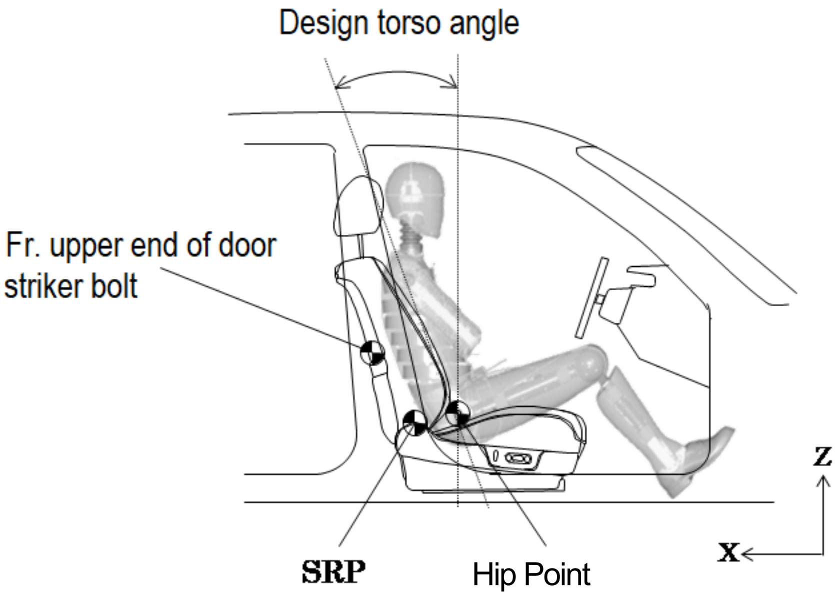
① 3-D Measuring Device Simple Recording Sheet

Vehicle Name/Model:______________________ Date: (dd/mm/yyyy)____________

Frame No. ______________________ Test Site: ______________________

Dummy Type: ______________________ Overseer: ______________________

Dummy No. ______________________ Notes: ______________________



Unit: mm

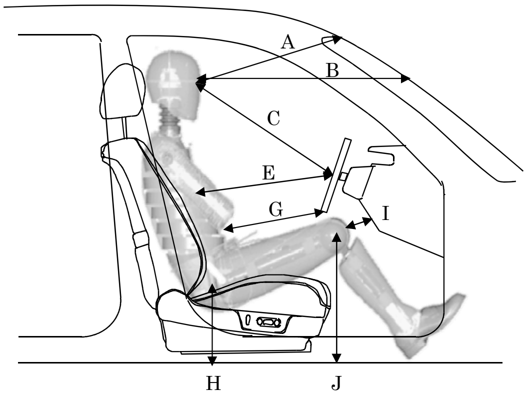
Dummy Mounting Position	Driver's Seat / Front Passenger Seat		
Measurement Items	Right Seat / Left Seat		
	X	Y	Z
Fr. Door Striker Bolt Upper Edge			
SRP (Seating Reference Point)			
Head Center of Gravity (Collision Side)			
Hip Point (Hm)			
Dummy Center (reference)			
Dummy Torso Angle	°		

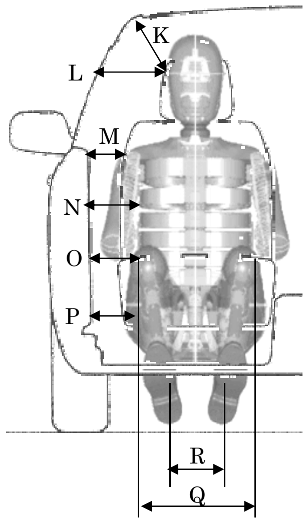
(Note) For the measured value of the hip point when the dummy is mounted, Both the X and Z points must be within ±5mm of a position 20mm forward from the design hip point . If the hip point is not in this range, the related organizations shall be consulted to make the necessary corrections. After these steps have been carried out, at least Paragraph 4.1.8.2 "Dummy Mounting Procedure" shall be satisfied before the test is carried out.

②−1 Record sheet for simple measurement use (for Driver's seat)

Vehicle name/model: ______________	Date: (dd/mm/yyyy) ______________
Frame No. ______________	Test Site: ______________
Type of Dummy: ______________	Overseer: ______________
Dummy No. ______________	Notes: ______________

Driver's Seat





*1: the same height as the head's center of gravity

*2: above the first abdominal rib

*3: mark the HP position on the suit

*4: a measurement with the suit open

Measurement Items (unit: mm)	
A : Head to windshield header (from the middle of the forehead*1 to glass surface)	
B: Head to windshield (horizontal distance)	
C: Head to steering STG-wheel (from the middle of the forehead*1 to the center of wheel)	
D: Head angle (tilt sensor)	X: Y:
E: MID rib to the center of STG-wheel (from MID rib to the center of wheel)	
F : Chest angle (tilt sensor)	X: Y:
G: Upper end of abdomen to STG-wheel (from the upper end of abdomen*2 to the center of wheel)	
H: H. P to floor (vertical distance to floor mat)	
I: Knee to dashboard (shortest distance)	Right: Left:
J: Height of knee*4 (vertical distance to floor mat)	Right: Left:
K: Center of gravity of head to side roof (shortest distance)	
L: Center of gravity of head to side window (shortest distance)	
M: Arm to door (horizontal distance from the skin through the center of bolt hole)	
N: MID rib to door (horizontal distance)	
O: Upper end of abdomen*2 to door (horizontal distance)	
P: H.P*3 to door (horizontal distance with a waist pad attached)	
Q: Interval between knees*4 (between outside the flange bolts)	
R: Interval between ankles (the center of ankles)	

②−2 For simple measurement use (front passenger seat)

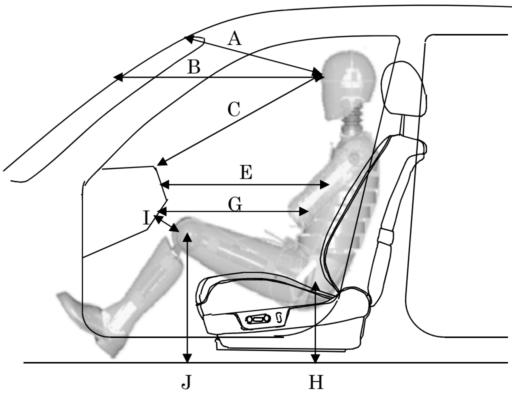
Vehicle name/model: ______________________ Date: （d d / m m / y y y y） ____________

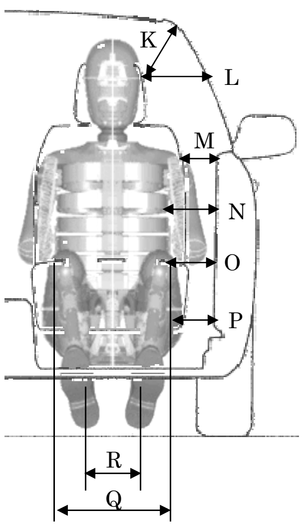
Frame No. ______________________ Test Site: __________________________

Type of Dummy ______________________ Overseer: __________________________

Dummy No. ______________________ Notes: __________________________

Front Passenger Seat





*1: the same height as the head's center of gravity

*2: above the first abdominal rib

*3: mark the HP position on the suit

*4: a measurement with the suit open

Measurement Items (unit: mm)	
A : Head to windshield header (from the middle of the forehead*1 to glass)	
B: Head to windshield (horizontal distance)	
C: Head to tip of dashboard (from the center brow*1 to the tip of dashboard)	
D: Head Angle (Tilt sensor)	X: Y:
E: MID Rib to tip of dashboard (from MID to dashboard tip)	
F: Chest Angle (Tilt sensor)	X: Y:
G: Upper end of abdomen to dashboard (from the upper end of abdomen*2 to the center of dashboard)	
H: H. P to floor (vertical distance to floor mat)	
I: Knee to dashboard (shortest distance)	Right: Left:
J: Height of knee*4 (vertical distance to floor mat)	Right: Left:
K: Center of gravity of head to side roof (shortest distance)	
L: Center of gravity of head to side window (shortest distance)	
M: Arm to door (horizontal distance from the skin through the center of bolt hole)	
N: MID rib to door (horizontal distance)	
O: Upper end of abdomen*2 to door (horizontal distance)	
P: H.P*3 to door (horizontal distance with a waist pad attached)	
Q: Interval between knees*4 (between outside the flange bolts)	
R: Interval between ankles (the center of ankles)	

*The vehicle manufacturer shall submit the measurement values to install the dummy as specified in ②−1 (Driver's Seat) and ②−2 (Fr. Passenger seat)

8. Seat Position for Determination of Seating Reference Point, etc.

The vehicle manufacturer shall attach a document that describes the lowest and most rearward seat positions that the driver and passengers can respectively take in their normal driving or seating positions and the way they determined such positions.

9. Seating Reference Point and Hip Point Specified by the Manufacturer

The vehicle manufacturer shall attach a track drawing for the seating reference point and hip point within the range of seat movement for the driver's seat and the front passenger seat, whether symmetrical or not. Furthermore, in the drawings, positions shall be specified relative to the base point mark.

10. Test Results by the Vehicle Manufacturer

The vehicle manufacturer shall attach the test results from the vehicle manufacturer, as required, using a form equivalent to Appendix 4.

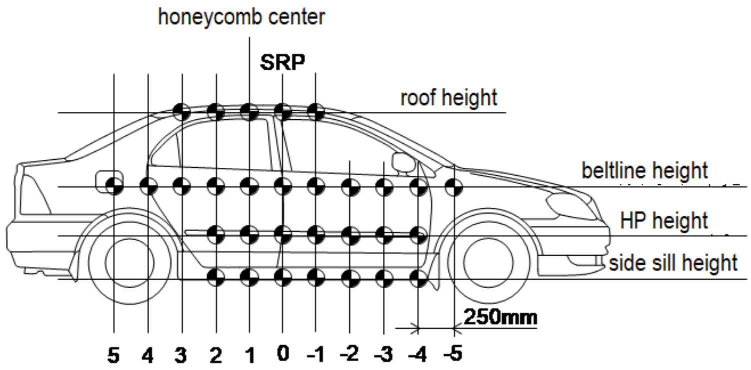
Appendix 2: Test Vehicle Specifications Data Sheet

【To be filled in by the testing institute】

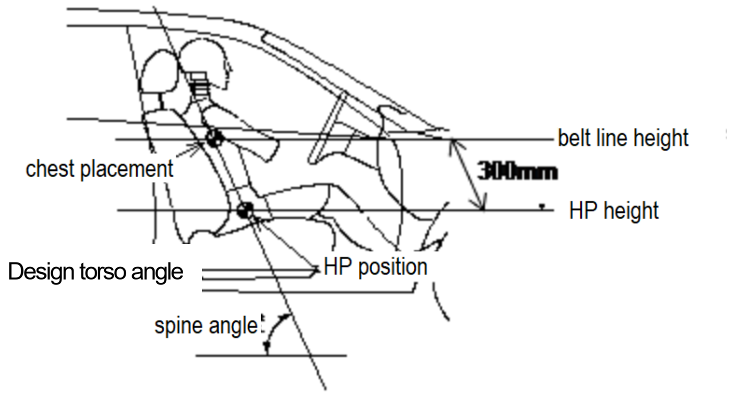
Vehicle name/model/classification		
Frame No.		
Body Style		
Engine Type		
Drive Type		
Transmission Type		
Steering System	Wheel Type	
	Airbag	Absent / Present
	Vertical Adjustment	Absent / Present (Electrical / Manual)
	Fore-Aft Adjustment	Absent / Present (Electrical / Manual)
Seats	Fore-Aft Adjustment	Absent / Present (Electrical / Manual)
	Seatback Adjustment	Absent / Present (Electrical / Manual)
	Lumbar Support Adjustment	Absent / Present (Electrical / Manual)
	Height Adjustment	Absent / Present (Electrical / Manual)
Seatbelts	Pre-tensioner	Absent / Present (Shoulder / Inside Waist)
	Shoulder Webbing Adjustment	Absent / Present (Electrical / Manual)
Side Airbag	Driver's Seat	Curtain: Absent / Present
		Torso: Absent / Present
		Other: Absent / Present
	Front Passenger's Seat	Curtain: Absent / Present
		Torso: Absent / Present
		Other: Absent / Present
Other Items (Circle those that are present)		Air conditioner / Power steering / Vehicle speed sensing door lock / Sunroof / Traction control / ABS / Side airbag / Footrest

Appendix 3: Dimensions of Vehicle and Deformable Barrier (example)

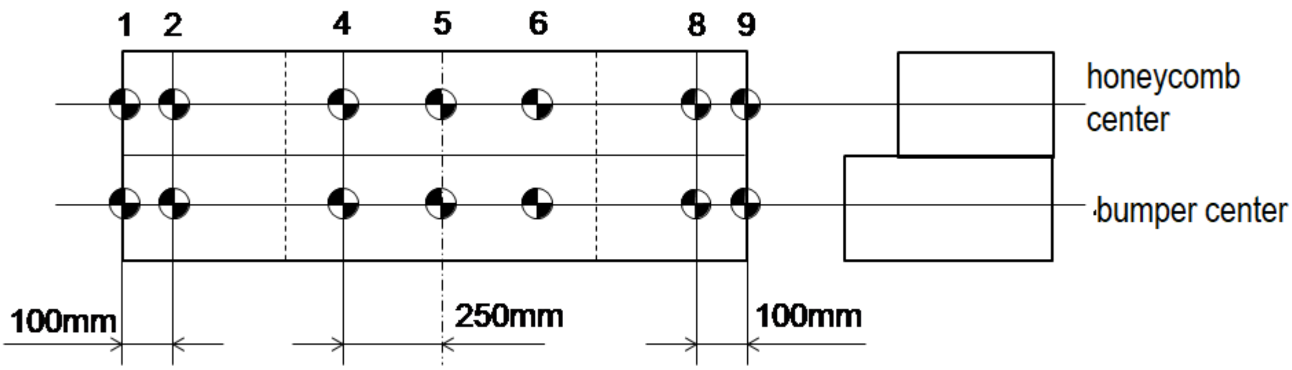
- Vehicle Body



- Vehicle Interior

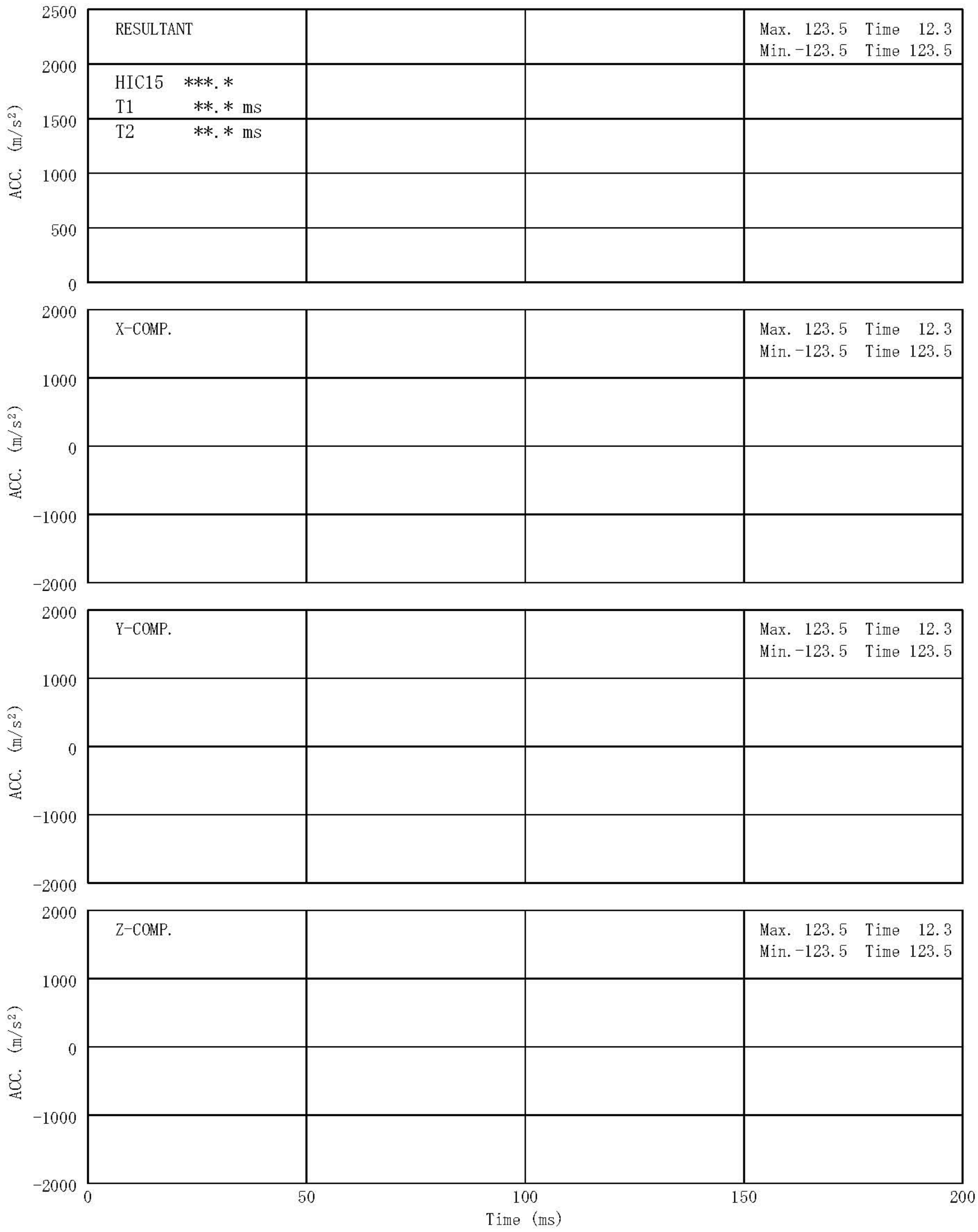


- Deformable Barrier



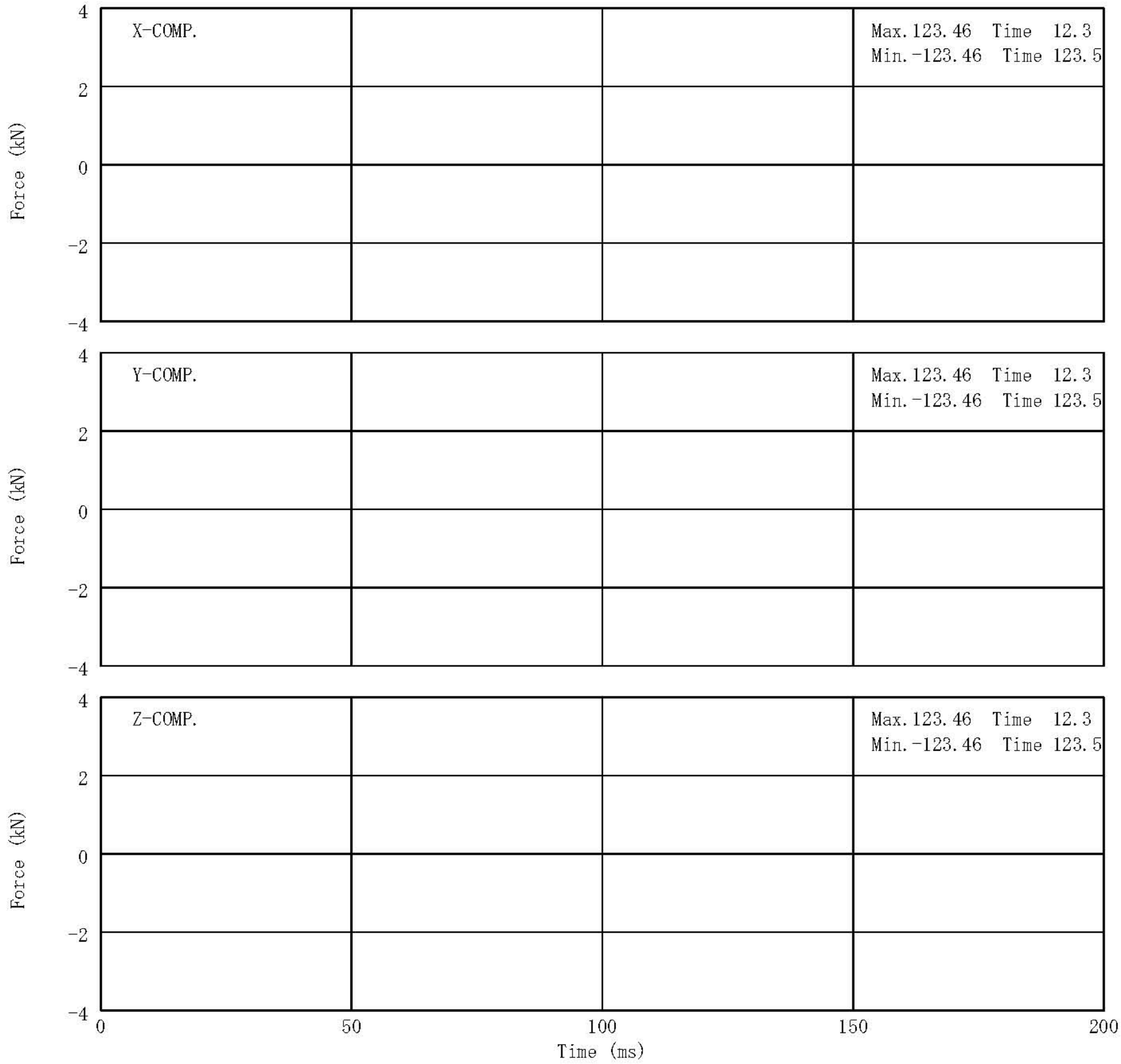
Level1	Honeycomb Center
Level2	Bumper Center

Appendix 4: Recorded Examples of Electric Measurement Results



Front Dummy Head Acc.

No. NASVA2018-9999-999



Front Dummy Upper Neck Force

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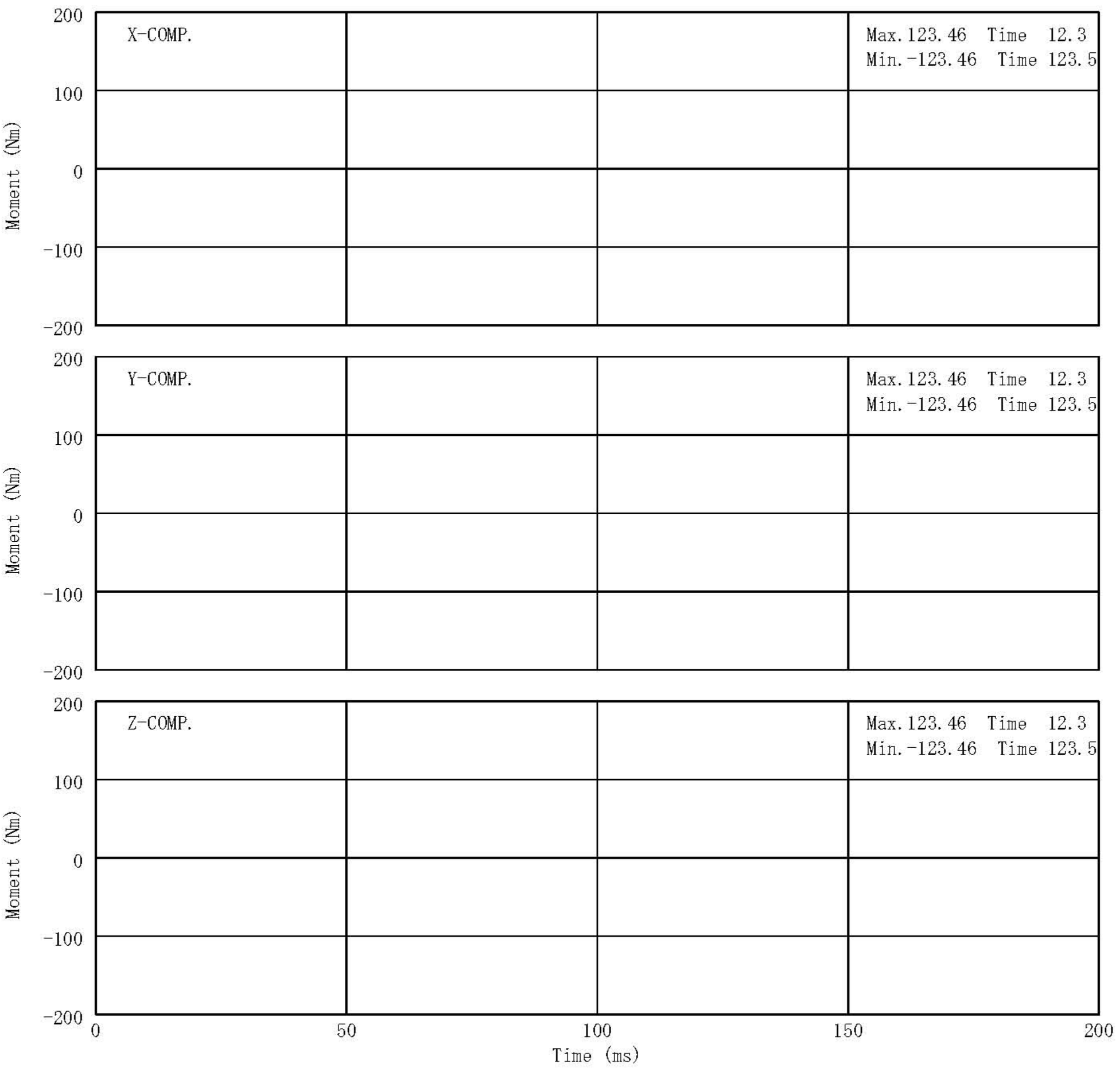

Front Dummy Upper Neck Moment

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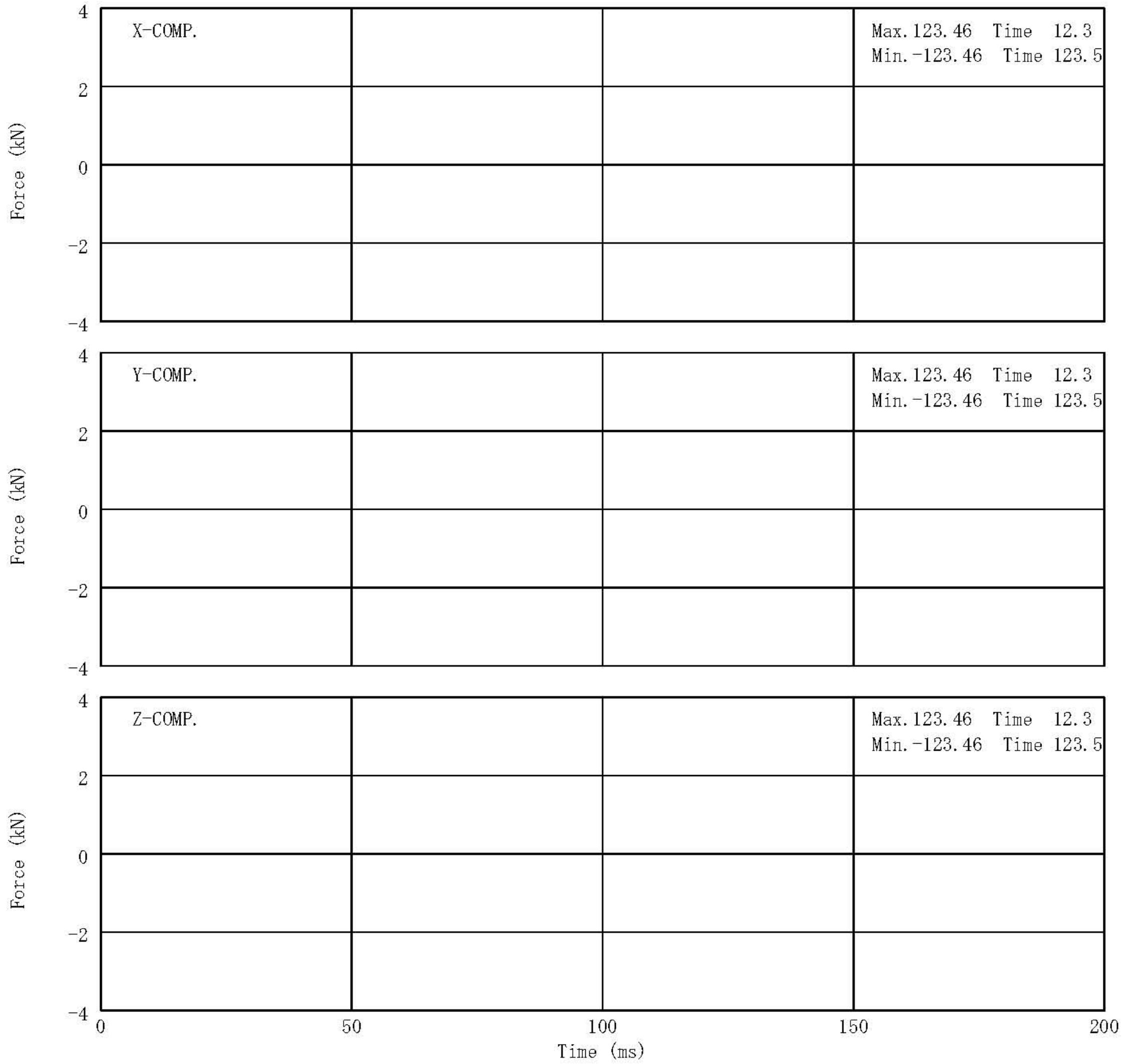

Front Dummy Shoulder Force

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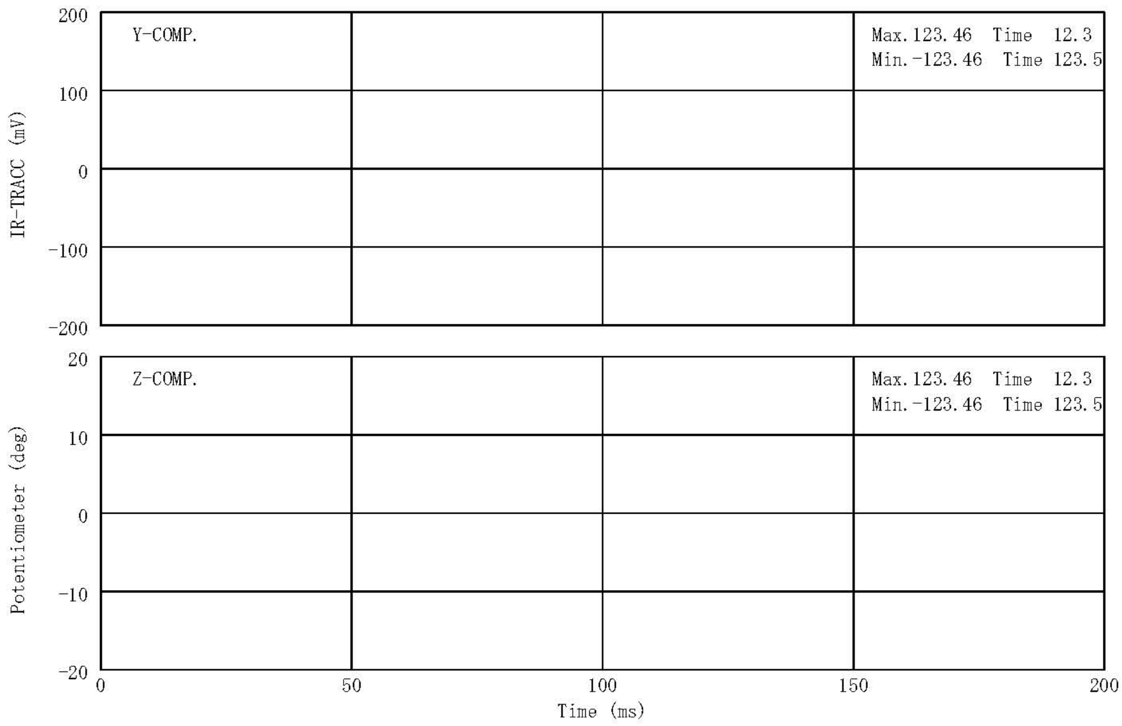

Front Dummy Shoulder IR-TRACC & Potentiometer

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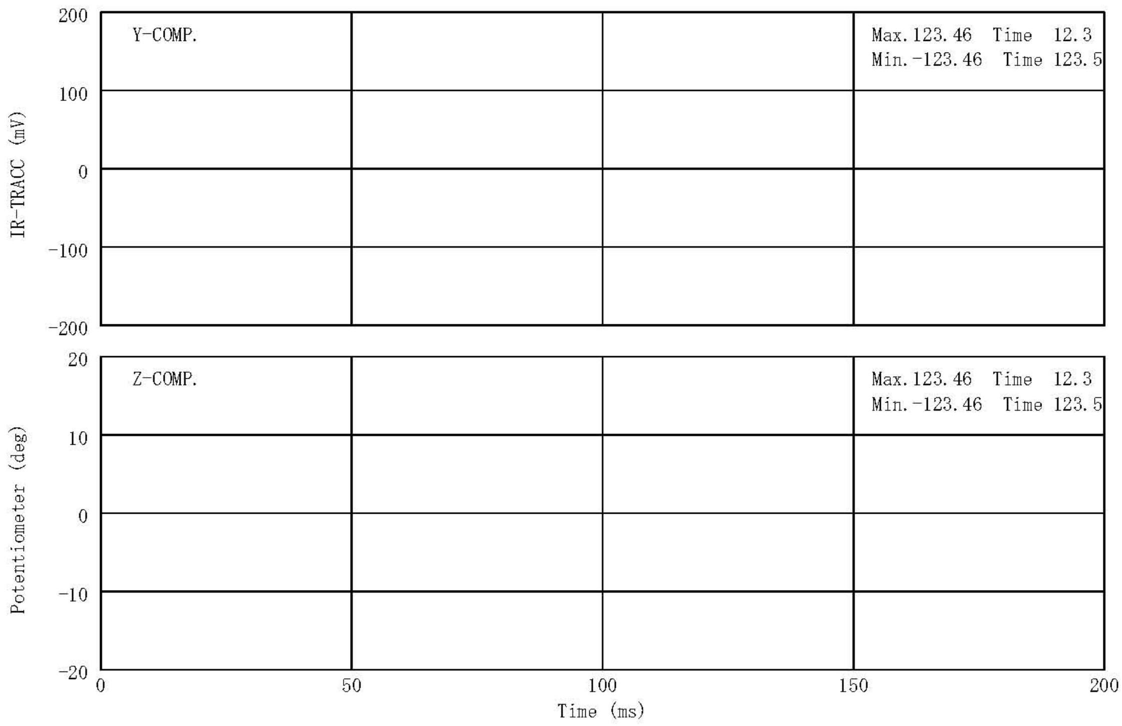

Front Dummy Thorax Rib1 IR-TRACC & Potentiometer

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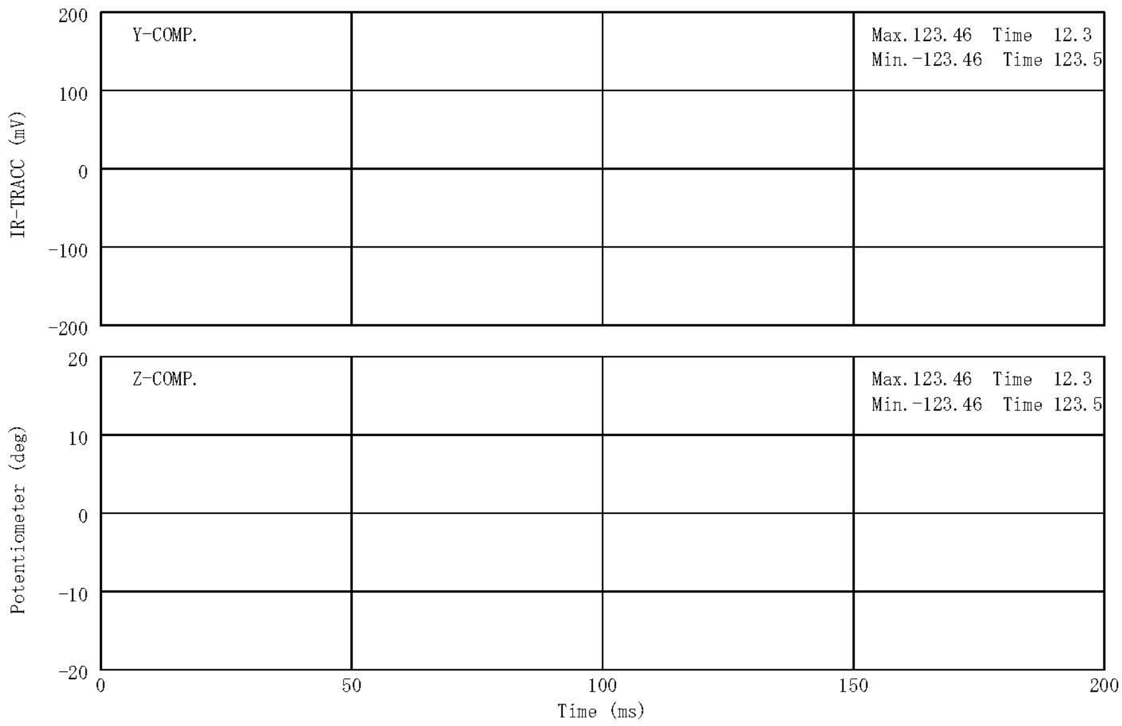

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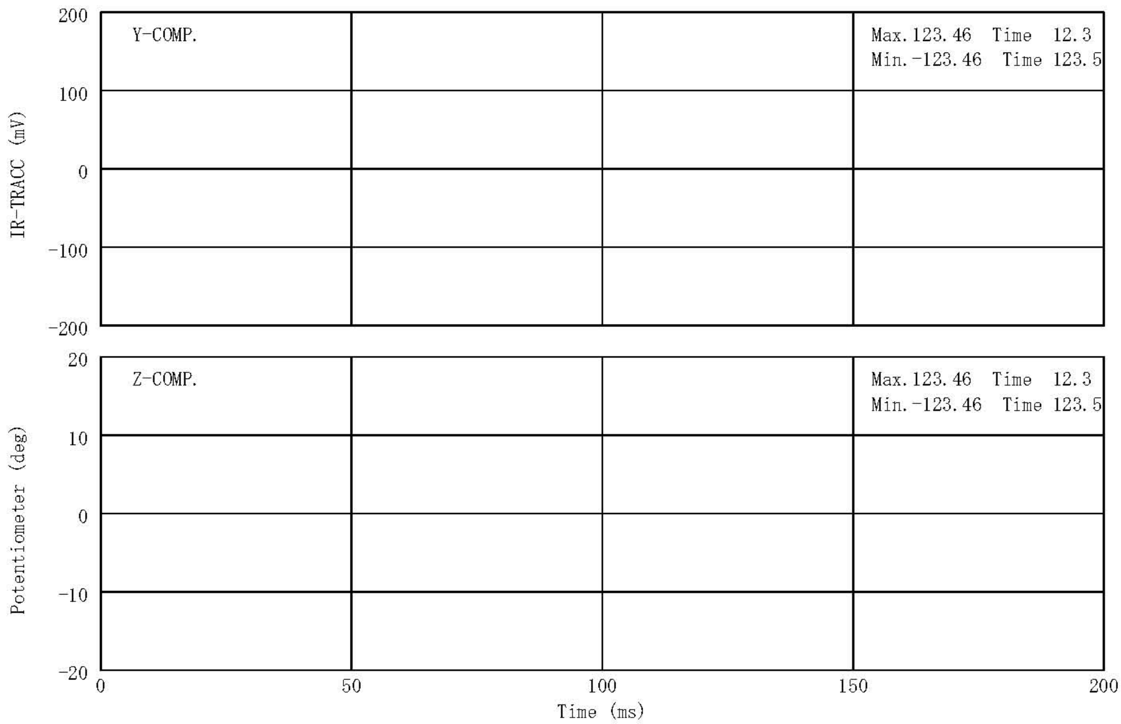

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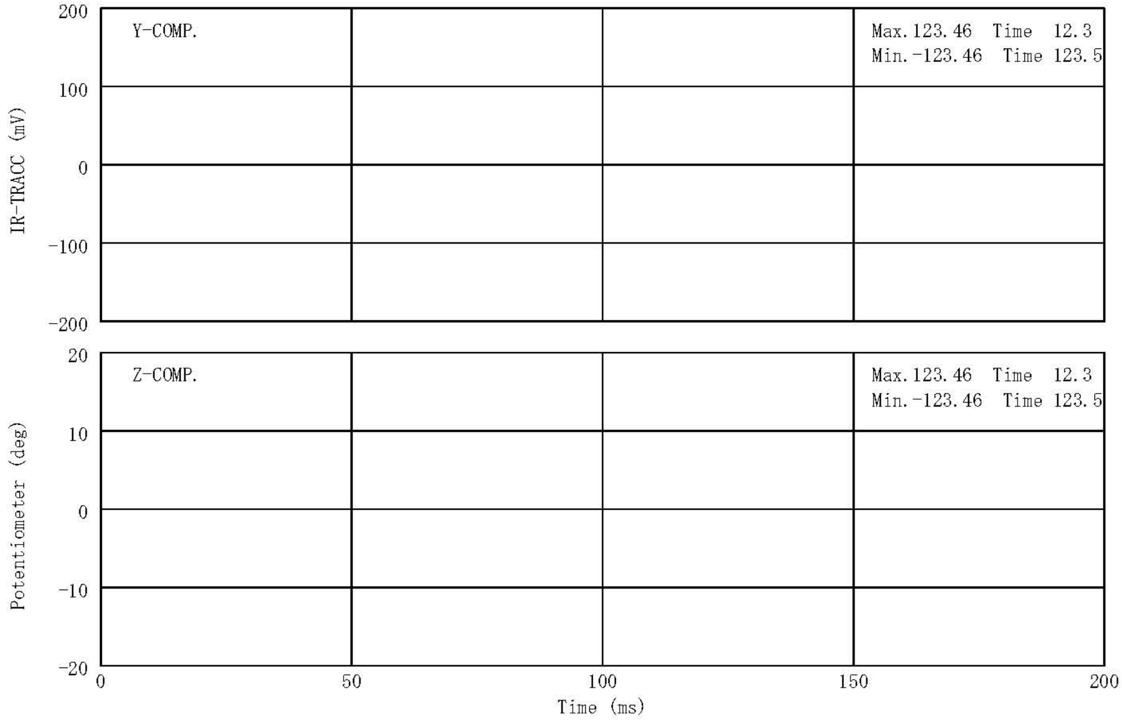

Front Dummy Abdominal Rib1 IR-TRACC & Potentiometer

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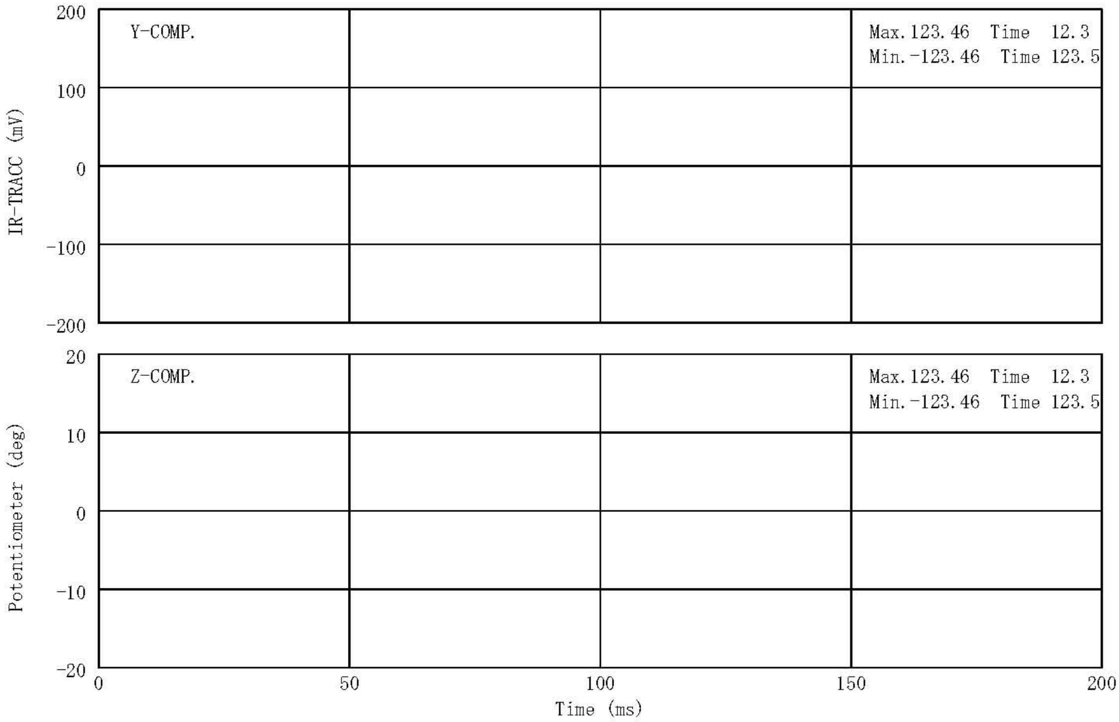

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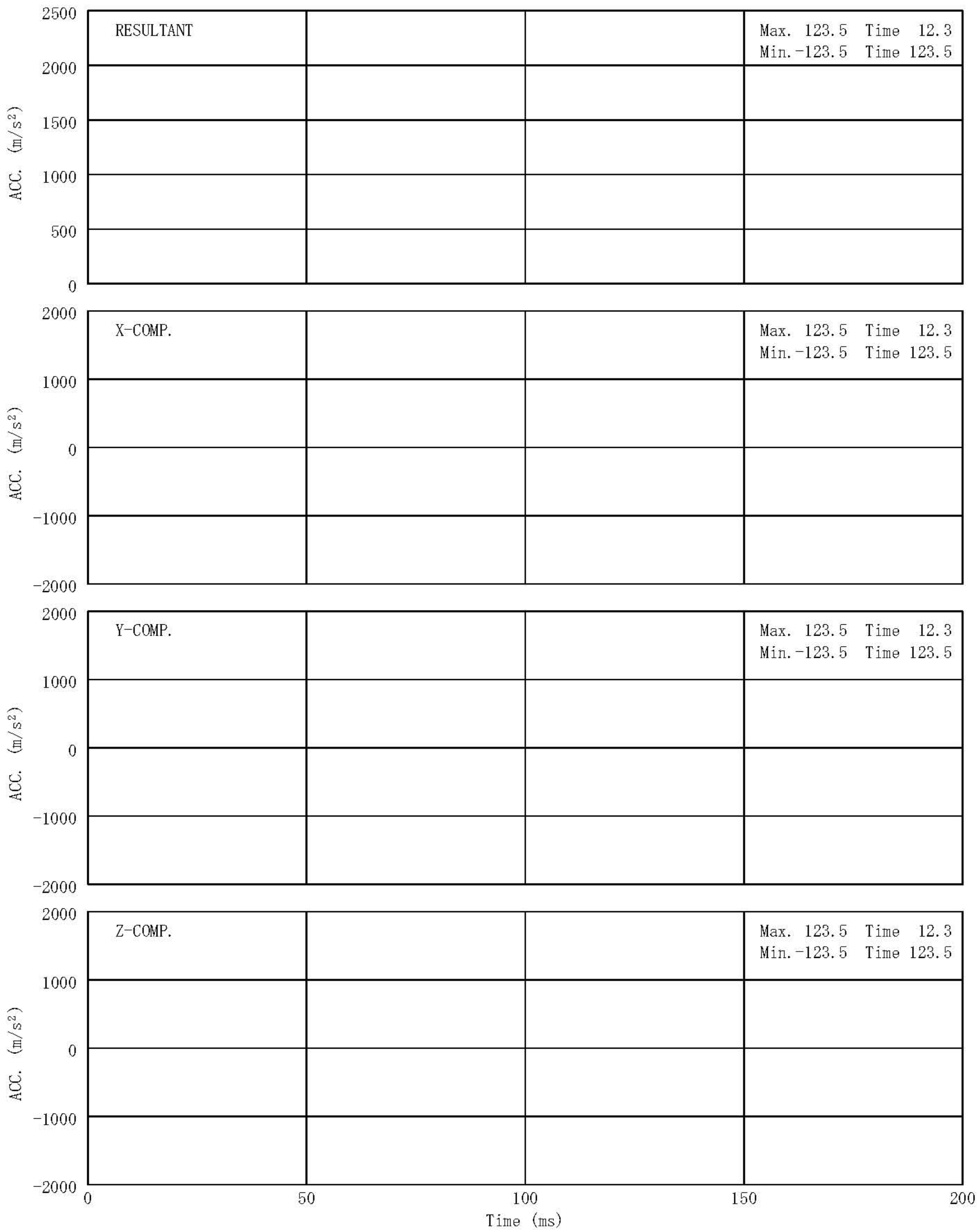

Front Dummy T12 Acc.

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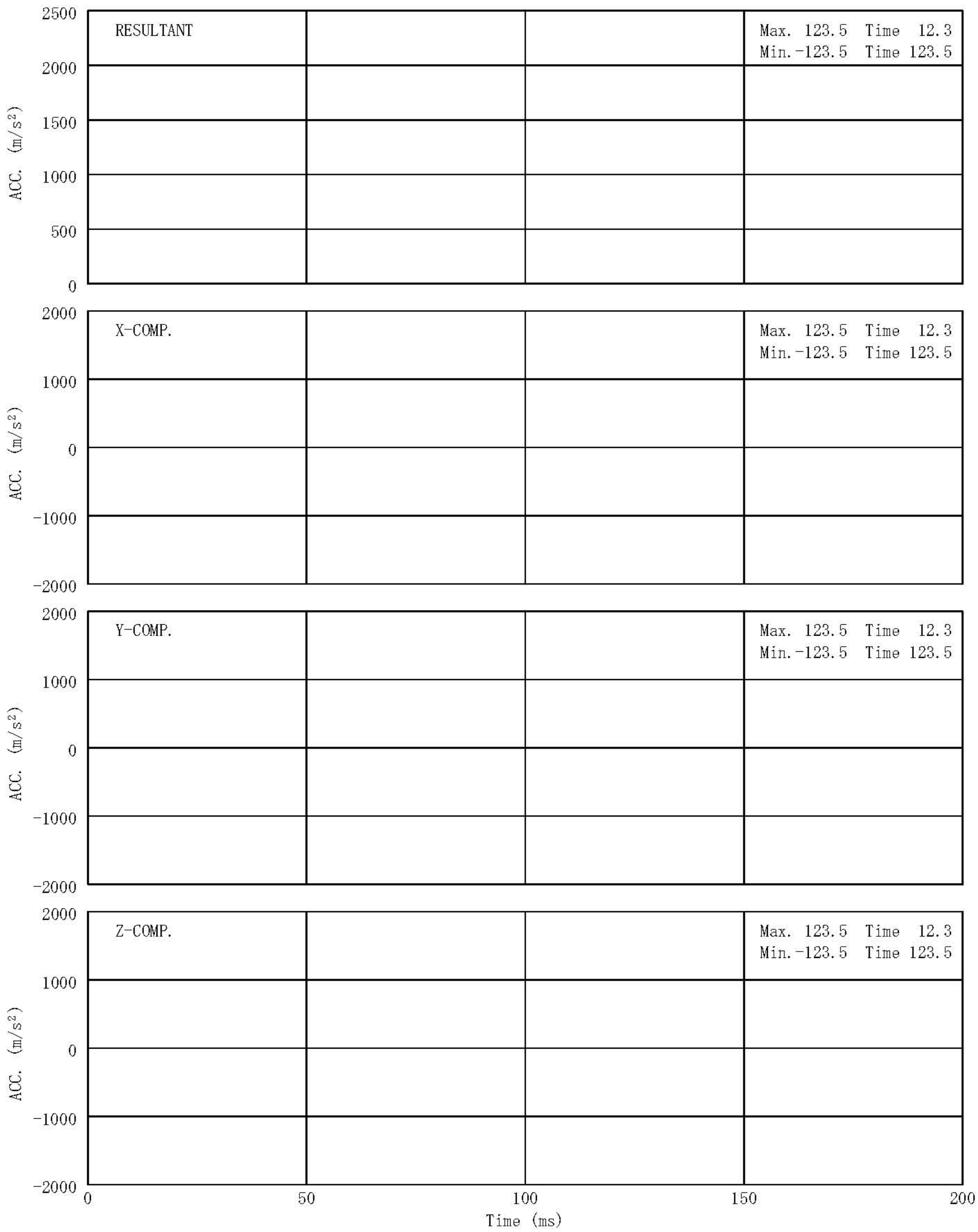
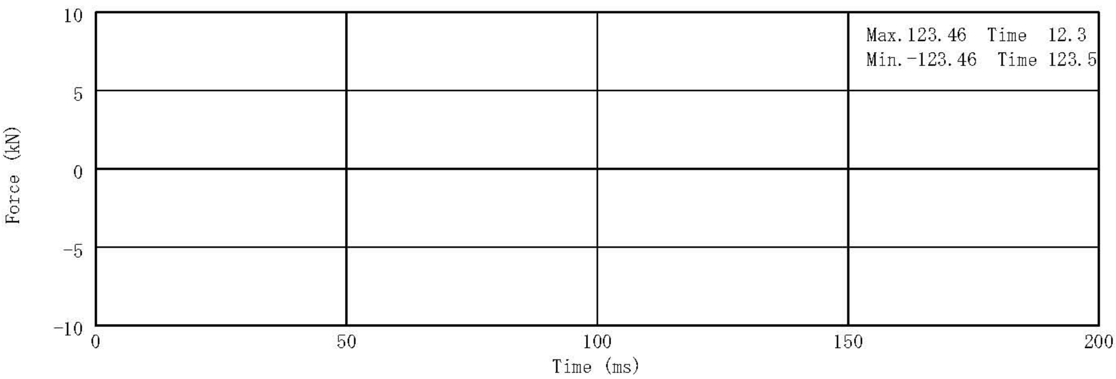


Front Dummy Pelvis Acc.

No. NASVA2018-9999-999



Front Dummy Pubic Force

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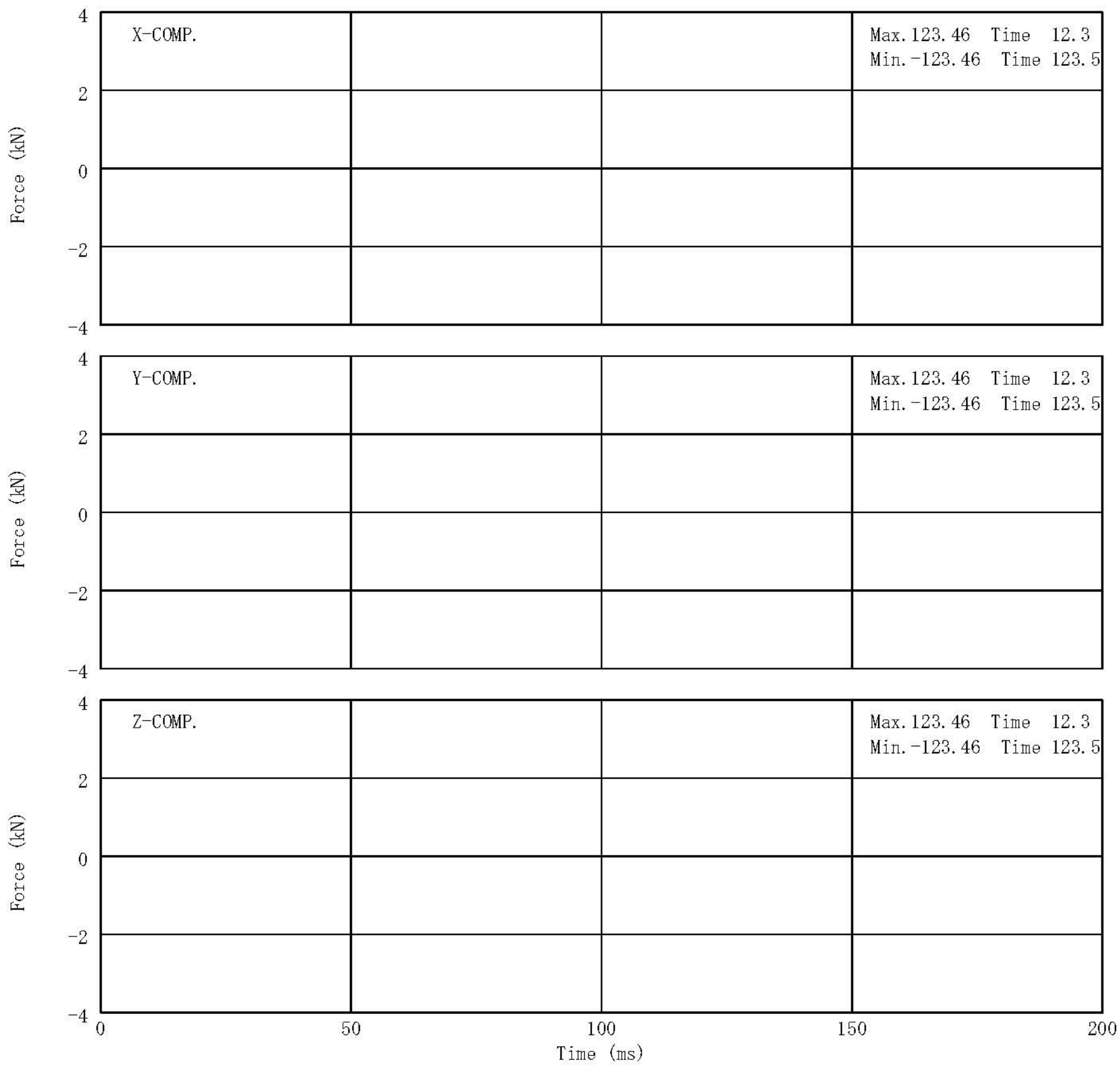

Front Dummy Femoral Neck Force

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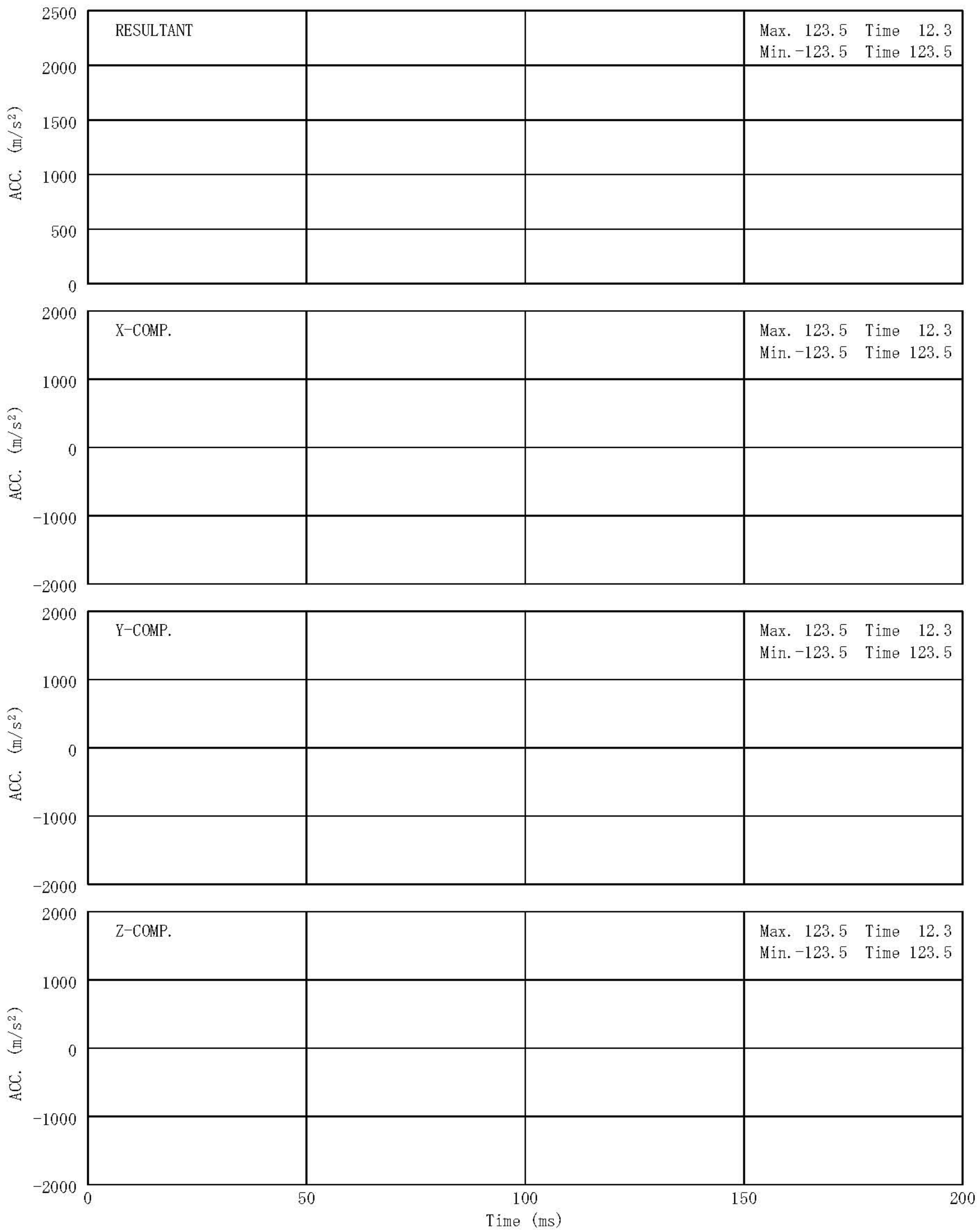
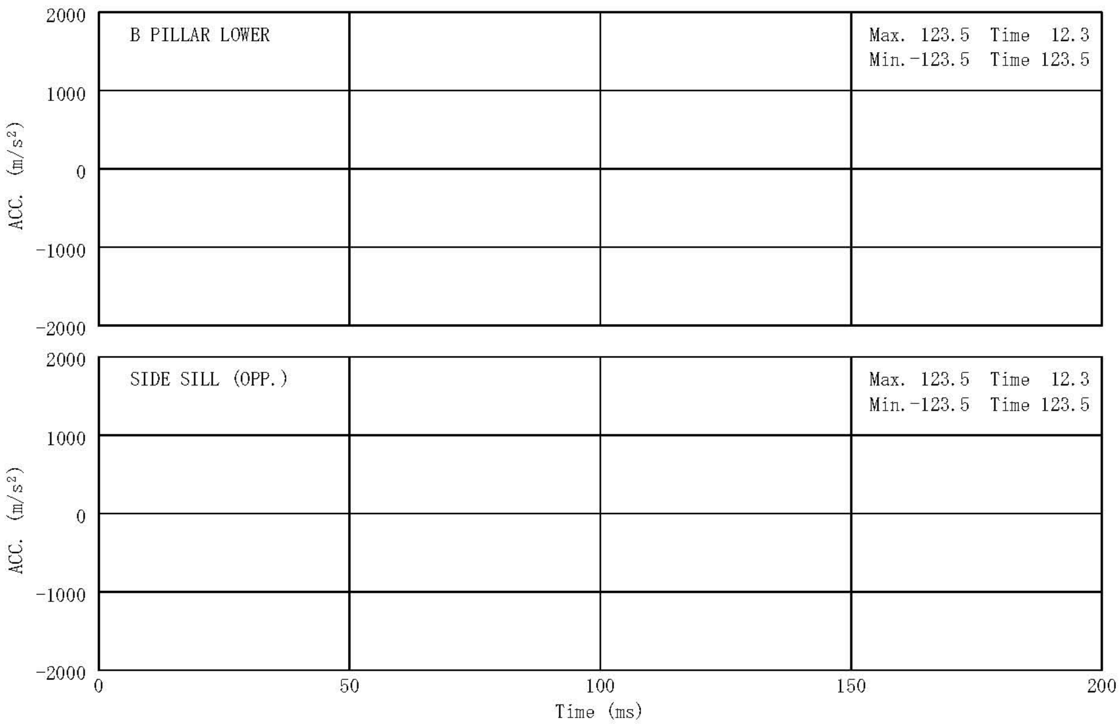


Vehicle Floor Acc.

No. NASVA2018-9999-999



Vehicle Acc.

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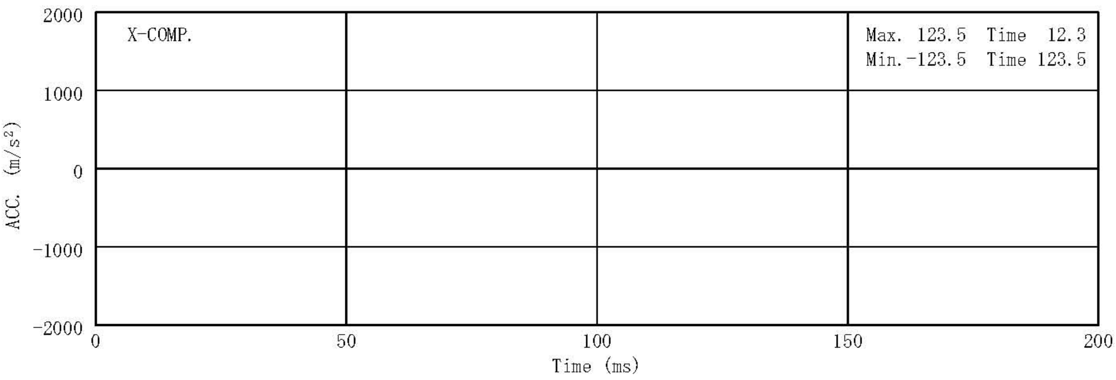

MDB Front Acc.

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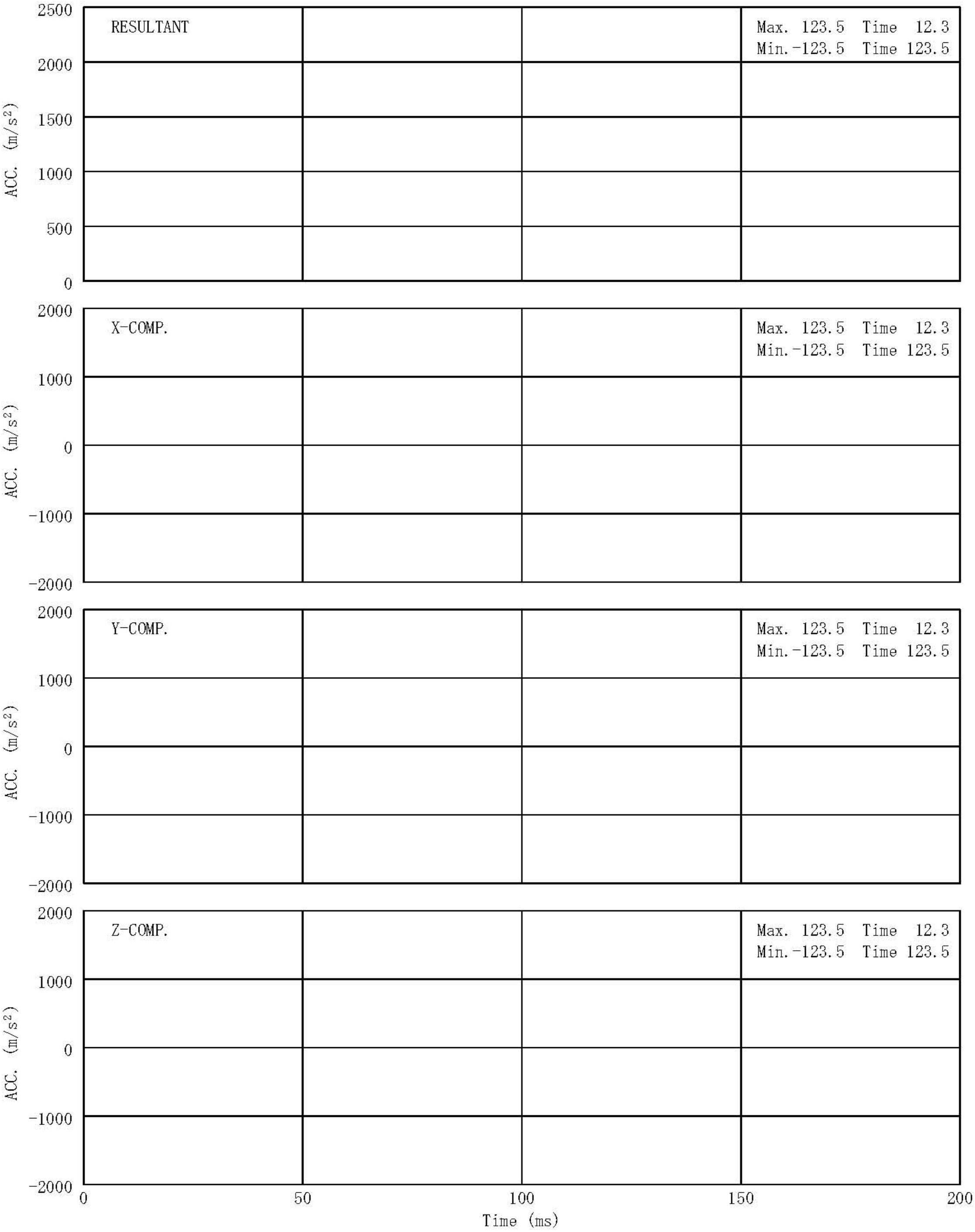
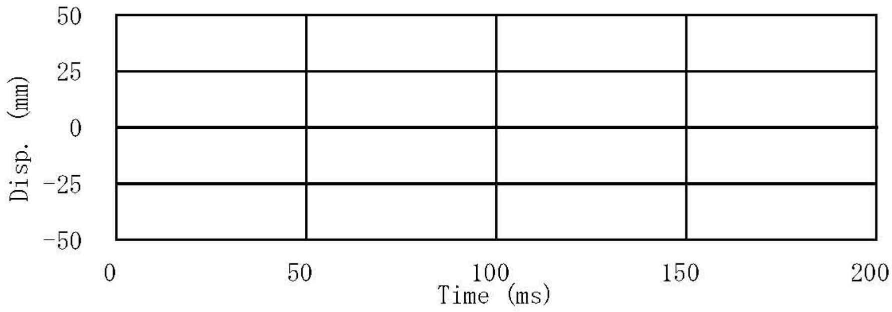


MDB C.G. Acc.

No. NASVA2018-9999-999

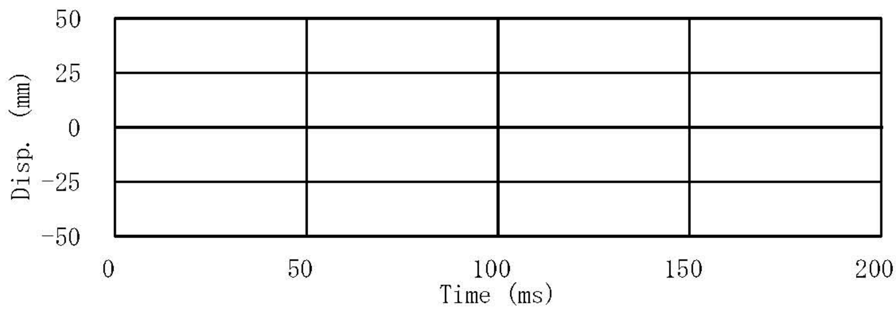
Shoulder Deflection Dx - calc　Max 0.00 Time 0.0

Min 0.00 Time 0.0



Shoulder Deflection Dy -calc　Max 0.00 Time 0.0

Min 0.00 Time 0.0



Front Dummy Shoulder Deflection

No. NASVA2018-9999-999

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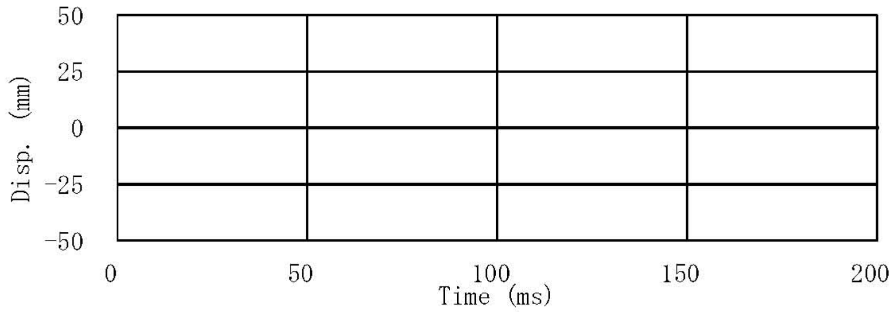
Min　　　0.00　Time　　0.0



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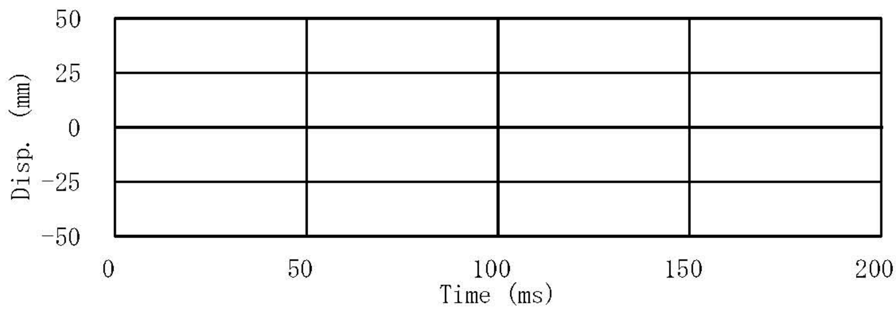
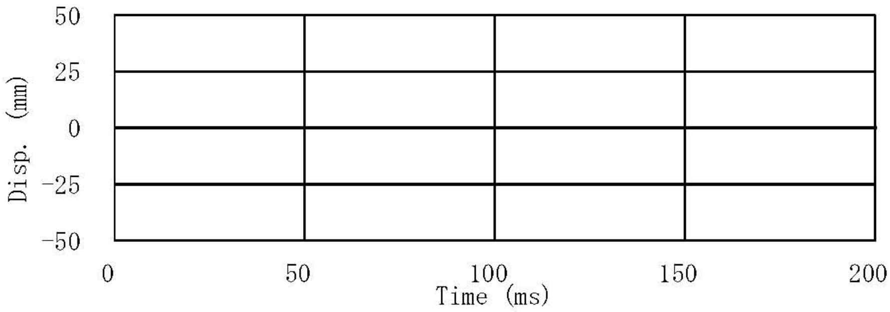


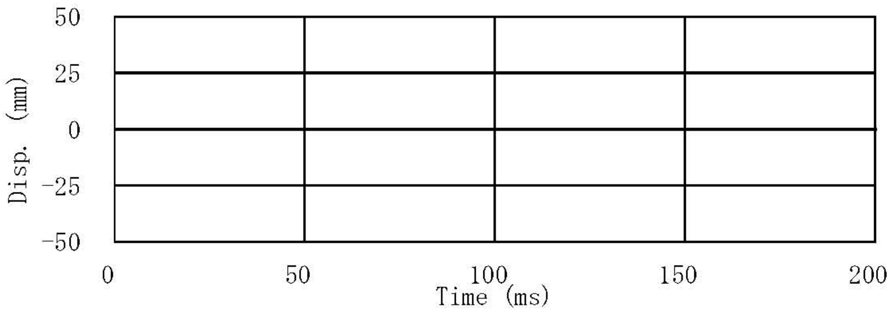
Front Dummy Thorax Rib1 Deflection

No. NASVA2018-9999-999

Thorax Rib2 Deflection Dx - calc   Max 0.00 Time 0.0
Min 0.00 Time 0.0



Thorax Rib2 Deflection Dy - calc   Max 0.00 Time 0.0
Min 0.00 Time 0.0

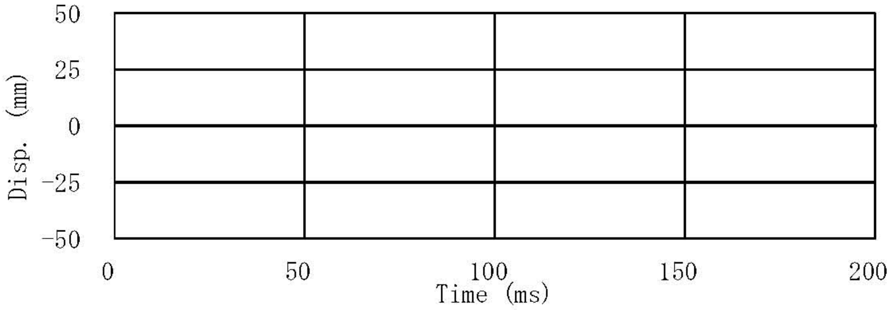


Front Dummy Thorax Rib2 Deflection

No. NASVA2018-9999-999

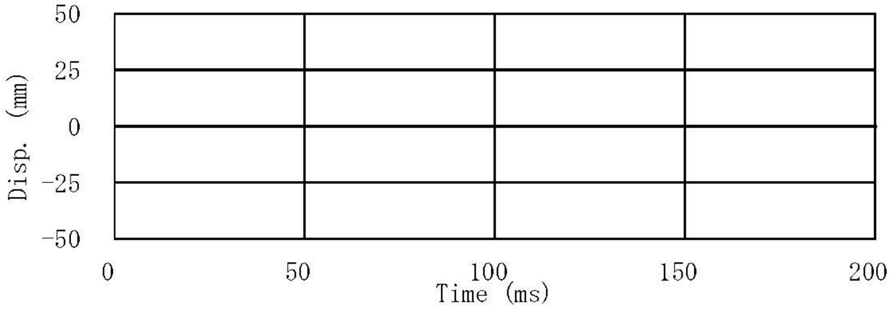
Thorax Rib3 Deflection Dx - calc

Max	0.00	Time	0.0
Min	0.00	Time	0.0



Thorax Rib3 Deflection Dy - calc

Max	0.00	Time	0.0
Min	0.00	Time	0.0

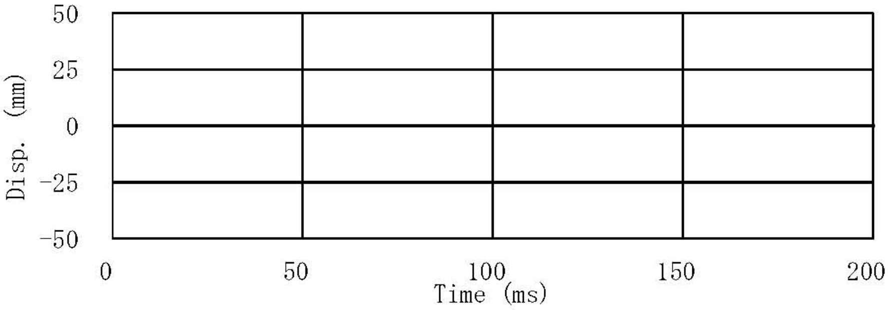


Front Dummy Thorax Rib3 Deflection

No. NASVA2018-9999-999

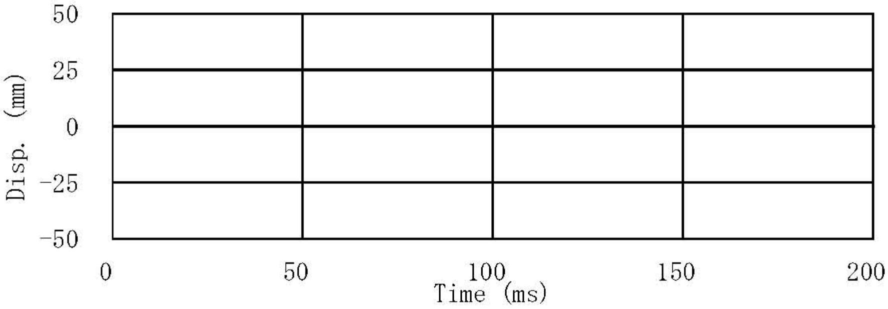
Abdominal Rib1 Deflection Dx - calc　　Max　0.00　Time　0.0

Min　0.00　Time　0.0



Abdominal Rib1 Deflection Dy - calc　　Max　0.00　Time　0.0

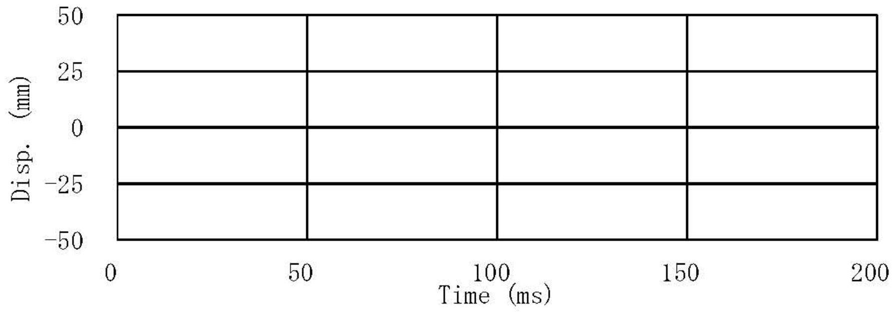
Min　0.00　Time　0.0



Front Dummy Abdominal Rib1 Deflection

No. NASVA2018-9999-999

Abdominal Rib2 Deflection Dx - calc　　Max 0.00　Time 0.0
Min 0.00　Time 0.0



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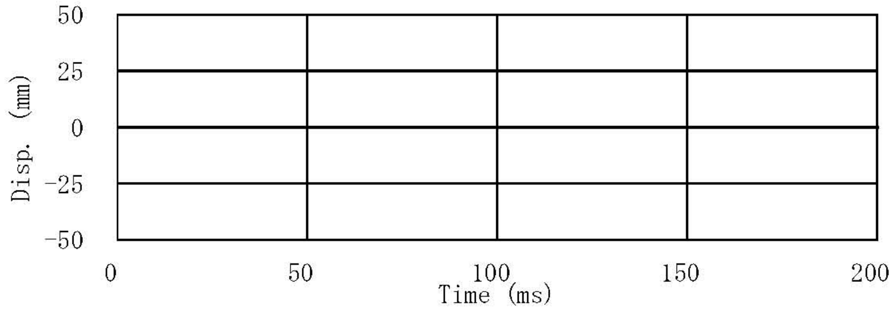
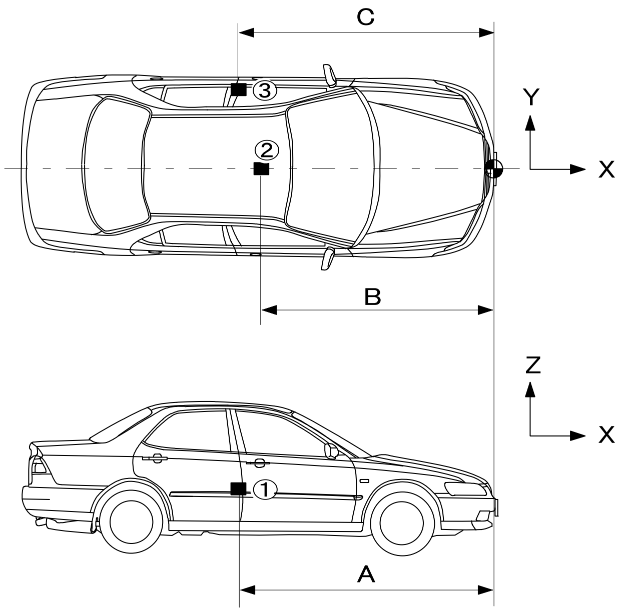


Front Dummy Abdominal Rib2 Deflection
No. NASVA2018-9999-999

Appendix 5: Accelerometer Installation Positions for the Test Vehicle and MDB

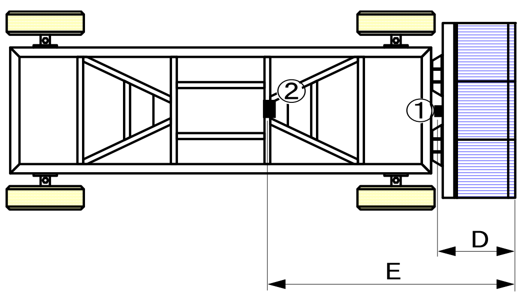
【For the Test Institute】

- Test Vehicle



Measuring Points		Distance from reference measuring position of vehicle dimensions		
		Mark	Sensitivity direction	Distance (mm)
(i)	Pillar B, lower	A	Y	
(ii)	Center Tunnel	B	XYZ	
(iii)	Side sill, non- collision side	C	Y	

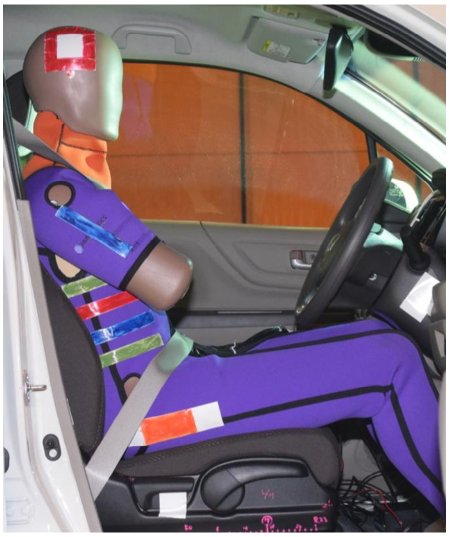
- MDB



Measuring Points		Distance from reference measuring position of vehicle dimensions		
		Mark	Sensitivity direction	Distance (mm)
(i)	MDB, front	D	X	
(ii)	MDB center of gravity	E	XYZ	

Appendix 6: Coloring the Dummy

Dress the dummy in the designated suit.



	Part	Color	Tape Position and Size
A	Head	Red	100mm×100mm, just above the head's center.
B	Shoulder/ arm	Blue	25mm × 150mm, starting at the shoulder hole
C	Upper-ribs	Green	25mm×150mm, at rib module position and starting from rearmost point that can reach by hand to seat surface
D	Mid-ribs	Red	25mm×150mm, at rib module position and starting from rearmost point that can reach by hand to seat surface
E	Lower-ribs	Blue	25mm×150mm, at rib module position and starting from rearmost point that can reach by hand to seat surface
F	Abdomen	Green	25mm×150mm, at rib module position and at the center of the rearmost point that can reach by hand to seat surface
G	Pelvis	Orange	50mm × 100mm, centered around the hip point

Note: refer to the diagram above for coloring.

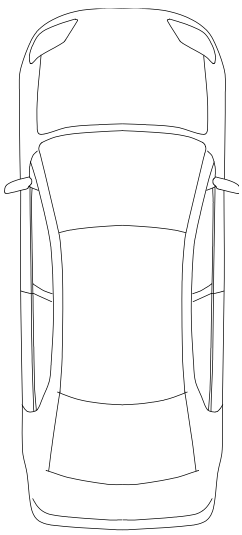
Appendix 7: Removal Parts for Mass Adjustment and Loaded Weight

【To be filled in by the test institute】

- Removed Parts

- Loaded Weight

"Loaded Position"



"Loaded Mass"

______________kg

Attachment 1

Procedure for Determining the Hip Point and the Actual Torso Angle for Seating Points in the Test Vehicle

1. Purpose

The procedure described in this Attachment is used to establish the hip point location and actual torso angle for one or several seating positions in a test vehicle.

2. Definitions

2.1 “3-Dimensional Manikin": The device used for the determination of hip points and actual torso angles. This device is described in Appendix 1 to this Attachment.

2.2 “Hip Point": A pivot center of the torso and the thigh of the three-dimensional manikin installed in the vehicle seat in accordance with Paragraph 4 below. The hip point is located between the hip point sight buttons on both sides of the three-dimensional manikin. Once determined in accordance with the procedure described in Paragraph 4, the hip point is considered fixed in relation to the seat-cushion structure and to move with it when the seat is adjusted.

2.3 “Torso Line": The centerline of the probe of the three-dimensional manikin with the probe in the fully rearward position.

2.4 “Actual Torso Angle": The angle measured between a vertical line through the hip point and the torso line using the back angle quadrant on the three-dimensional manikin.

2.5 “Center Plane of Occupant": The median plane of the three-dimensional manikin positioned in each designated seating position. It is represented by the coordinate of the hip point on the Y-axis. For individual seats, the center plane of the seat coincides with the center plane of the occupant. For other seats, the manufacturer specifies the center plane of the occupant.

2.6 “Three-Dimensional Coordinate System": A system as described in Appendix 2 to this Attachment.

2.7 "Fiducial Marks": are physical points (holes, surfaces, marks or indentations) on the vehicle body as defined by the manufacturer.

2.8 “Vehicle Measuring Attitude": The position of the vehicle as defined by the coordinates of fiducial marks in the three-dimensional coordinate systems.

3. Requirements

3.1 Presenting the Data

For each seating position where reference data are required in order to demonstrate compliance with the requirements, the following data shall be presented in the form indicated in Appendix 1, "Adjustment of Seat and Seatbelt".

3.1.1 All instructions necessary to adjust the seat (if it is adjustable) to the measuring position are specified in Paragraph 4.3 below.

4. Procedure for Determining Hip Point and Actual Torso Angle

4.1 The test vehicle shall be preconditioned at the test institute's discretion, at a temperature of 20 ± 10°C to ensure that the seat material has reached room temperature. If the seat to be checked has never been sat upon, a 70 to 80 kg person or device shall sit on the seat twice for one minute to flex the cushion and back. At the manufacturer's request, all seat assemblies shall remain unloaded for at least 30 minutes prior to installing the three-dimensional manikin.

4.2 The test vehicle shall be at the measuring attitude defined in Paragraph 2.8 above.

4.3 The seat, if it is adjustable, shall be adjusted to the position defined in Paragraph 4.1.5 of the Side Collision Safety Performance Test Procedure document.

4.4 The area of the seating position contacted by the three-dimensional manikin shall be covered by muslin cotton of sufficient size and appropriate texture (1.89 threads per cm^2 and 0.228 kg/m^2), or knitted or non-woven fabric having equivalent characteristics. If the test is conducted on a seat outside the test vehicle, the floor on which the seat is placed shall have the same essential characteristics ([Note1]) as the floor of the test vehicle in which the seat is intended to be used.

4.5 Place the seat and back assembly of the three-dimensional manikin so that the center plane of the occupant coincides with the center plane of the three-dimensional manikin. The three-dimensional manikin may be moved in-board with respect to the center plane of the occupant if the three-dimensional manikin is located so far out-board that the seat edge will not permit leveling of the three-dimensional manikin.

4.6 Set the lower leg segment to the 50th percentile length (417 mm), and the thigh bar segment to the 10th percentile length (408 mm).

4.7 Attach the foot and lower leg assemblies, either individually or by using the T-bar and lower leg assembly. A line through the hip point sight buttons shall be parallel to the ground and perpendicular to the longitudinal center plane of the seat.

4.8 Adjust the feet and leg positions of the three-dimensional manikin as follows:

4.8.1 Designated seating position: driver's seat and outside front passenger seat

4.8.1.1 Both feet and leg assemblies shall be moved forward in such a way that the feet take up natural positions on the floor, between the operating pedals if necessary. Where possible, the left foot shall be located at approximately the same distance to the left of the center plane of the three-dimensional manikin as the right foot is to the right. The spirit level verifying the transverse orientation of the three-dimensional manikin is brought to the horizontal by readjusting the seat pan if necessary, or by adjusting the leg and foot assemblies towards the rear. The line passing through the hip point sight buttons shall be maintained perpendicular to the longitudinal center plane of the seat.

4.8.1.2 If the left leg cannot be kept parallel to the right leg and the left foot cannot be supported by the structure, move the left foot until it is supported. Sight buttons shall be horizontal and perpendicular to the longitudinal center plane of the seat, and the alignment of the sight buttons shall be maintained.

[Note1] Tilt angle, height difference with a seat mounting, surface texture, etc.

4.8.2 Designated seating position: out-board rear

For rear seats or auxiliary seats, the legs are located as specified by the vehicle manufacturer. If the feet then rest on parts of the floor that are at different levels, the foot which first comes into contact with the front seat shall serve as a reference and the other foot shall be so arranged that the spirit level giving the transverse orientation of the seat of the device indicates the horizontal.

4.9 Apply lower leg and thigh weights and level the three-dimensional manikin.

4.10 Tilt the back pan forward against the forward stop and draw the three-dimensional manikin away from the seat back using the T-bar. Reposition the three-dimensional manikin on the seat by one of the following methods:

4.10.1 If the three-dimensional manikin tends to slide rearward, use the following procedure. Allow the three-dimensional manikin to slide rearward until a forward load on the T-bar is no longer required (i.e. until the seat pan contacts the seat back). If necessary, reposition the lower leg.

4.10.2 If the three-dimensional manikin does not tend to slide rearward, use the following procedure. Slide the three-dimensional manikin rearwards by applying a horizontal rearward load to the T-bar until the seat pan contacts the seat-back (see Figure 2, Appendix 1 to this Attachment).

4.11 Apply a load of 100 ± 10 N to the back pan assembly of the three-dimensional manikin at the intersection of the hip angle protractor and the T bar housing. The direction of load application shall be maintained along a line passing by the above intersection to a point just above the thigh bar housing (see Figure 2 of Appendix 1 to this Attachment). Then carefully return the back pan to the seat back. Take care throughout the remainder of the procedure to prevent the three-dimensional manikin from sliding forward.

4.12 Install the buttock weight to the right and left hip point pivots and then, alternately, the 8 torso weights to the torso weight hanger. Maintain the three-dimensional manikin level.

4.13 Tilt the back pan forward to release the tension on the seat back. Rock the three-dimensional manikin from side to side through a 10-degree arc (5° to each side of the vertical center plane) for three complete cycles to release any accumulated friction between the three-dimensional manikin and the seat.

During the rocking action, the T-bar of the three-dimensional manikin may tend to diverge from the specified horizontal and vertical alignment. The T-bar must therefore be restrained by applying an appropriate lateral load during the rocking motions. Care must be taken when holding the T-bar and rocking the three-dimensional manikin to ensure that no inadvertent exterior loads are applied in a vertical or fore-and-aft direction.

The feet of the three-dimensional manikin are not to be restrained or held during this step. If the feet change position, they should be allowed to remain in that attitude for the moment.

Carefully return the back pan to the seat back and check the two spirit levels for zero position. If any movement of the feet has occurred during the rocking operation of the three-dimensional manikin, they must be repositioned as follows:

Alternately, lift each foot off the floor until no additional foot movement is obtained. During this lifting, the feet are to be free to rotate, and no forward or lateral loads are to be applied. When each foot is placed back in the down position, the heel is to be in contact with the structure designed for this.

Check the lateral spirit level for zero position; if necessary, apply a lateral load to the top of the back pan sufficient to level the three-dimensional manikin’s seat pan on the seat.

4.14 While holding the T-bar to prevent the three-dimensional manikin from sliding forward on the seat cushion, proceed as follows:

(a) Return the back pan to the seatback.

(b) Alternately apply and release a horizontal rearward load, not exceeding 25 N, to the back angle bar at a height approximately at the center of the torso weights until the hip angle quadrant indicates that a stable position has been reached after load release. Take care to ensure that no exterior downward or lateral loads are applied to the three-dimensional manikin. If another level adjustment of the three-dimensional manikin is necessary, rotate the back pan forward, re-level, and repeat the procedure from item 4.12.

4.15 Take the following measurements:

4.15.1 Measure the coordinates of the hip point with respect to the three-dimensional coordinate system.

4.15.2 Read the actual torso angle at the back angle quadrant of the three-dimensional manikin with the probe in its fully rearward position.

4.16 The seating reference point should be measured by adjusting the seat to the lowest and rear-most position within the normal driving or sitting range defined by the manufacturer, and then the actual position of hip point is measured based on the three-dimensional coordinate system in accordance with Paragraphs 4.4 to 4.14.

4.17 If a re-run of the installation of the three-dimensional manikin is desired, the seat assembly should remain unloaded for at least 30 minutes prior to the re-run. The three-dimensional manikin should not be left loaded on the seat assembly for longer than the time required to perform the test.

4.18 If the seats in the same row can be regarded as similar (bench seat, identical seat, etc.), only one hip point and one "actual torso angle" shall be determined for each row of seats, with the three-dimensional manikin described in Appendix 1 to this Attachment being seated in a place regarded as representative for the row. This place shall be:

4.18.1 For the front row, the driver's seat.

4.18.2 For the back row, the outer seat

Attachment 1 - Appendix 1

1. Back and Seat Pan

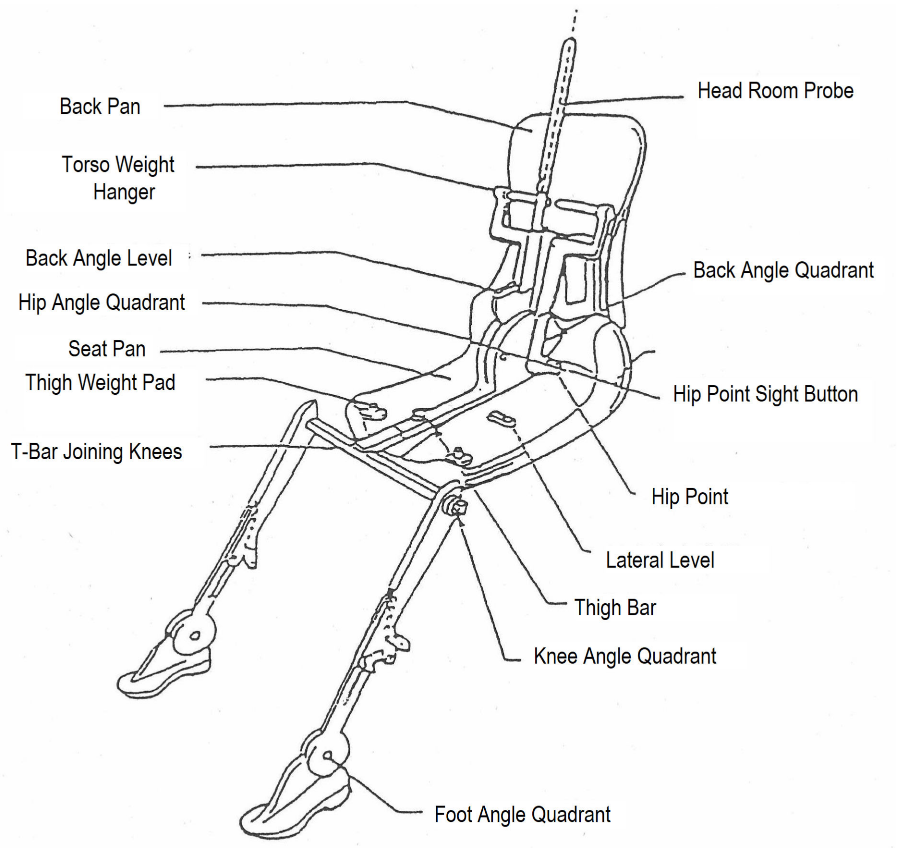
The back and seat pans are constructed of reinforced plastic and metal. They simulate the human torso and thigh and are mechanically hinged at the hip point. A quadrant is fastened to the probe hinged at the hip point to measure the actual torso angle. An adjustable thigh bar, attached to the seat pan, establishes the thigh centerline and serves as a baseline for the hip angle quadrant.

2. Body and Leg Elements

Lower leg segments are connected to the seat pan assembly at the T-bar joining the knees, which is a lateral extension of the adjustable thigh bar. Quadrants are incorporated in the lower leg segments to measure knee angles. Shoe and foot assemblies are calibrated to measure the foot angle. Two spirit levels orient the manikin in the vertical and horizontal directions. Body element weights are placed at the corresponding centers of gravity to provide seat penetration equivalent to a 76 kg male.

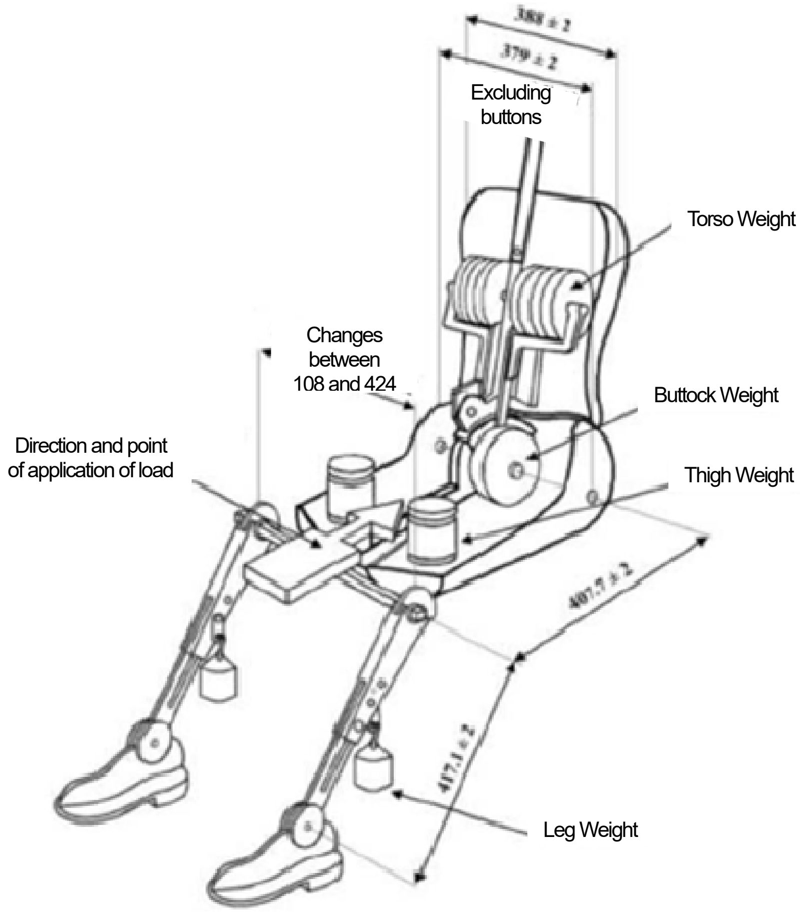
All joints of the three-dimensional manikin should be checked for free movement without encountering noticeable friction.

Figure 1: Three-Dimensional Manikin Elements Designation*note2



*note2 For details of the construction of the 3-D manikin refer to SAE, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096. The machine corresponds to that described in ISO Standard 6549-1999 and SAEJ826.

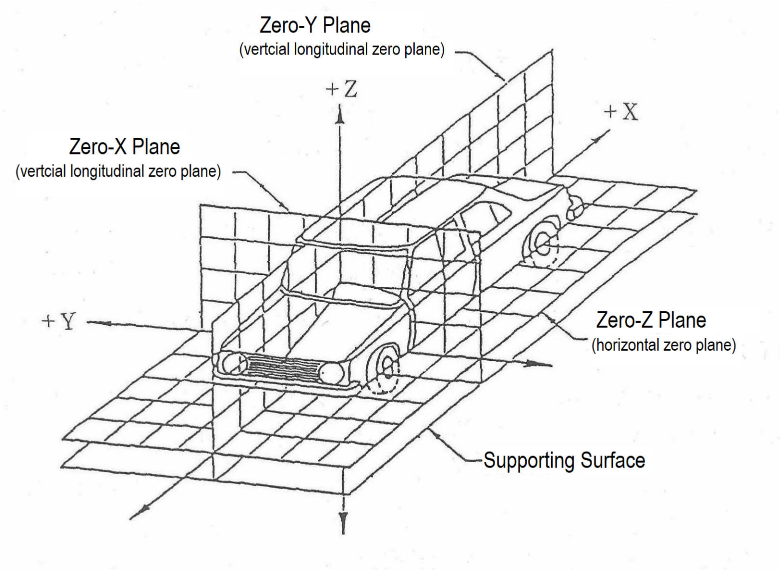
Figure 2: Dimensions of the 3-D H Measurement Elements and Load Distribution



Attachment 1 - Appendix 2

1. The three-dimensional coordinate system is defined by the three orthogonal planes established by the vehicle manufacturer (see Figure).
2. The vehicle-measuring attitude is established by positioning the vehicle on the supporting surface such that the coordinates of the fiducial marks corresponding the values indicated by the vehicle manufacturer.
3. The coordinates of the seating reference point and the hip point are established in relation to the fiducial marks defined by the vehicle manufacturer.

Figure: Three-Dimensional Coordinate System



Attachment 2

Characteristics of the Mobile Deformable Barrier

1. Characteristics of the Mobile Deformable Barrier

1.1 The mobile deformable barrier shall include both a barrier face and trolley.

1.2 The total mass shall be 1,300 ± 20 kg

1.3 The center of gravity shall be situated within 10m of the longitudinal median vertical plane 1,000 ± 30 mm behind the front axle and 500 ± 30 mm above the ground.

1.4 The distance between the front face of the barrier and the center of gravity of the mobile deformable barrier shall be 2,000 ± 30 mm.

1.5 The front and rear track width of the trolley shall be 1,500 ± 10 mm.

1.6 The wheelbase of the trolley shall be 3,000 ± 10 mm.

2. Characteristics of the Barrier Face

The barrier face consists of six single blocks of aluminum honeycomb, which have been processed in order to give a progressively increasing level of force with increasing deflection. Front and rear aluminum plates are attached to the aluminum honeycomb blocks.

2.1 The honeycomb blocks

2.1.1 Geometrical characteristics

2.1.1.1 The barrier face consists of six joined zones whose forms and positions are shown in Figures 1 and 2. The zones are defined as 500 ± 5 mm × 250 ± 3 mm for Block B and E, 600±5mm×250±3mm for Blocks A, C, D, and F. The 500 mm and 600 mm should be in the W direction and the 250 mm in the L direction of the aluminum honeycomb construction (see Figure 3).

2.1.1.2 The barrier face is divided into two rows. The lower row after pre-compression shall be defined as 250 ± 3 mm in height and 440 ± 2 mm in depth.

2.1.1.3 Blocks A, C, D, and F shall be chamfered at 45 degree angles. The front and back plates of the beam element shall not be chamfered. (see Figure 2, DETAIL A.)

2.1.1.4 Including the front portion of the bottom row in the barrier element, the barrier face's depth shall be 500±2mm. For the bumper element in the W direction, the front portion shall be 1112±2.5mm, and the rear shall be 1220±2.5mm. For the L direction, 200±3mm. (See Figure 3.)

2.1.2 Pre-Compression

2.1.2.1 The pre-compression shall be performed not on the bumper element, but on Blocks A, B, C, D, E, and F only. Pre-compression shall be conducted on the honeycomb parallel to the rear mounting surface that includes the lower portion of the upper-half of Blocks D, E, and F. Pre-compression is not necessary for angled surfaces.

2.1.2.2 Before the test, blocks A, B, C, D, E, and F shall all be compressed by 10 ± 2 mm

2.1.2.3 Angled surfaces on Blocks A, C, D, and F shall be excised after compression.

2.1.3 Material Characteristics

2.1.3.1 The extension direction of the aluminum honeycomb shall be set up as outlined in Figure 3.

2.1.3.2 The cell measurements shall be 19mm±10% for Blocks A, B, C, D, E, and F, and 6.35mm±10% for the bumper section. (See Figure 4.)

2.1.3.3 All honeycomb must be made of 3003 aluminum.

2.1.3.4 The aluminum honeycomb blocks (A-F) shall be processed such that the force-deflection curve when statically compressed (according to the procedure defined in Paragraph 2.1.4) is within the corridors defined for each of the six blocks in Appendix 1 to this Attachment.

2.1.3.5 When the aluminum honeycomb blocks (in accordance with NHTSA TP-214D) for the bumper element are compressed statically, they shall be constructed such that their strength is 1,586-1,793 MPa.

2.1.3.6 The processed honeycomb material used in the honeycomb blocks to be used for constructing the barrier should be cleaned in order to remove any residue that may have been produced during the processing of the raw honeycomb material.

2.1.3.7 The mass of the blocks in each batch shall not differ by more than 5% from the mean block mass for the batch.

2.1.4 Static Tests

2.1.4.1 A sample taken from each batch of processed honeycomb core shall be tested according to the static test procedure described in Chapter 5.

2.1.4.2 The force-compression curve for each block tested shall lie within the force-deflection corridors defined in Appendix 1 of Attachment 2. Static force-deflection corridors are defined for each block of the barrier. The barrier faces individual Blocks are determined by the stationary state's force-deflection corridors.

2.1.5 Dynamic Tests

2.1.5.1 The purpose of this test is to check the dynamic deformation characteristics of the barrier upon collision conducted according to the protocol described in Paragraph 6.

2.1.5.2 Deviation from the limits of the force-deflection corridors characterizing the rigidity of the barrier face as defined in Appendix 2 may be allowed provided that:

2.1.5.2.1 The deviation occurs after the beginning of the impact and before the deformation of the impactor is equal to 150 mm.

2.1.5.2.2 The deviation does not exceed 50% of the nearest instantaneous prescribed limit of the corridor;

2.1.5.2.3 Each deflection corresponding to each deviation does not exceed 35 mm, and the sum of these deflections does not exceed 70 mm (see Appendix 2 to this Attachment).

2.1.5.2.4 The sum of energy derived from deviating outside the corridor does not exceed 5% of the gross energy for that block.

2.1.5.3 Blocks A and C are identical. Their rigidity is such that their force-deflection curves shall stay in the corridor of Figure 2a.

2.1.5.4 Blocks D and F are identical. Their rigidity is such that their force-deflection curves shall stay in the corridor of Figure 2c.

2.1.5.5 The rigidity of block B is such that its force-deflection curve shall stay in the corridor of Figure 2b.

2.1.5.6 The rigidity of block E is such that its force-deflection curve shall stay in the corridor of Figure 2d.

2.1.5.7 The force-deflection of the barrier face as a whole shall stay in the corridor of Figure 2e.

2.1.5.8 The force-deflection curves shall be verified by a test detailed in Chapter 6, consisting of impacting the barrier against a dynamometric barrier at 35 ± 0.5 km/h.

2.1.5.9 The dissipated energy against blocks A and C during the test shall be equal to 5.0 ± 1.0 kJ for these blocks.

2.1.5.10 The dissipated energy against blocks D and F during the test shall be equal to 14.8 ± 2.0 kJ for these blocks.

2.1.5.11 The dissipated energy against block B shall be equal to 4.6±1.0kJ.

2.1.5.12 The dissipated energy against block E shall be equal to 17.3±2.0kJ.

2.1.5.13 The dissipated total energy during impact shall be equal to 61.5±5.0kJ.

2.1.5.14 The maximum barrier face deformation from the point of first contact, calculated by integrating the accelerometers according to Paragraph 6.6.3, shall be equal to 346 ± 20 mm.

2.1.5.15 The final residual static barrier face deformation measured along the MDB's center axis after the dynamic test at a height of 425 mm off the ground shall be equal to 340 ± 20 mm.

2.1.5.16 The displayed energy amount is the amount of energy radiated by the system when the barrier face's compression range reaches maximum.

2.2 The Front Plates

2.2.1 Geometrical Characteristics

2.2.1.1 The three front plates (upper, mid, and lower) shall cover the entire front of the barrier face. They shall be 0.5 ± 0.06 mm thick. The three plates shall be 250mm, 200mm, and 50mm wide, and they shall be long enough to successively cover the angled surfaces where pre-compression was carried out. The lower strips (50mm in width) must cover the angled sides of the barrier face.

2.2.1.2 When assembled, the overall dimensions of the barrier face (defined in Figure 2) shall be: 1700 ± 2.5 mm wide and 500 ± 2.5 mm high.

2.2.1.3 The upper edge of the lower front plate and the lower edge of the upper front plate shall be aligned within 4 mm.

2.2.2 Material Characteristics

2.2.2.1 The front plates shall be manufactured from aluminum of series $AlMg_2$ to $AlMg_3$ with elongation of over 12% and UTS of over 175 N/mm^2.

2.3 The Bumper's Front and Back Plates

2.3.1 Geometrical Characteristics

2.3.1.1 The geometric characteristics shall be as shown in Figures 1 and 2.

2.3.2 Material Characteristics

2.3.2.1 The bumper plate shall be constructed of aluminum 5251 H22, 5052 H32, or 5052 H34 and the plate thickness shall be 3mm±0.07mm.

2.4 The Barrier Face's Back Plates

2.4.1 Geometrical Characteristics

2.4.1.1 The geometric characteristics shall be as shown in Figures 5 and 8.

2.4.1.2 The upper mounting flange shall be placed vertically, and the lower mounting flange shall be at 90 degrees.

2.4.2 Material Characteristics

2.4.2.1 The back plate shall be constructed of aluminum and be 3mm±0.25mm thick. The back plate shall be manufactured from aluminum of series $AlMg_2$ to $AlMg_3$ with hardness between 50 and 67 HBS. This plate shall be perforated with holes for ventilation: the location, diameter and pitch are shown in Figures 5 and 7.

2.5 Location of the Honeycomb Blocks

2.5.1 The honeycomb blocks shall be centered on the perforated zone of the back plate.

2.6 Expanded Polyester

2.6.1 Cover Blocks A, C, D, and F with synthetic polyester thermal bonding cushion material as shown in Figure 1.

2.6.1.1 This polyester shall have a weight of 60g/m2±20%.

2.6.1.2 This material will provide a "soft link" between the top and bottom blocks. If it is the vertical type, one or many more pieces can be added to the chamfered zone. Each piece should be the same height as the chamfered zone.

2.7 Bonding

2.7.1 Adhesive film shall be applied evenly and directly over the surface of either the front plate or the back plate, giving a maximum film thickness of 0.5 mm. The adhesive to be used throughout should be a two-part polyurethane (such as Ciba Geigy XB5090/1 resin with XB5304 hardener) or equivalent.

2.7.2 For the back plate, the minimum bonding strength shall be 0.6 MPa (87 psi), tested according to Paragraph 2.7.3.

2.7.3 Bonding Strength Tests

2.7.3.1 Flatwise tensile testing is used to measure the bond strength of adhesives according to ASTM C297-61.

2.7.3.2 The test piece shall be 100 mm in height and width, and 15 mm in depth, and shall be connected to the sample of ventilated rear plate materials. The honeycomb block to be used should represent the honeycomb block of the barrier face, i.e. chemical etching shall be performed to the same degree as the honeycomb block near the back plate in the barrier but without pre-compression.

2.7.3.3 The vents in the back plate must be immaculate and free of any adhesive materials so that air can flow freely through.

2.8 Traceability

2.8.1 Barrier faces shall carry consecutive serial numbers that are stamped, etched or otherwise permanently attached, from which the batches for the individual blocks and the date of manufacture can be established.

2.9 Barrier Face Attachment

2.9.1 The fitting on the trolley must be as shown in Figure 8. The fitting shall use six M8 bolts, and nothing shall be larger than the dimensions of the barrier in front of the wheels of the trolley. Appropriate spacers must be used between the lower back plate flange and the trolley face to avoid bowing of the back plate when the attachment bolts are tightened.

3. The Ventilation System

3.1 The interface between the trolley and the ventilation system should be solid, rigid and flat. The ventilation device is part of the trolley and not of the barrier face as supplied by the manufacturer. The geometrical characteristics of the ventilation device shall be as shown in Figure 9 and Figure 10.

3.2 Ventilation Device Mounting Procedure

3.2.1 Mount the ventilation device to the front plate of the trolley.

3.2.2 Ensure that a 0.5 mm-thick gauge cannot be inserted between the ventilation device and the trolley face at any point. If there is a gap greater than 0.5 mm, the ventilation frame will need to be replaced or adjusted to fit without a gap of more than 0.5 mm.

3.2.3 Dismount the ventilation device from the front of the trolley.

3.2.4 Fix a 1.0 mm-thick layer of cork to the front face of the trolley.

3.2.5 Re-mount the ventilation device to the front of the trolley and tighten to exclude air gaps.

4. Production Compatibility

The production compatibility procedure shall be carried out as outlined in Attachment 2 (E/ECE/324-E/TRANS/505/Rev.2) or by the procedure outlined below:

4.1 The barrier face maker must take full responsibility for production compatibility, and, to that end, must comply with the following:

4.1.1 Must be able to verify an effective procedure to determine product quality.

4.1.2 Must be able to use proper testing equipment to test compatibility of the various products.

4.1.3 Must record all test data and make such data amendable for the next ten years.

4.1.4 Must be able to prove that the test sample is standard enough to trust that batch's performance. (For examples of sampling methods for batch production, refer to Paragraph 4.4.)

4.1.5 Must analyze the test results, taking temperature, quality of materials, chemical immersion time, chemical concentration, neutralization, fluctuations in industrial production, etc. into consideration to verify the stability of the barrier face's characteristics. Additionally, proof must be given that such treatment residue has been removed properly from the processed materials.

4.1.6 If incompatibility has been observed in a sample or part of the test, further sampling and tests must be conducted. The necessary treatments must be applied in order to achieve product compatibility.

4.2 The manufacturer's official level must be at least ISO9001-2008.

4.3 As a minimum requirement, there must be a manager following the compatibility procedure of Section 4.4 to ensure product compatibility.

4.4 Examples of Sampling in Accordance with the Batch

4.4.1 If several sample aluminum honeycomb original blocks into block types can be produced in the same processing tank, one of these blocks may be used as a sample. However, great care must be taken so that all of the non-molded blocks can be uniformly processed.

4.4.2 If there is a limited supply of same-type bocks processed in the same processing tank, the sample block shall be from a batch that contained all aluminum honeycomb original blocks start to finish. If the first sample meets this requirement, but the final sample does not, additional samples must be collected from the initial stage of production until the samples are compatible. Only blocks from this sample can be used. Every sample must be molded.

4.4.3 If the tester has experience with production control consistency, then both sampling methods may be used together. If the samples from the first and last production groups are compatible, this batch can be counted as one of the groups in concurrent production.

5. Static Tests

5.1 One or more samples (according to the batch method) taken from each batch of processed honeycomb core shall be tested according to the following procedure:

5.2 The sample size of the aluminum honeycomb block (A-F) for static tests shall be the size of a normal block of the barrier face, i.e. 250 mm × 500 mm × 440 mm.

5.3 The samples should be compressed between two parallel loading plates which are at least 20 mm larger than the block cross section.

5.4 The compression speed shall be 100 mm per minute, with a tolerance of 5%.

5.5 The data acquisition for static compression shall be sampled at a minimum of 5 Hz.

5.6 The static test shall be continued until the block compression is at least 300 mm for all blocks (A-F).

6. Dynamic Tests

For every 100 barrier faces produced, the manufacturer shall perform one dynamic test against a dynamometric wall supported by a fixed rigid barrier, according to the method described below.

6.1 Installation

6.1.1 Testing Site

6.1.1.1 The test area shall be large enough to accommodate the run-up track of the mobile deformable barrier, the rigid barrier and the technical equipment necessary for the test. The last part of the track, for at least 5 m before the rigid barrier, shall be horizontal, flat and smooth.

6.1.2 Fixed Rigid Barrier and Dynamometric Wall

6.1.2.1 The rigid wall shall consist of a block of reinforced concrete not less than 3 m wide and not less than 1.5 m high. The thickness of the rigid wall shall be such that it weighs at least 70 tons.

6.1.2.2 The front face shall be vertical, perpendicular to the axis of the run-up track and equipped with six load cell plates, each capable of measuring the total load on the appropriate block of the mobile deformable barrier face at the moment of impact. The load cell plate area centers shall be aligned with those of the six impact zones of the mobile deformable barrier face. Their edges shall clear adjacent areas by 20±2mm such that, within the tolerance of impact alignment of the mobile deformable barrier, the impact zones will not contact the adjacent impact plate areas. Cell mounting and plate surfaces shall be in accordance with the requirements set out in the annex to standard ISO 6487:1987.

6.1.2.3 There must be six load cells equipped, and the center load cell's front surface must be 500mm wide, 250mm high. The outer load cells opposing Blocks A, C, D, and F must be 600mm wide and 250mm high. If using more than six load cells, the total area must be 500mm x 250mm, and the outer edge must be 600mm x 250mm.

6.1.2.4 The range around the load cells (less than 1700mm x 500mm) must at least go up to 150mm, and it must have a surface common with the load cells' surface (at least 2000mm x at least 800mm.) This is necessary so that non-conformity with the barrier surface and load cells can be confirmed even if the barrier surface collision is uniform, or the barrier's collision alignment is not complete.

6.1.2.5 Surface protection, comprising a plywood face (thickness: 18 ± 5 mm), is added to each load cell plate such that it shall not degrade the transducer response.

6.1.2.6 The rigid wall shall be either anchored in the ground or placed on the ground with, if necessary, additional arresting devices to limit its deflection. A rigid wall (to which the load cells are attached) having different characteristics but giving results that are at least equally conclusive may be used.

6.1.2.7 Block B's and E's center load cells shall be aligned, and must be matched to the MDB surface's main axis. All of the blocks' intersections must match up with the intersections between the load cells.

6.2 Propulsion of the MDB

At the moment of impact, the mobile deformable barrier shall no longer be subject to the action of any additional steering or propelling device. It shall reach the obstacle on a course perpendicular to the front surface of the dynamometric wall. Impact alignment shall be accurate to within ±15mm.

6.3 Measuring Equipment

6.3.1 Speed

The impact speed shall be 35 ± 0.5 km/h. The instrument which records the speed at the time of collision shall be accurate to within 0.1%.

6.3.2 Loads

Measuring instruments shall meet the specifications set forth in ISO 6487:1987.

CFC for all blocks: 60 Hz

CAC for all blocks: 100 kN

6.3.3 Acceleration

6.3.3.1 The acceleration in the longitudinal direction shall be measured at three separate positions on the trolley, one centrally and one at each side, at places not subject to bending.

6.3.3.2 The central accelerometer shall be located within 500 mm of the location of the center of gravity of the mobile deformable barrier and shall lie in a vertical longitudinal plane which is within ±10 mm of the center of gravity of the mobile deformable barrier.

6.3.3.3 Accelerometers on the two sides shall be at the same height in the range of ±10 mm from each other and shall be placed at the same distance in the range of ±20 mm from the front of the mobile deformable barrier.

6.3.3.4 The instrumentation shall comply with ISO 6487:1987 with the following specifications:

CFC 1,000 Hz (before integration)

CAC 50 g

6.3.3.5 For the switch to verify the moment of collision, two contact switches shall be affixed to the front surface of the beam element that first touches the load cells.

6.4 General Specifications of the MDB

6.4.1 The individual characteristics of each barrier shall comply with Paragraph 1 of this Attachment and shall be recorded.

6.5 General Specifications of the Barrier Face

6.5.1 The suitability of a barrier face as regards the dynamic test requirements shall be confirmed when the outputs from the six-load cell plates each produce signals in compliance with the requirements indicated in this Attachment.

6.5.2 Barrier faces shall carry consecutive serial numbers that are stamped, etched or otherwise permanently attached, from which the batches for the individual blocks and the date of manufacture can be established.

6.6 Data Processing Procedure

6.6.1 Raw Data

6.6.1.1 aw data: At time $T=T_0$, all offsets should be removed from the data. The method by which offsets are removed shall be recorded in the test report.

6.6.1.2 The two contact switches on the beam element shall determine T_0.

6.6.2 Filtering

6.6.2.1 The raw data shall be filtered prior to processing/calculations.

6.6.2.2 Accelerometer data for integration shall be filtered according to CFC 180, ISO 6487:1987.

6.6.2.3 Accelerometer data for impulse calculations shall be filtered according to CFC 60, ISO 6487:1987.

6.6.2.4 Load cell data shall be filtered according to CFC 60, ISO 6487:1987.

6.6.3 Calculating the MDB Face Deflection

6.6.3.1 Accelerometer data from all three accelerometers individually (after filtering according to CFC 180), shall be integrated twice to obtain the deflection of the barrier deformable element.

6.6.3.2 The initial conditions for deflection are:

6.6.3.2.1 velocity = impact velocity (from speed measuring device)

6.6.3.2.2 deflection = 0

6.6.3.3 The deflection at the left-hand side, mid-line and right-hand side of the MDB shall be plotted with respect to time.

6.6.3.4 The maximum deflection calculated from each of the three accelerometers shall be within 10 mm. If this is not the case, then the outlier should be removed and the difference between the deflections calculated from the remaining two accelerometers should be checked to ensure that it is within 10 mm.

6.6.3.5 If the deflections as measured by the left-hand side, right-hand side and mid-line accelerometers are within 10 mm, then the mean acceleration of the three accelerometers should be used to calculate the deflection of the barrier face.

6.6.3.6 If the deflection from only two accelerometers meets the 10 mm requirement, then the mean acceleration from these two accelerometers should be used to calculate the deflection of the barrier face.

6.6.3.7 If the deflections calculated from all three accelerometers (left-hand side, right-hand side and mid-line) are not within the 10 mm requirement, then the raw data should be reviewed to determine the causes of such large variation. In this case the individual test institute must determine which accelerometer data should be used to determine mobile deformable barrier deflection or whether none of the accelerometer readings can be used, in which case, the certification test must be repeated. A full explanation should be given in the test report.

6.6.3.8 For both load and acceleration data, the use the two contact switches installed on the beam element to determine T_0. If T_0'sload level from the filter is as illustrated below, then it becomes greater than 0kN. To set up 0kN with T_0, the load data must be changed.

6.6.3.9 The mean deflection-time data will be combined with the load cell wall force-time data to generate the force-deflection result for each block.

6.6.4 Calculation of Energy

The absorbed energy for each block and for the whole MDB face should be calculated up to the point of peak deflection of the barrier by:

$$En = \int_{t_0}^{t_1} Fn \bullet ds_{mean}$$

Where:

t_0 is the time of first contact.

t_1 is the time where the trolley comes to rest (i.e. where u = 0)

s is the deflection of the trolley deformable element calculated according to Paragraph 6.6.3.

6.6.5 Verifying the Dynamic Force Data

6.6.5.1 Compare the total impulse (I) calculated from integrating the total force over the period of contact, with the momentum change (M*ΔV) over that period.

6.6.5.2 Compare the total energy change to the change in kinetic energy of the MDB, given by:

$$Ek = \frac{1}{2} M V_i^2$$

where, V_i is the impact velocity and M is the whole mass of the MDB.

If the momentum change (M*ΔV) does not agree with the difference in the range of ±5% of the total impulse (I) or if the absorbed total energy (ΣEn) does not agree with the difference in the range of ±5% of the kinetic energy (E_k), the test data shall be reviewed, and the cause of this error shall be decided.

6.7 After the Test

6.7.1 The barrier face compression will be recorded after collision with the LCW at the typical position above the barrier. The compression measurements will be compared with the deflection measured from the data from the trolley accelerometer. If the deflection measurement is 20mm lower than the collision compression measurement, the individual testing institutes shall determine if some of the accelerometer data is useable or not, and a re-test might become necessary. A complete explanation of this must be included in the test report.

Design of Barrier Face

All dimensions are in mm. The tolerance on the dimensions of the blocks allows for the difficulties of measuring cut aluminum honeycomb. The tolerance on the overall dimensions of the barrier face is less than that for the individual blocks since the honeycomb blocks can be adjusted, with overlap, if necessary, to maintain a more closely defined barrier face dimension.

Figure 1: AE-MDB Drawing

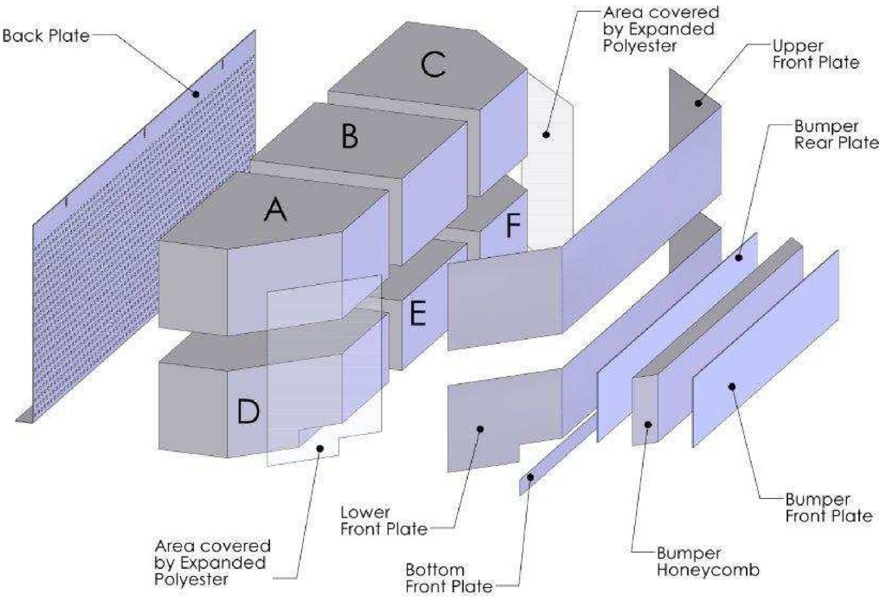


Figure 2: AE-MDB Size

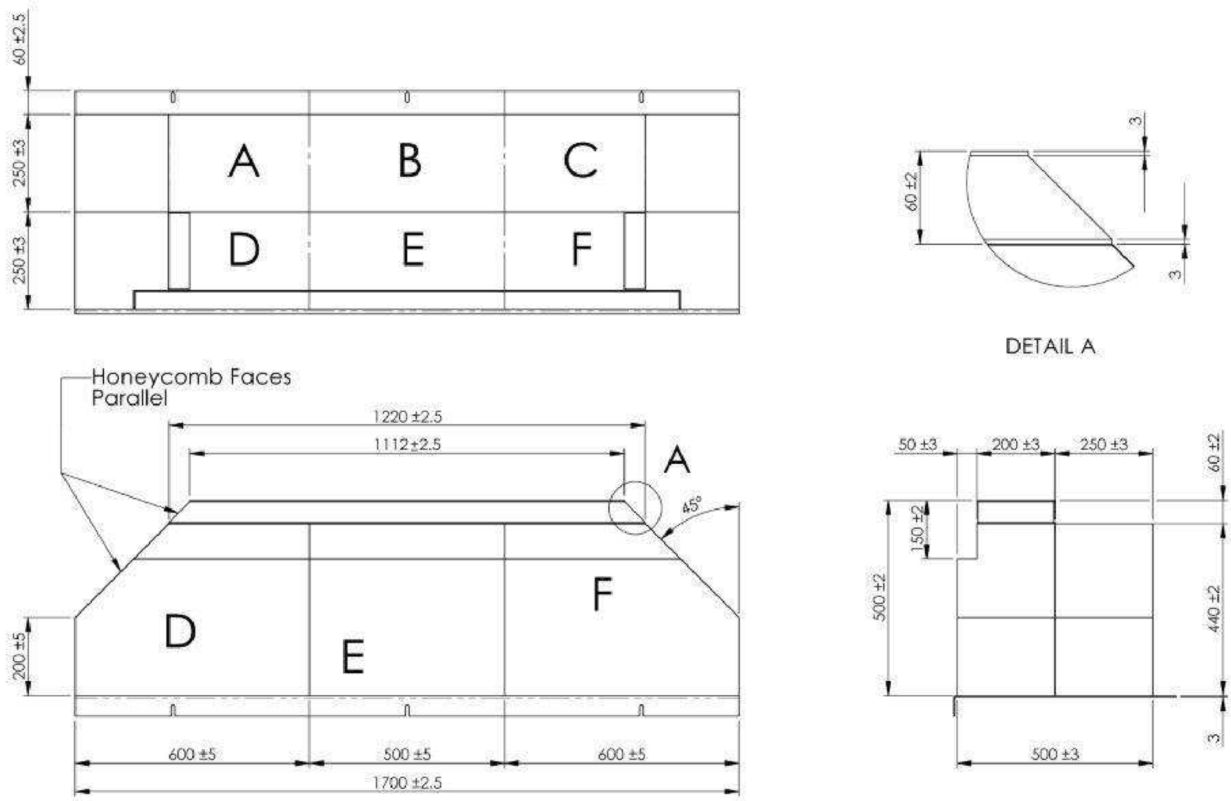


Figure 3: Aluminum Honeycomb Block Facing

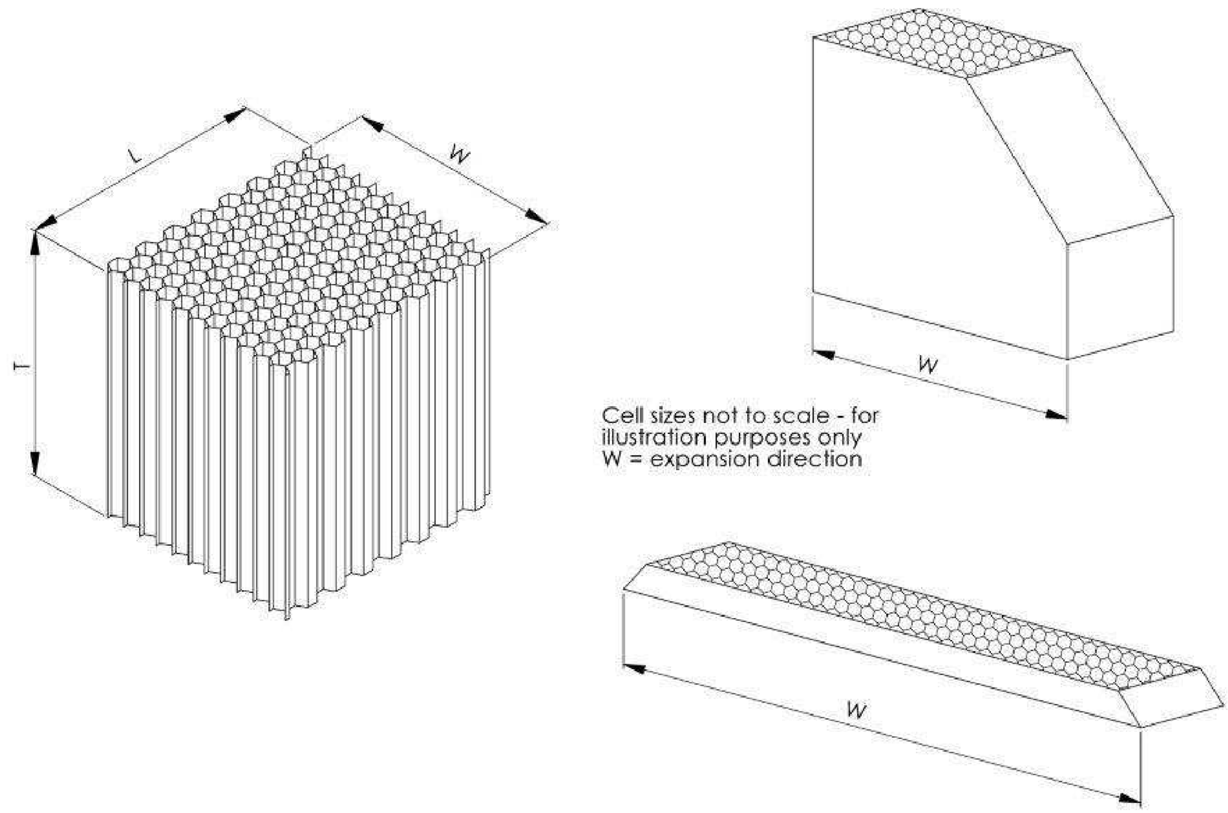


Figure 4: Aluminum Honeycomb Cell Size

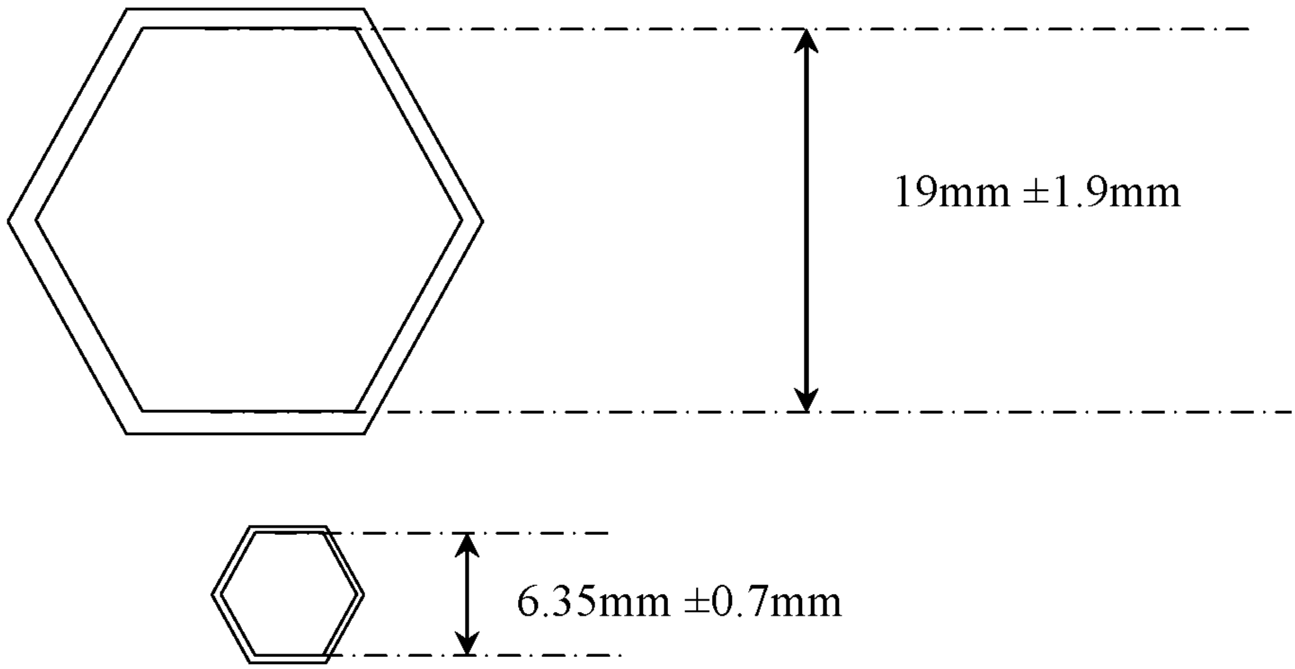


Figure 5: Back Plate Design

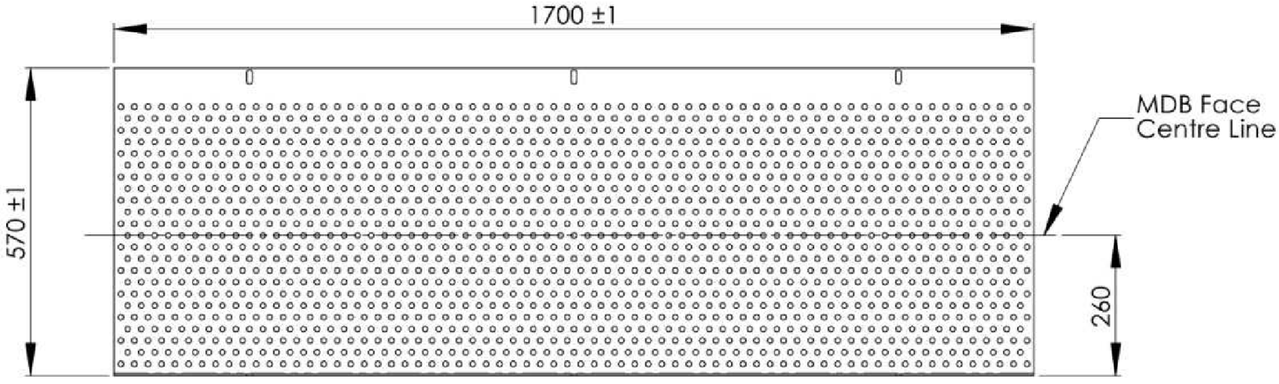


Figure 6: Back Plate Ventilation and Front Plate of Trolley Attachment

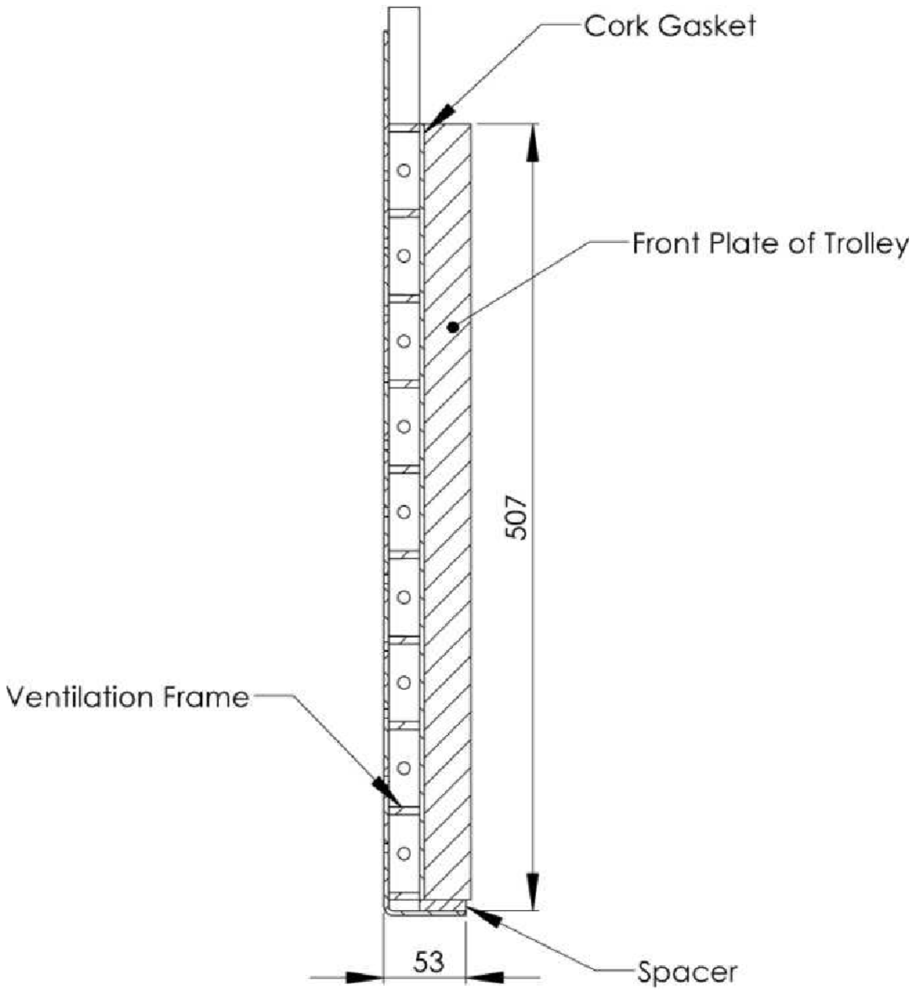


Figure 7: Back Plate Vent Hole Staggered Arrangement Example

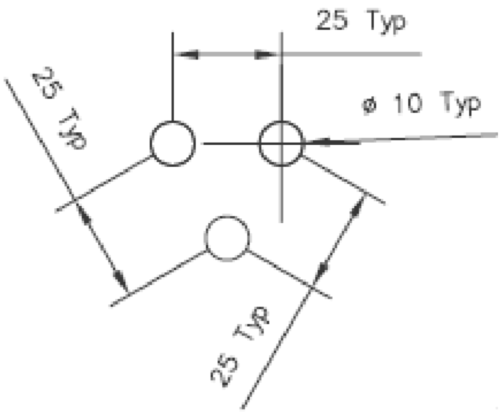
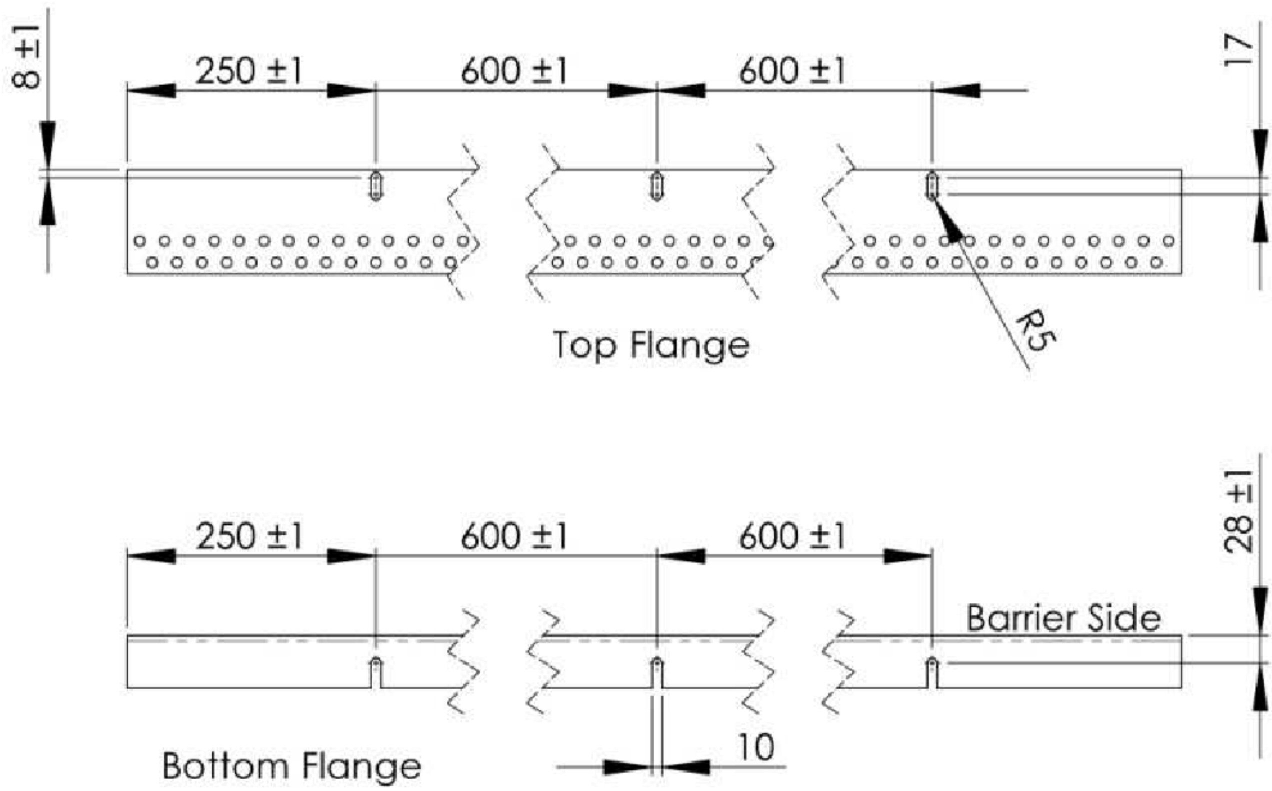


Figure 8: Top and Bottom Plate Flanges



Note: The attachment holes in the bottom flange may be opened to slots, as shown below, for ease of attachment provided sufficient grip can be ensured to avoid detachment during the impact test.

Figure 9: Ventilation Frame

The ventilation device shall be constructed with a plate of 5 mm thickness and 20 mm width. Only the vertical plate may have nine 8-mm holes and air can circulate laterally. A ventilation frame of 1500mm width with an extension capacity of 1700mm width is also acceptable. However, it must have the proper ventilation and fixed pattern.

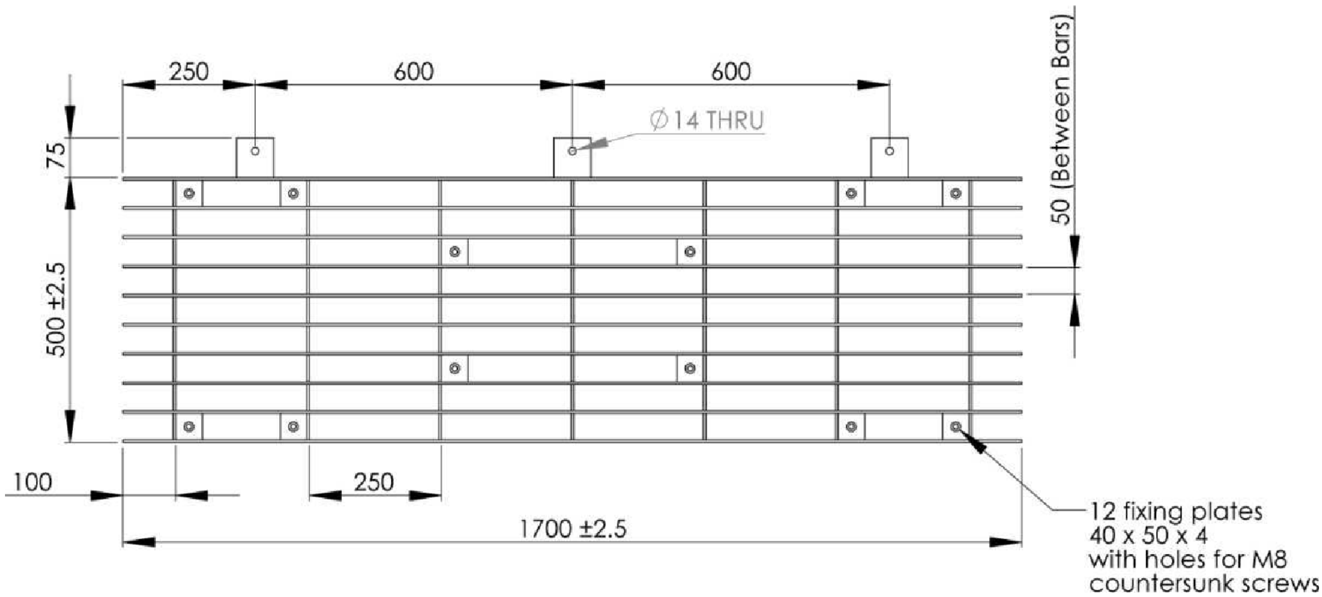
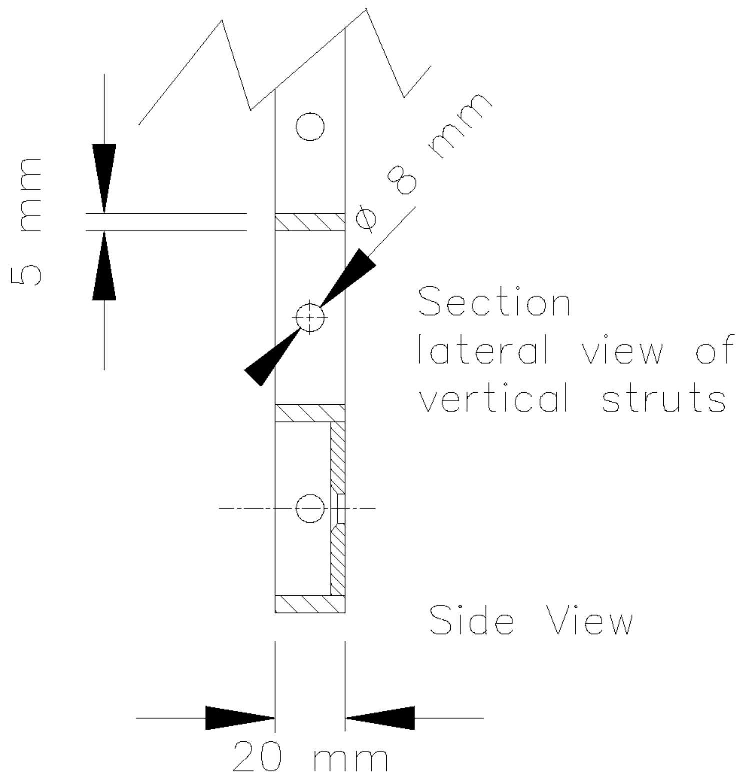


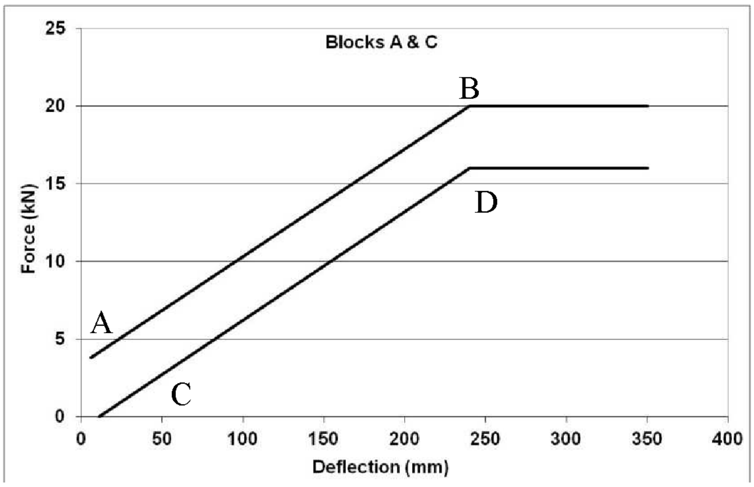
Figure 10: Ventilation, Side View



Attachment 2—Appendix 1

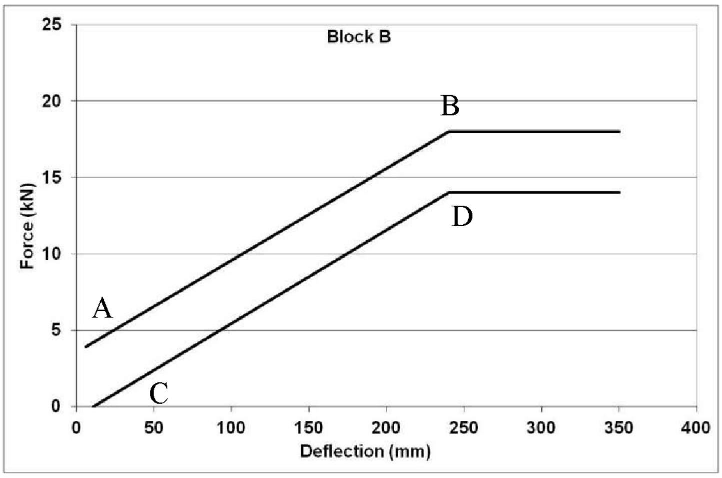
Force-Deflection Curves for Static Tests

Blocks A and C Figure 1a



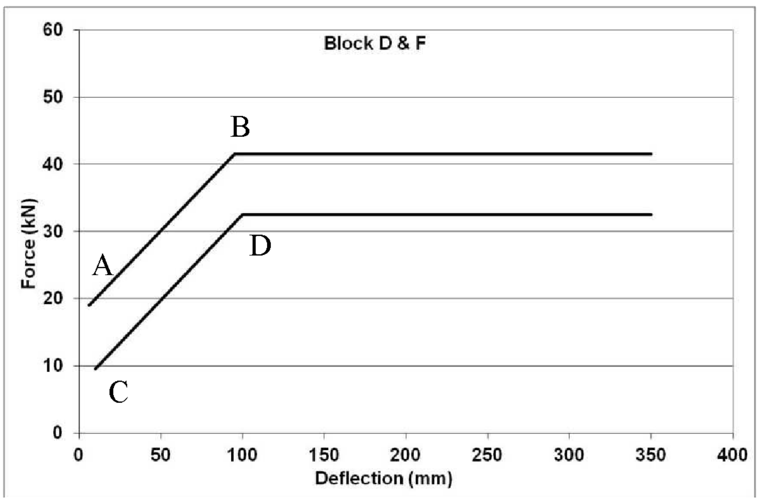
	Force	Deflection
A	3.8kN	6mm
B	20kN	240mm
C	0kN	11mm
D	16kN	240mm

Block B Figure 1b



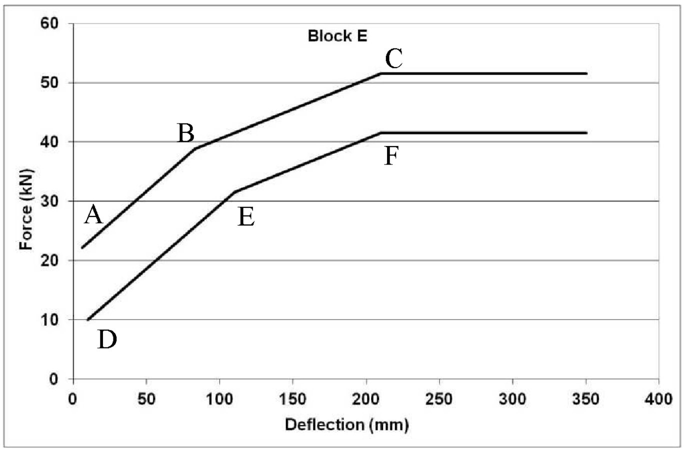
	Force	Deflection
A	3.9kN	6mm
B	18kN	240mm
C	0kN	11mm
D	14kN	240mm

Bocks D and F Figure 1c



	Force	Deflection
A	19kN	6mm
B	41.5kN	95mm
C	9.5kN	10mm
D	32.5kN	100mm

Block E Figure 1d



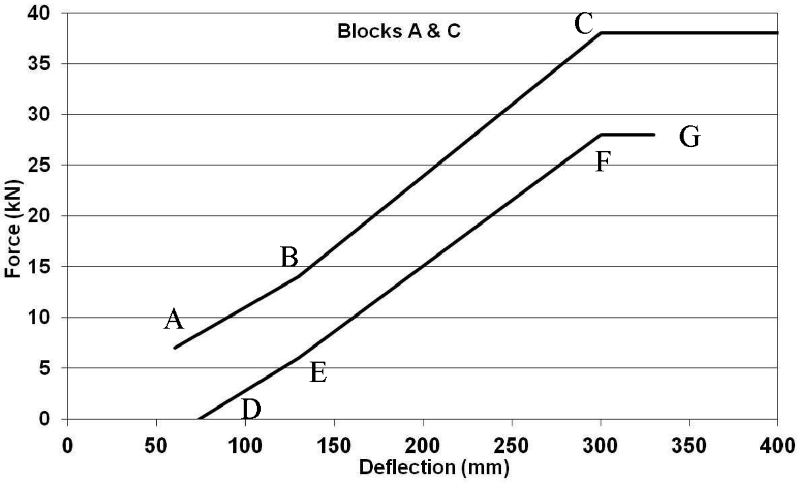
	Force	Deflection
A	22.2kN	6mm
B	38.8kN	83mm
C	51.5kN	210mm
D	10kN	10mm
E	31.5kN	110mm
F	41.5kN	210mm

Figure 13: Block E static corridor

Attachment 2 - Appendix 2

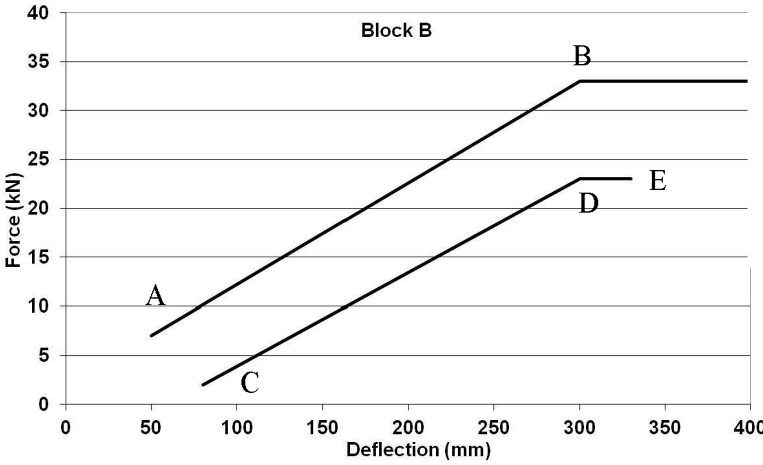
Force-Deflection Curves for Dynamic Tests

Blocks A and C Figure 2a



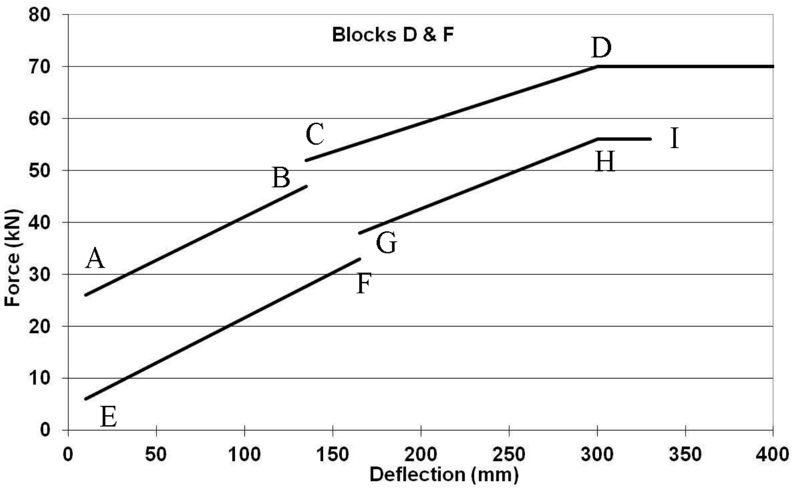
	Force	Deflection
A	7kN	60mm
B	14kN	130mm
C	38kN	300mm
D	0kN	74mm
E	6kN	130mm
F	28kN	300mm
G	28kN	330mm

Block B Figure 2b



	Force	Deflection
A	7kN	50mm
B	33kN	300mm
C	2kN	80mm
D	23kN	300mm
E	23kN	330mm

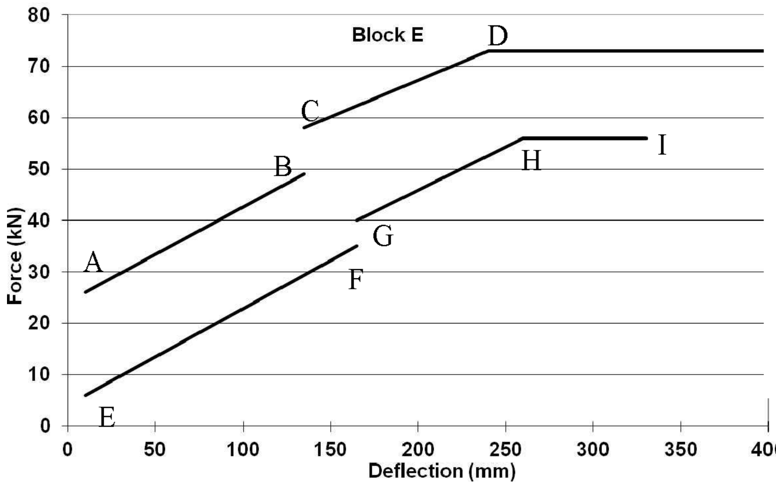
Blocks D and F Figure 2c



	Force	Deflection
A	26kN	10mm
B	47kN	135mm
C	52kN	135mm
D	70kN	300mm
E	6kN	10mm
F	33kN	165mm
G	38kN	165mm
H	56kN	300mm
I	56kN	330mm

Block E

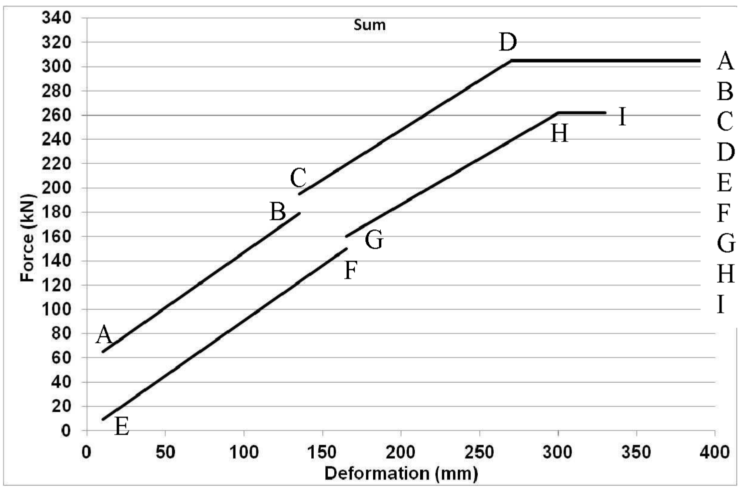
Figure 2d



	Force	Deflection
A	26kN	10mm
B	49kN	135mm
C	58kN	135mm
D	73kN	240mm
E	6kN	10mm
F	35kN	165mm
G	40kN	165mm
H	56kN	260mm
I	56kN	330mm

All Blocks

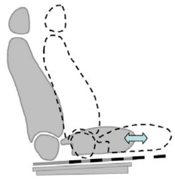
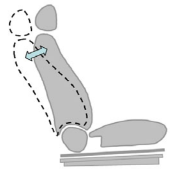
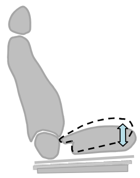
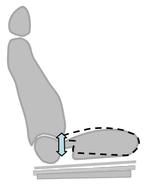
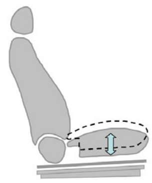
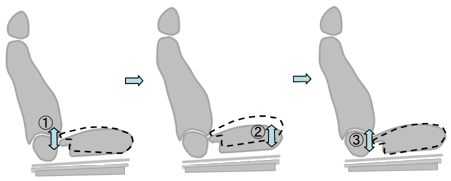
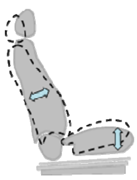
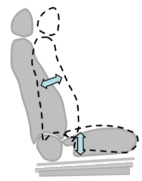
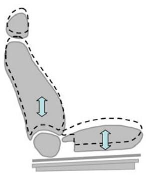
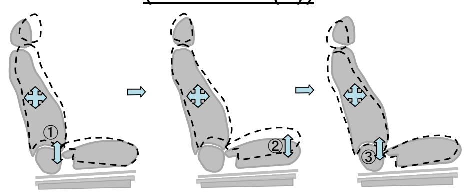
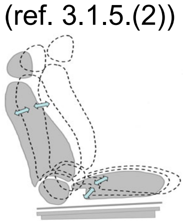
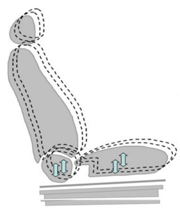
Figure 2e



	Force	Deflection
A	65kN	10mm
B	179kN	135mm
C	195kN	135mm
D	305kN	270mm
E	9kN	10mm
F	150kN	165mm
G	160kN	165mm
H	262kN	300mm
I	262kN	330mm

Attachment 3

Adjusting position of test seat adjustment mechanism

Fore-aft direction adjustment device (ref. 3.1.5.(1))  20mm behind middle position in fore-and-aft direction	Seatback angle adjustment device (ref. 3.1.5.(3))  Design standard angle
Seat cushion surface angle adjustment device (tilt or lifter) (ref. 3.1.5.(2))  or  Middle position or lowest position in vertical direction	Seat cushion surface vertical adjustment device (lifter) (ref. 3.1.5.(2))  Lowest position in vertical direction
Seat cushion surface angle, vertical adjustment device (other) (ref. 3.1.5.(2))  ①=Highest position ②=Mid-position ③=Lowest position	Seat lower, seatback angle adjustment device (ref. 3.1.5.(2))  or  Vertical mid-position or Vertical lowest position
Seat lower, seatback vertical adjustment device(lifter) (ref. 3.1.5.(2))  Lowest vertical position	<u>Seat lower (angular, vertical), seatback angle adjustment device</u> <u>(ref. 3.1.5.(2))</u>  ①=highest position ②=mid-position ③=lowest position
Fore-aft, vertical, angle all linked adjustment device (ref. 3.1.5.(2))  Lowest Vertical Position	Fore-aft, vertical all linked adjustment device (ref. 3.1.5.(2))  Lowest Vertical Position

Attachment 4

Test Report (Example)
Side Collision
Test No. NASVA 2023-****-***
Test Vehicle's Name: NASVA 1234

Testing Date	: ___dd/____mm/2023 (*)
Testing Site	: (general) JARI

1.Test Vehicle:

Vehicle name/model	:NASVA 1234(DAA-ABCD)
Vehicle mass	:1000 kg (F:600/ R:400)
Chassis No.	:ABCD-123456
Occupant crash protection	:Driver seat - seatbelt (with double pretensioner) + airbag (side, curtain)

2. Dummy:

Driver's Seat:	WorldSID 50%tile / WorldSID-A

3. Deformable Barrier:

Manufacturer	: ******, ltd.
Part No. / Serial No.	: ******** ／ 23**-***
Date of inspection	: ___dd/____mm/2023

4.Test Report

①Collision Speed: 55.0km/h

②Center Deviation: Left-right: 0mm Up-down: 0mm

③Injury Criterion:

Measurement position		Driver Seat
Head injury value (HIC15)		123.4
Shoulder load (kN)		1.23
Amount of chest displacement (mm)	Rib 1 (Upper)	-12.34
	Rib 2 (Middle)	-12.34
	Rib 3 (Lower)	-12.34
Abdomen displacement (mm)	Rib 1 (Upper)	-12.34
	Rib 2 (Lower)	-12.34
Pubic bone load (kN)		-12.34

④Vehicle rollover : None

⑤Door opening during test : None

⑥Fuel leakage during or after collision : None

⑦Ability to open side door:

		Non-collision side
Front seat	Method	One-handed
	Door lock	None
Rear seat	Method	One-handed
	Door lock	None

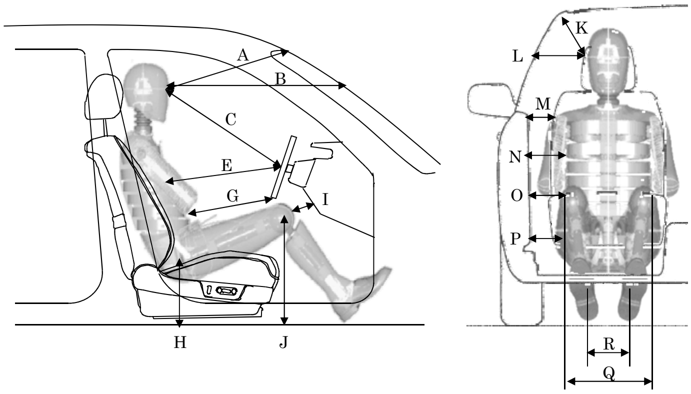
⑧Restrained condition of dummy during and after test : Optimal

⑨Ability to retrieve dummy from vehicle : Without tools, without readjusting the steering wheel or seat.

⑩Protrusions from the vehicle, etc. : None

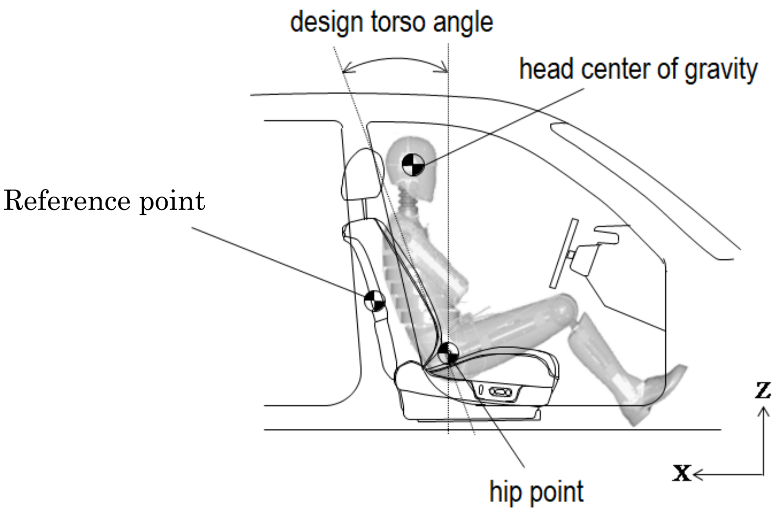
5. Dummy's Seating Position:

(1) Point-to-Point (2D) Measurement Results



	Measured Position	Measurement (mm)	
A	Head to Windshield Header (The shortest distance from the brow to the glass)	123	
B	Head to Windshield (The horizontal distance from the brow to the glass)	123	
C	Head to STG Wheel (The distance from the brow to the center of STG)	123	
D	Head Angle (Tilt sensor)	X :	1.2°
		Y :	1.2°
E	MID RIB to STG Wheel (The distance from the MID to the center of STG)	123	
F	Chest Angle (Tilt sensor)	X :	1.2°
		Y :	1.2°
G	Upper-abdomen to STG Wheel (The distance from upper-abdomen to the lower of STG)	123	
H	Hip Point to the Floor (The vertical distance from the hip point to the floor carpet)	123	
I	Knee to Dashboard (The shortest distance from the knee to the dashboard)	Right knee :	123
		Left knee	123
J	Knee Height (The vertical distance from the knee to the floor carpet)	Right knee :	123
		Left knee	123
K	Head's Center of Gravity to Side Roof (The shortest distance from the head's center of gravity to the side roof)	123	
L	Head's Center of Gravity to Side Window (The horizontal distance from the head's center of gravity to the glass)	123	
M	Arm to Door (The horizontal distance from the shoulder to the door)	123	
N	MID RIB to Door (The horizontal distance from the chest to the door)	123	
O	Upper-abdomen to Door (The horizontal distance from the abdomen to the door)	123	
P	Hip Point to Door (The horizontal distance from the hip point to the door)	123	
Q	Distance Between Knees (The distance from the left knee center to the right knee center)	123	
R	Distance Between Feet (The distance from the left ankle center to the right ankle center)	123	

(2) 3-D Measurement Results



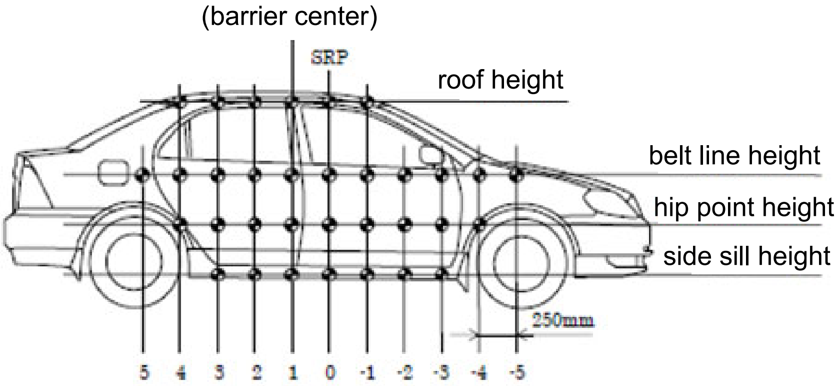
Reference point (example) door switch mounting hole / (X;123 Y;123 Z;123) / unit : mm

Design torso angle / 12.3°

Measured Points	Axis	Measurement (mm)
Head's Center of Gravity (collision side)	X	1234
	Y	1234
	Z	1234
Hip Point	X	1234
	Y	1234
	Z	1234
Dummy Center	Y	1234

6. Degree of Deformation on Vehicle and Deformable Barrier

(1) Body Outer Panel



side sill height (unit : mm)

Position	Axis	Before test	After test	Deformation	Distance
-5	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-4	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-3	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-2	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
SRP 0	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
barrier center 1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
2	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
3	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
4	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
5	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	

hip point height (unit : mm)

Position	Axis	Before test	After test	Deformation	Distance
-5	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-4	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-3	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-2	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
-1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
SRP 0	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
barrier center 1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
2	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
3	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
4	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
5	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	

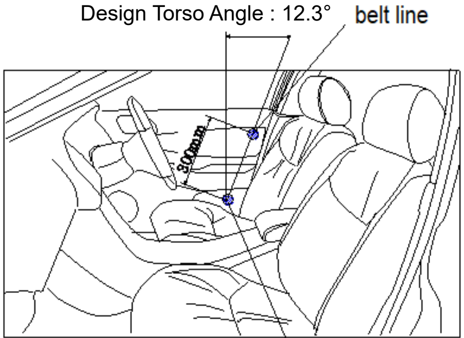
Belt line height (unit : mm)

Position	Axis	Before test	After test	Deformation	Distance
-5	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-4	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-3	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-2	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-1	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
SRP 0	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
barrier center 1	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
2	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
3	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
4	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
5	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	

Roof height (unit : mm)

Position	Axis	Before test	After test	Deformation	Distance
-5	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-4	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-3	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-2	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
-1	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
SRP 0	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
barrier center 1	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
2	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
3	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
4	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
5	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	

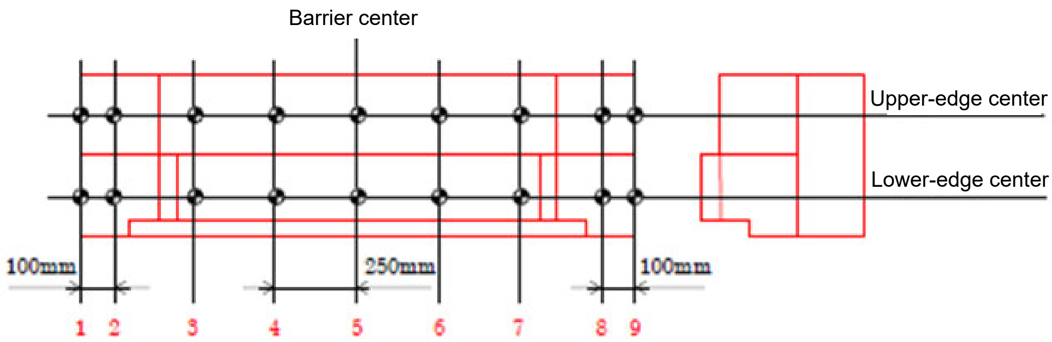
(2) Vehicle Interior



Vehicle Interior (unit : mm)

Position	Axis		After test	Deformation	Distance
Belt Line	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	
Hip Point	X	123	123	0	
	Y	123	123	0	0
	Z	123	123	0	

(3) Deformable Barrier



Upper-edge center (unit : mm)

Position	Axis	Before test	After test	Deformation	Distance
1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
2	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
3	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
4	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
barrier center 1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
6	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
7	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
8	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
9	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	

Lower-edge center (unit : mm)

Position	Axis	Before test	After test	Deformation	Distance
1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
2	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
3	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
4	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
barrier center 1	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
6	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
7	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
8	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	
9	X	123	123	0	0
	Y	123	123	0	
	Z	123	123	0	