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**PROPOSAL FOR DRAFT AMENDMENTS (SUPPLEMENT 3 TO THE 01 SERIES)
TO REGULATION No. 21
(Interior fittings)**

Transmitted by the Expert from the United States of America

Note: The text reproduced below was prepared by the expert from the United States of America in order to introduce into the Regulation provisions for ensuring the protection in all interior parts of the vehicle which could be impacted by occupants' heads in a collision. These provisions are based on the Federal Motor Vehicle Safety Standard (FMVSS) No. 201. The text which supersedes documents TRANS/WP.29/GRSP/R.163 and TRANS/WP.29/GRSP/1997/2 contains recent modifications to FMVSS No. 201. However, the pole impact test procedures/requirements are not included.

Note: This document is distributed to the Experts on Passive Safety only.

List of Contents, insert new titles of paragraphs 5. and 6., to read (the titles of former paragraphs 6. to 10., renumber as paragraphs 7. to 11.):

"5. Requirements for Parts other than Roof Support Structures

6. Requirements for Roof Support Structures"

List of Contents, annexes, insert a new title of annex 8, to read:

"Annex 8 - Anthropomorphic Test Device for Application of Paragraph 6. of this Regulation"

Paragraph 1.1., amend to read:

"1.1. the interior parts of the passenger compartment other than rear-view mirrors and stop lamp of category S3;"

Paragraph 1.3., amend to read:

"1.3. the roof, the sliding roof, and the roof support structures including pillars, side rails, headers, roll-bars, and".

Paragraph 2.2., amend to read:

"2.2. "Vehicle type" with regard to the interior fittings of the passenger compartment (other than the rear-view mirrors and stop lamp of category S3; the arrangement of controls, the roof and sliding roof and the roof support structures, the back rest and rear part of the seat) means power-driven vehicles which do not differ in such essential respects as:"

Insert new paragraphs 2.10. to 2.29., to read:

"2.10. "A-pillar" means any pillar that is entirely forward of a transverse vertical plane passing through the seating reference point of the driver's seat.

2.11. "B-pillar" means the forward most pillar on each side of the vehicle that is, in whole or part, rearward of a transverse vertical plane passing through the seating reference point of the driver's seat, unless there is only one pillar rearward of that plane and it is also a rearmost pillar.

2.12. "Brace" means a fixed diagonal structural member in any vehicle with opening roof or convertible cars that is used to brace the roll-bar and that connects the roll-bar to the main body of the vehicle structure.

2.13. "Convertible roof frame" means the system of frames and folding rods used to support the roof of a convertible car.

- 2.14. "Convertible roof linkage mechanism" means any anchorage, fastener, or device necessary to deploy a convertible roof frame.
- 2.15. "Daylight opening" means, for openings on the side of the vehicle, other than a door opening, the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centreline, is tangent to the periphery of the opening. For openings on the front and rear of the vehicle, other than a door opening, daylight opening means the locus of all points where a horizontal line, parallel to the vehicle longitudinal centreline, is tangent to the periphery of the opening. If the horizontal line is tangent to the periphery at more than one point at any location, the most inboard point is used to determine the daylight opening.
- 2.16. "Door opening" means, for door openings on the side of the vehicle, the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centreline, is tangent to the periphery of the side door opening. For door openings on the back end of the vehicle, door opening means the locus of all points where a horizontal line, parallel to the vehicle longitudinal centreline, is tangent to the periphery of the back door opening. If the horizontal line is tangent to the periphery at more than one point at any location, the most inboard point is the door opening.
- 2.17. "Forehead impact zone" means the part of the free motion headform surface area that is determined in accordance with the procedure set forth in paragraph 6.3.10.
- 2.18. "Free motion headform" means a test device which conforms to the specifications of annex 8.
- 2.19. "Mid-sagittal plane of a dummy" means a longitudinal vertical plane passing through the seating reference point of a designated seating position.
- 2.20. "Other pillar" means any pillar which is not an A-pillar, a B-pillar, or a rearmost pillar.
- 2.21. "Pillar" means any structure, excluding glazing and the vertical portion of door window frames, but including accompanying mouldings, attached components such as safety belt anchorages and coat hooks, which:
- (1) supports either a roof or any other structure (such as a roll-bar) that is above the driver's head, or
 - (2) is located along the side edge of a window.
- 2.22. "Roll-bar" means a fixed overhead structural member, including its vertical support structure, that extends from the left to the

right side of the passenger compartment of any vehicle with opening roof and convertible cars. It does not include a header.

- 2.23. "Roof support structures" mean vehicle upper interior components including pillars, side rails, headers, roll-bars, and roof.
- 2.24. "Seat belt anchorage" means any component involved in transferring seat belt loads to the vehicle structure, including, but not limited to, the attachment hardware, but excluding webbing or straps, seat frames, seat pedestals, and the vehicle structure itself, whose failure causes separation of the belt from the vehicle structure.
- 2.25. "Seating reference point" means the unique design H-point which establishes the rearmost normal design driving or riding position of each designated seating position, which includes consideration of all modes of adjustment, horizontal, vertical, and tilt, in a vehicle.
- 2.26. "Sliding door track" means a track structure along the upper edge of a side door opening that secures the door in the closed position and guides the door when moving to and from the open position.
- 2.27. "Stiffener" means a fixed overhead structural member that connects one roll-bar to another roll-bar or to a header of any vehicle with opening roof and convertible cars.
- 2.28. "Upper roof" means the area of the vehicle interior that is determined in accordance with the procedure set forth in paragraph 6.3.15.
- 2.29. "Windscreen trim" means moulding of any material between the windscreen glazing and the exterior roof surface, including material that covers a part of either the windscreen glazing and the exterior roof surface."

Paragraph 4.1., amend to read:

- "4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5. and 6. below, approval of that vehicle type shall be granted."

Paragraph 5., amend to read:

- "5. REQUIREMENTS FOR PARTS OTHER THAN ROOF SUPPORT STRUCTURES"

Insert new paragraphs 6. to 6.5.13., to read:

"6. REQUIREMENTS FOR ROOF SUPPORT STRUCTURES

Each vehicle shall, when tested under the conditions of paragraph 6.3., comply with the requirements specified in paragraph 6.2. at the target locations specified in paragraph 6.5. when impacted by the free motion headform specified in annex 8 at any speed up to and including 24 kilometers per hour. The requirements do not apply to any target that cannot be located using the procedures of paragraph 6.5.

6.1. A vehicle need not meet the requirements for:

6.1.1. Any target located on the convertible roof frame or the convertible roof linkage mechanism.

6.1.2. Any target located rearward of a vertical plane 600 mm away from the seating reference point of the rearmost designated seating position, measured in the +X direction of the vehicle reference coordinate system as shown in annex 5 - appendix 2.

6.2. Performance Criterion

The HIC(d) shall not exceed 1000 when calculated in accordance with the following formula:

6.2.1. $HIC(d) = 0.75446 \text{ (free motion headform HIC)} + 166.4.$

6.2.2. The free motion headform HIC is calculated in accordance with the following formula:

$$\left[\frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a dt \right]^{2.5} (t_2 - t_1)$$

Where the term \underline{a} is the resultant acceleration expressed as a multiple of \underline{g} (the acceleration of gravity), and t_1 and t_2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval.

6.3. Test conditions

6.3.1. Vehicle test attitude

6.3.1.1. The vehicle is supported off its suspension at an attitude determined in accordance with paragraph 6.3.1.2.

6.3.1.2. Directly above each wheel opening, determine the vertical distance between a level surface and a standard reference point on the test vehicle's body under the conditions of paragraphs 6.3.1.2.1. to 6.3.1.2.3.

6.3.1.2.1. The vehicle is loaded to its unloaded vehicle weight, plus its rated cargo and luggage capacity or 136 kg, whichever is less, secured in the luggage area. The load placed in the cargo area is centred over the longitudinal centreline of the vehicle.

6.3.1.2.2. The vehicle is filled to 100 per cent of all fluid capacities.

6.3.1.2.3. All tyres are inflated to the manufacturer's specifications listed on the vehicle's tyre placard.

6.3.2. Windows and sun roofs

6.3.2.1. Movable vehicle windows are placed in the fully open position.

6.3.2.2. For testing, any window on the opposite side of the longitudinal centreline of the vehicle from the target to be impacted may be removed.

6.3.2.3. For testing, movable sun roofs are placed in the fully open position.

6.3.3. Convertible tops

The top of convertible cars and vehicles with opening roof is in the closed passenger compartment configuration.

6.3.4. Doors

6.3.4.1. Except as provided in paragraphs 6.3.4.2. or 6.3.4.3., doors, including any rear hatchback or tailgate, are fully closed and latched but not locked.

6.3.4.2. During testing, any side door on the opposite side of the longitudinal centreline of the vehicle from the target to be impacted may be open or removed.

6.3.4.3. During testing, any rear hatchback or tailgate may be opened or removed for testing any targets except targets on the rear header, rearmost pillars, or the rearmost other side rails on either side of the vehicle.

6.3.5. Sun visors

Each sun visor shall be placed in any position where one side of the visor is in contact with the vehicle interior surface (windscreen, side rail, front header, roof, etc.).

6.3.6. Steering wheel and seats

6.3.6.1. During testing, the steering wheel and seats may be removed from the vehicle.

6.3.6.2. During targeting, the steering wheel and seats may be placed in any position intended for use while the vehicle is in motion.

6.3.7. Seat belt anchorages

If a target is on a seat belt anchorage, and if the seat belt anchorage is adjustable, tests are conducted with the anchorage adjusted to a point midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, tests are conducted with the anchorage adjusted to the nearest position above the midpoint of the two extreme positions.

6.3.8. Temperature and humidity

6.3.8.1. The ambient temperature is between 19°C and 26°C, at any relative humidity between 10 per cent and 70 per cent.

6.3.8.2. Tests are not conducted unless the headform specified in paragraph 6.3.9. is exposed to the conditions specified in paragraph 6.3.8.1. for a period not less than four hours.

6.3.9. Headform

The headform used for testing conforms to the specifications of annex 8.

6.3.10. Forehead impact zone

The forehead impact zone of the headform is determined according to the procedure specified in paragraphs 6.3.10.1. to 6.3.10.6.

6.3.10.1. Position the headform so that the baseplate of the skull is horizontal. The mid-sagittal plane of the headform is designated as Plane S.

6.3.10.2. From the centre of the threaded hole on top of the headform, draw a 69 mm line forward toward the forehead, coincident with Plane S, along the contour of the outer skin of the headform. The front end of the line is designated as Point P. From Point P, draw a 100 mm line forward toward the forehead, coincident with Plane S, along the contour of the outer skin of the headform. The front end of the line is designated as Point O.

6.3.10.3. Draw a 125 mm line which is coincident with a horizontal plane along the contour of the outer skin of the forehead from left to right through Point O so that the line is bisected at Point O.

The end of the line on the left side of the headform is designated as Point a and the end on the right as Point b.

6.3.10.4. Draw another 125 mm line which is coincident with a vertical plane along the contour of the outer skin of the forehead through Point P so that the line is bisected at Point P. The end of the line on the left side of the headform is designated as Point c and the end on the right as Point d.

6.3.10.5. Draw a line from Point a to Point c along the contour of the outer skin of the headform using a flexible steel tape. Using the same method, draw a line from Point b to Point d.

6.3.10.6. The forehead impact zone is the surface area on the FMH forehead bounded by lines a-O-b and c-P-d, and a-c and b-d.

6.3.11. Target circle

The area of the vehicle to be impacted by the headform is marked with a solid circle 12.7 mm in diameter, centred on the targets specified in paragraph 6.5., using any transferable opaque colouring medium.

6.3.12. Location of head centre of gravity

6.3.12.1. Front outboard designated seating positions (CG-F)

6.3.12.1.1. Location of rearmost CG-F (CG-F2)

For front outboard designated seating positions, the head centre of gravity with the seat in its rearmost normal design driving or riding position (CG-F2) is located 160 mm rearward and 660 mm upward from the seating reference point.

6.3.12.1.2. Location of forward most CG-F (CG-F1)

For front outboard designated seating positions, the head centre of gravity with the seat in its forward most adjustment position (CG-F1) is located horizontally forward of CG-F2 by the distance equal to the fore-aft distance of the seat track.

6.3.12.2. Rear outboard designated seating positions (CG-R)

For rear outboard designated seating positions, the head centre of gravity (CG-R) is located 160 mm rearward (in reference to the seat orientation) and 660 mm upward from the seating reference point.

6.3.13. Impact configuration

6.3.13.1. The headform is launched from any location inside the vehicle which meets the conditions of paragraph 6.3.13.4. At the time of

launch, the mid-sagittal plane of the headform is vertical and the headform is upright.

- 6.3.13.2. The headform travels freely through the air, along a velocity vector that is perpendicular to the headform's skull cap plate, not less than 25 mm before making any contact with the vehicle.
- 6.3.13.3. At the time of initial contact between the headform and the vehicle interior surface, some portion of the forehead impact zone of the headform must contact some portion of the target circle.
- 6.3.13.4. Approach angles

The headform launching angle is as specified in Table 1. For components for which Table 1 specifies a range of angles, the headform launching angle is within the limits determined using the procedures specified in paragraphs 6.3.13.4.1. and 6.3.13.4.2., and within the range specified in Table 1, using the orthogonal reference system specified in paragraph 6.4.

TABLE 1 - APPROACH ANGLE LIMITS (IN DEGREES)

<u>IMPACT ZONES</u>	<u>HORIZONTAL ANGLE</u>	<u>VERTICAL ANGLE</u>
Front Header	180	0 - 50
Rear Header	0 or 360	0 - 50
Left Side Rail and sliding door track	270	0 - 50
Right Side Rail and sliding door track	90	0 - 50
Left A-Pillar	195 - 255	-5 - 50
Right A-Pillar	105 - 165	-5 - 50
Left B-Pillar	195 - 345	-10 - 50
Right B-Pillar	15 - 165	-10 - 50
Other Left Pillars	270	-10 - 50
Other Right Pillars	90	-10 - 50
Left Rearmost Pillar	270 - 345	-10 - 50
Right Rearmost Pillar	15 - 90	-10 - 50
Upper Roof	Any	0 - 50
Overhead Rollbar	0 or 180	0 - 50
Brace or Stiffener	90 or 270	0 - 50
Seat Belt Anchorages	Any	0 - 50

6.3.13.4.1. Horizontal approach angles for headform impacts

- (a) Left A-pillar horizontal approach angles
 - (a1) Locate a line formed by the shortest horizontal distance between CG-F1 for the left seat and the right A-pillar. The maximum horizontal approach angle for the left A-pillar equals 360° minus the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.
 - (a2) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left A-pillar. The minimum horizontal approach angle for the left A-pillar impact equals the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.
- (b) Right A-pillar horizontal approach angles
 - (b1) Locate a line formed by the shortest horizontal distance between CG-F1 for the right seat and the left A-pillar. The minimum horizontal approach angle for the right A-pillar equals 360° minus the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.
 - (b2) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right A-pillar. The maximum horizontal approach angle for the right A-pillar impact equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.
- (c) Left B-pillar horizontal approach angles
 - (c1) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left B-pillar. The maximum horizontal approach angle for the left B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 270° , whichever is greater.
 - (c2) Locate a line formed by the shortest horizontal distance between CG-R for the left seat and the left B-pillar. The minimum horizontal approach angle for the left B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.
- (d) Right B-pillar horizontal approach angles
 - (d1) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right B-pillar. The minimum horizontal approach angle for the right B-pillar

equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 90°, whichever is less.

- (d2) Locate a line formed by the shortest horizontal distance between CG-R for the right seat and the right B-pillar. The maximum horizontal approach angle for the right B-pillar equals the angle between that line and the X-axis of the vehicle measured counterclockwise.

6.3.13.4.2 Vertical approach angles

- (a) Position the forehead impact zone in contact with the selected target at the prescribed horizontal approach angle. If a range of horizontal approach angles is prescribed, position the forehead impact zone in contact with the selected target at any horizontal approach angle within the range which may be used for testing.
- (b) Keeping the forehead impact zone in contact with the target, rotate the FMH upward until the lip, chin or other part of the FMH contacts the component or other portion of the vehicle interior.
- (b1) Except as provided in paragraph 6.3.13.4.2.(b.2.), keeping the forehead impact zone in contact with the target, rotate the FMH downward by 5° for each target to determine the maximum vertical angle.
- (b2) For all pillars except A-Pillars, keeping the forehead impact zone in contact with the target, rotate the FMH downward by 10° for each target to determine the maximum vertical angle.

6.3.14. Multiple impacts

- 6.3.14.1. A vehicle being tested may be impacted multiple times, subject to the limitations in paragraphs 6.3.14.2. and 6.3.14.3.
- 6.3.14.2. As measured as provided in paragraph 6.3.14.4., impacts within 300 mm of each other may not occur less than 30 minutes apart.
- 6.3.14.3. As measured as provided in paragraph 6.3.14.4., no impact may occur within 150 mm of any other impact.
- 6.3.14.4. For paragraphs 6.3.14.2. and 6.3.14.3., the distance between impacts is the distance between the centres of the target circle specified in paragraph 6.3.11. for each impact, measured along the vehicle interior.

6.3.15. Upper roof

The upper roof of a vehicle is determined according to the procedure specified in paragraphs 6.3.15.1. to 6.3.15.8.:

- 6.3.15.1. Locate the transverse vertical plane A at the forwardmost point where it contacts the interior roof (including trim) at the vehicle centreline.
- 6.3.15.2. Locate the transverse vertical plane B at the rearmost point where it contacts the interior roof (including trim) at the vehicle centreline.
- 6.3.15.3. Measure the horizontal distance (D1) between Plane A and Plane B.
- 6.3.15.4. Locate the longitudinal vertical plane C at the leftmost point at which a transverse vertical plane, located 300 mm rearward of the A-pillar reference point described in paragraph 6.5.1.1., contacts the interior roof (including trim).
- 6.3.15.5. Locate the longitudinal vertical plane D at the rightmost point at which a transverse vertical plane, located 300 mm rearward of the A-pillar reference point described in paragraph 6.5.1.1., contacts the interior roof (including trim).
- 6.3.15.6. Measure the horizontal distance (D2) between Plane C and Plane D.
- 6.3.15.7. Locate a point (Point M) on the roof interior surface, midway between Plane A and Plane B along the vehicle longitudinal centreline.
- 6.3.15.8. The upper roof zone is the area of the vehicle upper interior surface bounded by the four planes described in paragraphs 6.3.15.8.1. and 6.3.15.8.2.:
- 6.3.15.8.1. A transverse vertical plane E located at a distance of (0.35 D1) forward of Point M and a transverse vertical plane F located at a distance of (0.35 D1) rearward of Point M, measured horizontally.
- 6.3.15.8.2. A longitudinal vertical plane G located at a distance of (0.35 D2) to the left of Point M and a longitudinal vertical plane H located at a distance of (0.35 D2) to the right of Point M, measured horizontally.

6.4. Orthogonal reference system

The approach angles specified in paragraph 6.3.13.4. are determined using the reference system specified in paragraphs 6.4.1. to 6.4.4.:

- 6.4.1. An orthogonal reference system consisting of a longitudinal X axis and a transverse Y axis in the same horizontal plane and a

vertical Z axis through the intersection of X and Y is used to define the horizontal direction of approach of the headform. The X-Z plane is the longitudinal vertical zero plane and is parallel to the longitudinal centreline of the vehicle. The X-Y plane is the horizontal zero plane parallel to the ground. The Y-Z plane is the transverse vertical zero plane that is perpendicular to the X-Y and X-Z planes. The X coordinate is negative forward of the Y-Z plane and positive to the rear. The Y coordinate is negative to the left of the X-Z plane and positive to the right. The Z coordinate is negative below the X-Y plane and positive above it.

6.4.2. The origin of the reference system is the centre of gravity of the headform at the time immediately prior to launch for each test.

6.4.3. The horizontal approach angle is the angle between the X axis and the headform impact velocity vector projected onto the horizontal zero plane, measured in the horizontal zero plane in the counter-clockwise direction. A 0° horizontal vector and a 360° horizontal vector point in the positive X direction; a 90° horizontal vector points in the positive Y direction; a 180° horizontal vector points in the negative X direction; and a 270° horizontal vector points in the negative Y direction.

6.4.4. The vertical approach angle is the angle between the horizontal plane and the velocity vector, measured in the mid-sagittal plane of the headform. A 0° vertical vector in Table I coincides with the horizontal plane and a vertical vector of greater than 0° in Table I makes an upward angle of the same number of degrees with that plane.

6.5. Target Locations

- (a) The target locations specified in paragraphs 6.5.1. to 6.5.13. are located on both sides of the vehicle and, except as specified in (b), are determined using the procedures specified in those paragraphs.
- (b) Except as specified in (c), if there is no combination of horizontal and vertical angles specified in paragraph 6.3.13.4. at which the forehead impact zone of free motion headform can contact one of the targets located using the procedures in paragraphs 6.5.1. to 6.5.13., the centre of that target is moved to any location within a sphere with a radius of 25 mm, centred on the centre of the original target, which the forehead impact zone can contact at one or more combination of angles.
- (c) If there is no point within the sphere specified in (b) which the forehead impact zone of the free motion headform can contact at one or more combination of horizontal and vertical angles specified in paragraph 6.3.13.4., the radius

of the sphere is increased by 25 mm increments until the sphere contains at least one point that can be contacted at one or more combination of angles.

6.5.1. A-pillar targets

6.5.1.1. A-pillar reference point and target AP1

On the vehicle exterior, locate a transverse vertical plane (Plane 1) which contacts the rearmost point of the windscreen trim. The intersection of Plane 1 and the vehicle exterior surface is Line 1. Measuring along the vehicle exterior surface, locate a point (Point 1) on Line 1 that is 125 mm inboard of the intersection of Line 1 and a vertical plane tangent to the vehicle at the outboardmost point on Line 1 with the vehicle side door open. Measuring along the vehicle exterior surface in a longitudinal vertical plane (Plane 2) passing through Point 1, locate a point (Point 2) 50 mm rearward of Point 1. Locate the A-pillar reference point (Point APR) at the intersection of the interior roof surface and a line that is perpendicular to the vehicle exterior surface at Point 2. Target AP1 is located at point APR.

6.5.1.2. Target AP2

Locate the horizontal plane (Plane 3) which intersects point APR. Locate the horizontal plane (Plane 4) which is 88 mm below Plane 3. Target AP2 is the point in Plane 4 and on the A-pillar which is closest to CG-F2 for the nearest seating position.

6.5.1.3. Target AP3

Locate the horizontal plane (Plane 5) containing the highest point at the intersection of the dashboard and the A-pillar. Locate a horizontal plane (Plane 6) half-way between Plane 3 and Plane 5. Target AP3 is the point on Plane 6 and the A-pillar which is closest to CG-F1 for the nearest seating position.

6.5.2. B-pillar targets

6.5.2.1. B-pillar reference point and target BP1

Locate the point (Point 3) on the vehicle interior at the intersection of the horizontal plane passing through the highest point of the forwardmost door opening and the centreline of the width of the B-pillar, as viewed laterally. Locate a transverse vertical plane (Plane 7) which passes through Point 3. Locate the point (Point 4) at the intersection of the interior roof surface, Plane 7, and the plane, described in paragraph 6.3.15.8., defining the nearest edge of the upper roof. The B-pillar reference point (Point BPR) is the point located at the middle of the line from

Point 3 to Point 4 in Plane 7, measured along the vehicle interior surface. Target BP1 is located at Point BPR.

6.5.2.2. Target BP2

If a seat belt anchorage is located on the B-pillar, Target BP2 is located at any point on the anchorage.

6.5.2.3. Target BP3

Target BP3 is located in accordance with this paragraph. Locate a horizontal plane (Plane 8) which intersects Point BPR. Locate a horizontal plane (Plane 9) which passes through the lowest point of the daylight opening forward of the pillar. Locate a horizontal plane (Plane 10) half-way between Plane 8 and Plane 9. Target BP3 is the point located in Plane 10 and on the interior surface of the B-pillar, which is closest to CG-F2 for the nearest seating position.

6.5.2.4. Target BP4

Locate a horizontal plane (Plane 11) half-way between Plane 9 and Plane 10. Target BP4 is the point located in Plane 11 and on the interior surface of the B-pillar which is closest to CG-R for the nearest seating position.

6.5.3. Other pillar targets

6.5.3.1. Target OP1

6.5.3.1.1. Except as provided in paragraph 6.5.3.1.2., target OP1 is located in accordance with this paragraph. Locate the point (Point 5), on the vehicle interior, at the intersection of the horizontal plane through the highest point of the highest adjacent door opening or daylight opening (if no adjacent door opening) and the centreline of the width of the other pillar, as viewed laterally. Locate a transverse vertical plane (Plane 12) passing through Point 5. Locate the point (Point 6) at the intersection of the interior roof surface, Plane 12 and the plane, described in paragraph 6.3.15.8., defining the nearest edge of the upper roof. The other pillar reference point (Point OPR) is the point located at the middle of the line between Point 5 and Point 6 in Plane 12, measured along the vehicle interior surface. Target OP1 is located at Point OPR.

6.5.3.1.2. If a seat belt anchorage is located on the pillar, Target OP1 is any point on the anchorage.

6.5.3.2. Target OP2

Locate the horizontal plane (Plane 13) intersecting Point OPR. Locate a horizontal plane (Plane 14) passing through the lowest

point of the daylight opening forward of the pillar. Locate a horizontal plane (Plane 15) half-way between Plane 13 and Plane 14. Target OP2 is the point located on the interior surface of the pillar at the intersection of Plane 15 and the centreline of the width of the pillar, as viewed laterally.

6.5.4. Rearmost pillar target

6.5.4.1. Rearmost pillar reference point and target RP1

Locate the point (Point 7) at the corner of the upper roof nearest to the pillar. The distance between Point M, as described in paragraph 6.3.15.7., and Point 7, as measured along the vehicle interior surface, is D. Extend the line from Point M to Point 7 along the vehicle interior surface in the same vertical plane by $(3 \times D/7)$ beyond Point 7 or until the edge of a daylight opening, whichever comes first, to locate Point 8. The rearmost pillar reference point (Point RPR) is at the midpoint of the line between Point 7 and Point 8, measured along the vehicle interior. Target RP1 is located at Point RPR.

6.5.4.2. Target RP2

6.5.4.2.1. Except as provided in paragraph 6.5.4.2.2., target RP2 is located in accordance with this paragraph. Locate the horizontal plane (Plane 16) through Point RPR. Locate the horizontal plane (Plane 17) 150 mm below Plane 16. Target RP2 is located in Plane 17 and on the pillar at the location closest to CG-R for the nearest designated seating position.

6.5.4.2.2. If a seat belt anchorage is located on the pillar, Target RP2 is any point on the anchorage.

6.5.5. Front header targets

6.5.5.1. Target FH1

Locate the contour line (Line 2) on the vehicle interior trim which passes through the APR and is parallel to the contour line (Line 3) at the upper edge of the windscreen on the vehicle interior. Locate the point (Point 9) on Line 2 that is 125 mm inboard of the APR, measured along that line. Locate a longitudinal vertical plane (Plane 18) that passes through Point 9. Target FH1 is located at the intersection of Plane 18 and the upper vehicle interior, halfway between a transverse vertical plane (Plane 19) through Point 9 and a transverse vertical plane (Plane 20) through the intersection of Plane 18 and Line 3.

6.5.5.2. Target FH2

6.5.5.2.1. Except as provided in paragraph 6.5.5.2.2., target FH2 is located in accordance with this paragraph. Locate a point (Point 10) 275 mm inboard of Point APR, along Line 2. Locate a longitudinal vertical plane (Plane 21) that passes through Point 10. Target FH2 is located at the intersection of Plane 21 and the upper vehicle interior, halfway between a transverse vertical plane (Plane 22) through Point 10 and a transverse vertical plane (Plane 23) through the intersection of Plane 21 and Line 3.

6.5.5.2.2. If a sun roof opening is located forward of the front edge of the upper roof and intersects the mid-sagittal plane of a dummy seated in either front outboard seating position, target FH2 is the nearest point that is forward of a transverse vertical plane (Plane 24) through CG-F2 and on the intersection of the mid-sagittal plane and the interior sun roof opening.

6.5.6. Targets on the side rail between the A-pillar and the B-pillar or the rearmost pillar in vehicles with only two pillars on each side of the vehicle

6.5.6.1. Target SR1

Locate a transverse vertical plane (Plane 25) 150 mm rearward of Point APR. Locate the point (Point 11) at the intersection of Plane 25 and the upper edge of the forwardmost door opening. Locate the point (Point 12) at the intersection of the interior roof surface, Plane 25 and the plane, described in paragraph 6.3.15.8., defining the nearest edge of the upper roof. Target SR1 is located at the middle of the line between Point 11 and Point 12 in Plane 25, measured along the vehicle interior.

6.5.6.2. Target SR2

Locate a transverse vertical plane (Plane 26) 300 mm rearward of the APR or 300 mm forward of the BPR (or RPR in vehicles with no B-pillar). Locate the point (Point 13) at the intersection of Plane 26 and the upper edge of the forward most door opening. Locate the point (Point 14) at the intersection of the interior roof surface, Plane 26 and the plane, described in paragraph 6.3.15.8., defining the nearest edge of the upper roof. Target SR2 is located at the middle of the line between Point 13 and Point 14 in Plane 26, measured along the vehicle interior.

6.5.7. Other side rail target (target SR3)

6.5.7.1. Except as provided in paragraph 6.5.7.2., target SR3 is located in accordance with this paragraph. Locate a transverse vertical plane (Plane 27) 150 mm rearward of either Point BPR or Point OPR. Locate the point (Point 15) as provided in either paragraphs 6.5.7.1.1. or 6.5.7.1.2., as appropriate. Locate the

point (Point 16) at the intersection of the interior roof surface, Plane 27 and the plane, described in paragraph 6.3.15.8., defining the nearest edge of the upper roof. Target SR3 is located at the middle of the line between Point 15 and Point 16 in Plane 27, measured along the vehicle interior surface.

- 6.5.7.1.1. If Plane 27 intersects a door or daylight opening, the Point 15 is located at the intersection of Plane 27 and the upper edge of the door opening or daylight opening.
- 6.5.7.1.2. If Plane 27 does not intersect a door or daylight opening, the Point 15 is located on the vehicle interior at the intersection of Plane 27 and the horizontal plane through the highest point of the door or daylight opening nearest Plane 27. If the adjacent door(s) or daylight opening(s) are equidistant to Plane 27, Point 15 is located on the vehicle interior at the intersection of Plane 27 and either horizontal plane through the highest point of each door or daylight opening.
- 6.5.7.2. Except as provided in paragraph 6.5.7.3., if a grab handle is located on the side rail, target SR3 is located at any point on the anchorage of the grab-handle. Folding grab-handles are in their stowed position for testing.
- 6.5.7.3. If a seat belt anchorage is located on the side rail, target SR3 is located at any point on the anchorage.
- 6.5.8. Rear header target (target RH)

Locate the point (Point 17) at the intersection of the surface of the upper vehicle interior, the mid-sagittal plane (Plane 28) of the outboard rearmost dummy and the plane, described in paragraph 6.3.15.8., defining the rear edge of the upper roof. Locate the point (Point 18) as provided in paragraphs 6.5.8.1. or 6.5.8.2., as appropriate. Except as provided in paragraph 6.5.8.3., Target RH is located at the mid-point of the line that is between Point 17 and Point 18 and is in Plane 28, as measured along the surface of the vehicle interior.

- 6.5.8.1. If Plane 28 intersects a rear door opening or daylight opening, then Point 18 is located at the intersection of Plane 28 and the upper edge of the door opening or the daylight opening (if no door opening).
- 6.5.8.2. If Plane 28 does not intersect a rear door opening or daylight opening, then Point 18 is located on the vehicle interior at the intersection of Plane 28 and a horizontal plane through the highest point of the door or daylight opening nearest to Plane 28. If the adjacent door(s) or daylight opening(s) are equidistant to Plane 28, Point 18 is located on the vehicle interior at the intersection of Plane 28 and either horizontal plane through the highest point of each door or daylight opening.

6.5.8.3. If Target RH is more than 112 mm from Point 18 on the line that is between Point 17 and Point 18 and is in Plane 28, as measured along the surface of the vehicle interior, then Target RH is the point on that line which is 112 mm from Point 18.

6.5.9. Upper roof target (target UR)

Target UR is any point on the upper roof.

6.5.10. Sliding door track target (target SD)

Locate the transverse vertical plane (Plane 29) passing through the middle of the widest opening of the sliding door, measured horizontally and parallel to the vehicle longitudinal centreline. Locate the point (Point 19) at the intersection of the surface of the upper vehicle interior, Plane 29 and the plane, described in paragraph 6.3.15.8., defining the nearest edge of the upper roof. Locate the point (Point 20) at the intersection of Plane 29 and the upper edge of the sliding door opening. Target SD is located at the middle of the line between Point 19 and Point 20 in Plane 29, measured along the vehicle interior.

6.5.11. Roll-bar targets

6.5.11.1. Target RB1

Locate a longitudinal vertical plane (Plane 30) at the mid-sagittal plane of a dummy seated in any outboard designated seating position. Target RB1 is located on the roll-bar and in Plane 30 at the location closest to either CG-F2 or CG-R, as appropriate, for the same dummy.

6.5.11.2. Target RB2

If a seat belt anchorage is located on the roll-bar, Target RB2 is any point on the anchorage.

6.5.12. Stiffener targets

6.5.12.1. Target ST1

Locate a transverse vertical plane (Plane 31) containing either CG-F2 or CG-R, as appropriate, for any outboard designated seating position. Target ST1 is located on the stiffener and in Plane 31 at the location closest to either CG-F2 or CG-R, as appropriate.

6.5.12.2. Target ST2

If a seat belt anchorage is located on the stiffener, Target ST2 is any point on the anchorage.

6.5.13. Brace target (target BT)

Target BT is any point on the width of the brace as viewed laterally from inside the passenger compartment."

Paragraphs 6. to 7.1. (former), renumber as paragraphs 7. to 8.1.

Paragraphs 7.2. and 7.3. (former), renumber as paragraphs 8.2. and 8.3., and amend to read:

"8.2. In order to verify conformity as prescribed in paragraph 8.1. above, a vehicle bearing the approval mark required by this Regulation shall be taken from the series.

8.3. Production shall be deemed to conform to the requirements of this Regulation if the requirements of paragraphs 5. and 6. above are met."

Paragraph 8. (former), renumber as paragraph 9.

Paragraph 8.1. (former), renumber as paragraph 9.1., and amend to read:

"9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 8.1. above is not complied with or if the vehicle fails to pass the checks prescribed in paragraph 8. above."

Paragraphs 8.2. to 10. (former), renumber as paragraphs 9.2. to 11.

EXPLANATORY NOTES, the note referring to paragraph 2.3., amend to read:

"Paragraph 2.3.

The paragraph is amended to read:

The reference zone is outlined without rear view mirror and stop lamp of category S3. The energy-dissipation test is accomplished without the rear view mirror and the stop lamp of category S3. The pendulum shall not impact the mounting of the mirror and of the stop lamp of category S3."

Insert a new annex 8, to read:

"Annex 8

ANTHROPOMORPHIC TEST DEVICE FOR APPLICATION
OF PARAGRAPH 6 OF THIS REGULATION

1. Apparatus

This section describes the anthropomorphic test device (ATD) that is to be used for testing vehicle upper interior components. The device is a modified head component of the Part 572, Subpart E - Hybrid III Test Dummy that is used by the National Highway Traffic Safety Administration (NHTSA), U.S. Department of Transportation, for compliance testing of motor vehicles and motor vehicle equipment with motor vehicle safety standards. The ATD is a free-motion-headform (FMH) that is depicted in the U.S. Code of Federal Regulations - 49 CFR Chapter V (10-1-95 edition); Part 572 - Anthropomorphic Test Devices; Subpart L - Free Motion Headform.

2. Apparatus description

2.1. The drawings and specifications referred to in paragraph 2.3. of this section are incorporated in the FMH by reference. These materials are thereby made part of this regulation. Copies of the materials may be inspected at NHTSA's Docket Section, 400 Seventh Street, S.W., room 5109, Washington, DC, U.S.A. or at the Office of the Federal Register, 800 North Capitol Street, N.W., Suite 700, Washington, DC, U.S.A.

2.2. The incorporated material:

2.2.1. Drawing number 92041-001, "Head Form Assembly," (November 30, 1992); drawing number 92041-002, "Skull Assembly," (November 30, 1992); drawing number 92041-003, "Skull Cap Plate Assembly," (November 30, 1992); drawing number 92041-004, "Skull Cap Plate," (November 30, 1992); drawing number 92041-005, "Threaded Pin," (November 30, 1992); drawing number 92041-006, "Hex Nut," (November 30, 1992); drawing number 92041-008, "Head Skin without Nose," (November 30, 1992, as amended March 6, 1995); drawing number 92041-009, "Six-Axis Load Cell Simulator Assembly," (November 30, 1992); drawing number 92041-011, "Head Ballast Weight," (November 30, 1992); drawing number 92041-018, "Head Form Bill of Materials," (November 30, 1992); drawing number 78051-148, "Skull-Head (cast) Hybrid III," (May 20, 1978, as amended August 17, 1978); drawing number 78051-228/78051-229, "Skin-Hybrid III," (May 20, 1978, as amended through September 24, 1979); drawing number 78051-339, "Pivot Pin - Neck Transducer," (May 20, 1978, as amended May 14, 1986); drawing number 78051-372, "Vinyl Skin Formulation Hybrid III," (May 20, 1978); and drawing number C-1797, "Neck Blank, (August 1, 1989); drawing number SA572-S4, "Accelerometer Specification," (November 30, 1992), are

available from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, MD 20705.

- 2.2.2. A user's manual entitled "Free-Motion Headform User's Manual," version 2, March 1995, is available from NHTSA's Docket Section at the address in paragraph 2.1. of this section.
- 2.2.3. The U.S. SAE Recommended Practice J211, OCT 1988, "Instrumentation for Impact Tests," Class 1000, is available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096, U.S.A.
- 2.3. General descriptions:
 - 2.3.1. The free motion headform consists of the component assembly which is shown in drawings 92041-001 (incorporated by reference; see para. 572.100), 92041-002 (incorporated by reference; see para. 572.100), 92041-003 (incorporated by reference; see para. 572.100), 92041-004 (incorporated by reference; see para. 572.100), 92041-005 (incorporated by reference; see para. 572.100), 92041-006 (incorporated by reference; see para. 572.100), 92041-008 (incorporated by reference; see para. 572.100), 92041-009 (incorporated by reference; see para. 572.100), 92041-011 (incorporated by reference; see para. 572.100), 78051-148 (incorporated by reference; see para. 572.100), 78051-228/78051-229 (incorporated by reference; see para. 572.100), 78051-339 (incorporated by reference; see para. 572.100), 78051-372 (incorporated by reference; see para. 572.100), C-1797 (incorporated by reference; see para. 572.100), and SA572-S4 (incorporated by reference; see para. 572.100).
 - 2.3.2. Disassembly, inspection, and assembly procedures, and sign convention for the signal outputs of the free motion headform accelerometers, are set forth in the Free-Motion Headform User's Manual (incorporated by reference; see para. 572.100).
 - 2.3.3. The structural properties of the headform are such that it conforms to this section in every respect both before and after being used in the test specified in the ECE Regulation No. 21.
 - 2.3.4. The outputs of accelerometers installed in the headform are recorded in individual data channels that conform to the requirements of the U.S. SAE Recommended Practice J211, OCT 1988, "Instrumentation for Impact Tests," Class 1000 (incorporated by reference; see para. 572.100).

3. Headform drop test - calibration test

3.1. Performance requirements

When the headform is dropped from a height of 376 mm in accordance with paragraph 3.2. of this section, the peak resultant accelerations at the location of the accelerometers mounted in the headform as shown in drawing 92041-001 (incorporated by reference; see para. 572.100) shall not be less than 225g, and not more than 275g. The acceleration/time curve for the test shall be unimodal to the extent that oscillations occurring after the main acceleration pulse are less than ten per cent (zero to peak) of the main pulse. The lateral acceleration vector shall not exceed 15g (zero to peak).

3.2. Test procedure

3.2.1. Soak the headform in a test environment at any temperature between 19° C to 26° C and at a relative humidity from 10 per cent to 70 per cent for a period of at least four hours prior to its use in a test.

3.2.2. Clean the headform's skin surface and the surface of the impact plate with 1,1,1 Trichloroethane or equivalent.

3.2.3. Suspend the headform as shown in Figure 50 of the U.S. 49 CFR, Part 752.102. Position the forehead below the chin such that the skull cap plate is at an angle of $28.5 \pm 0.5^\circ$ with the impact surface when the mid-sagittal plane is vertical.

3.2.4. Drop the headform from the specified height by means that ensure instant release onto a rigidly supported flat horizontal steel plate, which is 51 mm thick and 508 mm square. The plate shall have a clean, dry surface and any microfinish of not less than 0.2 μ and not more than 2.0 μ .

3.2.5. Allow at least 3 hours between successive tests on the same headform.

3.3. Test conditions and instrumentation

3.3.1. Headform accelerometers shall have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 (incorporated by reference; see para. 572.100) and be mounted in the headform as shown in drawing 92041-001 (incorporated by reference; see para. 572.100).

3.3.2. The outputs of accelerometers installed in the headform are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211, OCT 1988, "Instrumentation for Impact Tests," Class 1000 (incorporated by reference; see para. 572.100).

- 3.3.3. Coordinate signs for instrumentation polarity conform to the sign convention shown in the Free-Motion Headform User's Manual (incorporated by reference; see para. 572.100).
 - 3.3.4. The mountings for accelerometers shall have no resonant frequency within a range of 3 times the frequency range of the applicable channel class."
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