SURFACE VEHICLE STANDARD

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(R) Motor Vehicle Seat Dimensions

RATIONALE

This document has been revised to be applicable to the SAE J826 HPD I, SAE J4002 HPD II, and SAE J826 CAD models. Additional definitions and measures have been added, including a new head restraint measurement grid and related dimensions.

INTRODUCTION

The tools and procedures for determining motor vehicle seat dimensions used in this document are based on the SAE H-Point Design Tool (HPD). Users shall document and maintain a record noting which SAE HPD is used in making the measurements cited in this document.

H-point devices are used (1) during vehicle design and development to establish interior reference points and dimensions for occupant packaging, (2) to validate (audit) the location of these key reference points and dimensions on physical properties, and (3) to measure competitive vehicles for benchmarking. The procedures employed for each usage vary somewhat.

H-point devices can be used to audit or benchmark vehicle seats and other interior compartment dimensions. Audits are conducted by regulatory agencies and OEMs to assess how closely the vehicle is manufactured to its design intent. Although serving different purposes, auditing and benchmarking procedures are very similar. The most significant difference between them is that audits use actual design intent values to set up the vehicle and position the seat, whereas benchmarking is used to discover the design intent values for competitor vehicles.

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1. SCOPE

This document provides dimensional definitions that facilitate geometric quantification and evaluation of seats. Linear, radial, and angular surface dimensions included in this document are intended to approximate shape characteristics based on defined points of interest and not as a method needed to reproduce complex surface contours. In many cases, other points across the seat surface shape may exceed or not reach the boundary defined by these simple geometric definitions.

Dimensions described in this document have been designed to be measured in a CAD environment; however, many dimensions require the HPD position and attitude. This can be obtained by physically establishing H-point using benchmark or auditing procedures OR by measuring the HPD within a CAD or modelling system. Refer to the appropriate document for these procedures.

Three types of seat geometry reference points and measurements have been developed:

1. Simple reference points and measurements not related to H-point.
2. H-point dependent reference points and measurements that utilize the seat characterization capabilities of the HPD to quantify seat measurements.
3. Cross-sectional seat trim outlines.

For convenience and simplicity, many terms associated with H-point devices use human body parts in their name. However, they should not be construed as measures that indicate interaction with any or all occupants concerning accommodation, human capabilities, or comfort.

H-point devices do not represent the size or posture of any category of occupant.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J182 Motor Vehicle Fiducial Marks and Three-Dimensional Reference System

SAE J826 Devices for Use in Defining and Measuring Vehicle Seating Accommodation

SAE J1100 Motor Vehicle Dimensions

SAE J4002 H-Point Machine (HPM-II) Specifications and Procedure for H-Point Determination—Auditing Vehicle Seats

3. DEFINITIONS

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

Table 1 - Seat definitions

Term	Definition	Figure
A-Surface	Surface of a seat, or any of its components, that is closest to the occupant. For example, the A-surface of the foam pad is the surface on which the occupant sits.	2
B-Surface	Surface of a seat, or any of its components, that is furthest from the occupant (opposite the A-surface). For example, the B-surface of the foam pad is the surface in contact with the frame.	2
Bench Seat	Seat structure designed to hold multiple occupants.	n/a
Biteline (Seat Bight)	Area close to and including the intersection of the surface of the vehicle seat cushion and seat back.	1
Bolster	Raised contour at lateral edges of the seat cushion and seat back.	1
Bucket Seat (Quad or Captain's Seat)	Seat structure designed to hold a single occupant usually contoured to hold the occupant.	n/a
Centerline of Occupant (C/LO)	Lateral (Y) centerline of an occupant in a given designated seating position. Refer to SAE J1100. C/LO is repeated in this section for convenience. In the case of a CL trench or decorative raised regions, a lateral offset can be used to approximate the centerline.	1
Cross-Car	Lateral direction across vehicle (also refers to sections taken along the Y axis).	n/a
Head Restraint	Protective device that limits the rearward displacement of a seated occupant's head relative to the occupant's torso.	1
Insert	Primary seating region between the bolsters on the seat cushion and seat back, usually defined with a seam or line in the trim A-surface.	1
Lumbar Region	Area of the seat back that provides support for an occupant's lower back.	n/a
Protruded (Extended)	Refers to an adjustable mechanism when it is in its maximal or projected state.	n/a
Retracted	Refers to an adjustable mechanism when it is in its minimal or withdrawn state.	n/a
Seat Adjuster	Refers to mechanisms used to alter position, shape, or support characteristics of the seat.	n/a
Seat Back	Part of the seat that supports the occupant's back.	1
Seat Cushion	Part of the seat that supports the occupant's buttocks and thighs.	1
Seat Trim Outline (STO)	The A-surface shape of the soft surfaces of the fully-trimmed seat	n/a
Split Bench Seat	Seat structure designed to hold multiple occupants that may be split for independent adjustment of two or more occupant positions.	n/a
Tie-Down	Depression or line in the A-surface of the trim cover created by the attachment of trim to seat components.	n/a
Trench	Recess in the foam pad used to accommodate or attach seams in the trim cover.	1
Trim Cover	Material and attachments used to cover a seat.	n/a
Trim Prominence	Most prominent point on the undeflected profile of the seat trim defined by the tangent point of a line parallel to a reference line such as the thigh or torso (back) line.	2

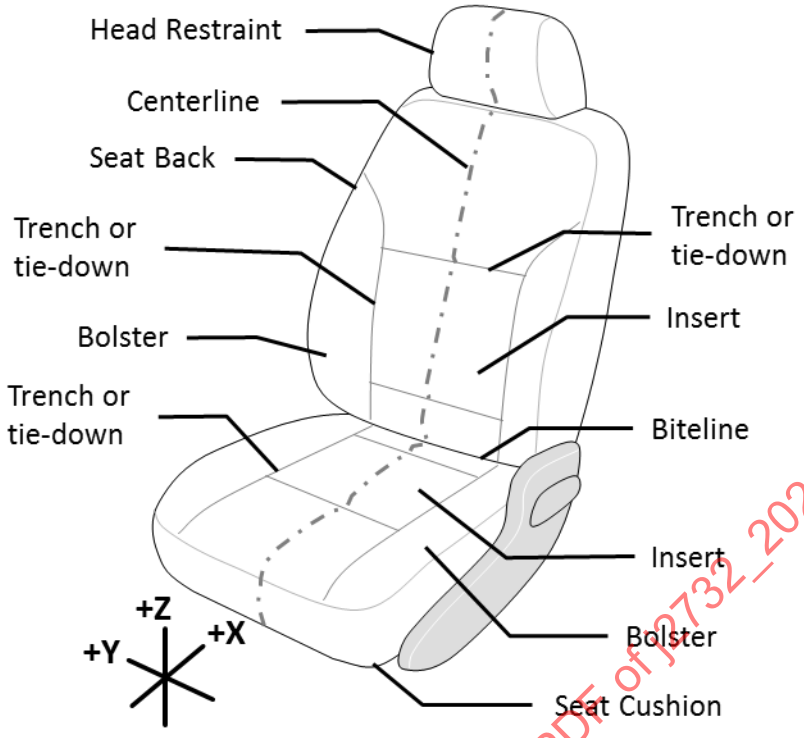

Figure 1 - General seat definitions

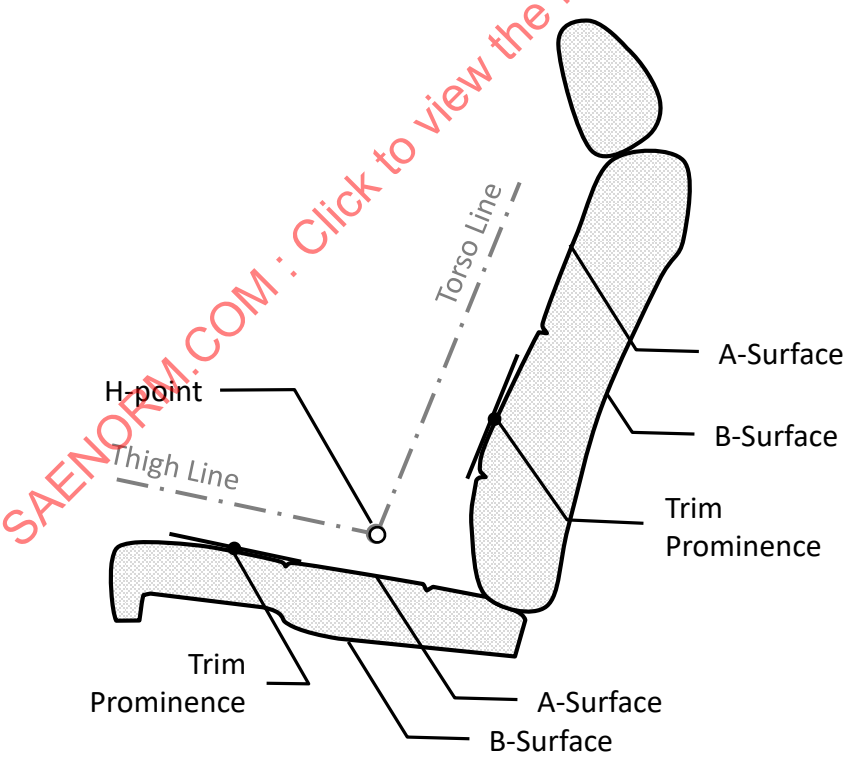

Figure 2 - General seat definitions (cross section)

Table 2 - H-point related definitions

Term	Definition	Figure
Deflection (HPM or HPD)	Distance between the free unloaded seat trim contour prior to HPM installation and the HPM surface, when loaded in the seat.	3
Exit Point	Point where the undeflected trim separates from the manikin's surface. Exit points are determined using CAD. Lateral exit points are referenced to the HPM centerline.	3
H-Point	Point at the pivot center of the back pan and cushion pan assemblies, located on the lateral centerline of the H-point device (HPM or HPD). Refer to SAE J1100. NOTE 1: When an H-point device is properly positioned within a vehicle—either in CAD or in an actual physical property—the location of the H-point relative to the vehicle is used as a vehicle reference point. If the seat is moved, the location of the H-point within the vehicle is changed. Therefore, adjustable seats will have more than one H-point location, while fixed seats will have only one H-point location. NOTE 2: H-points are often referred to as hip points or hip pivot points. However, they do not accurately represent the location of the human hip joint.	3
H-Point Design Tool (HPD)	A CAD representation of the H-point device used during design or benchmarking for establishing H-point locations. Refer to J1100.	n/a
H-Point Machine (HPM)	The physical H-point device used on physical properties for the purpose of auditing and benchmarking H-point locations. Refer to J1100.	n/a
Thigh Angle	Included angle between the thigh line and horizontal.	3
Thigh Line	Representation of the segment connecting the HPD H-point to knee joint.	3
Torso (Back) Line	Line from the H-point through the centerline of the headroom probe when it is rotated to the full back condition.	3
Torso Angle	Included angle between the torso (back) line and a vertical line through H-point. Refer to SAE J1100.	3

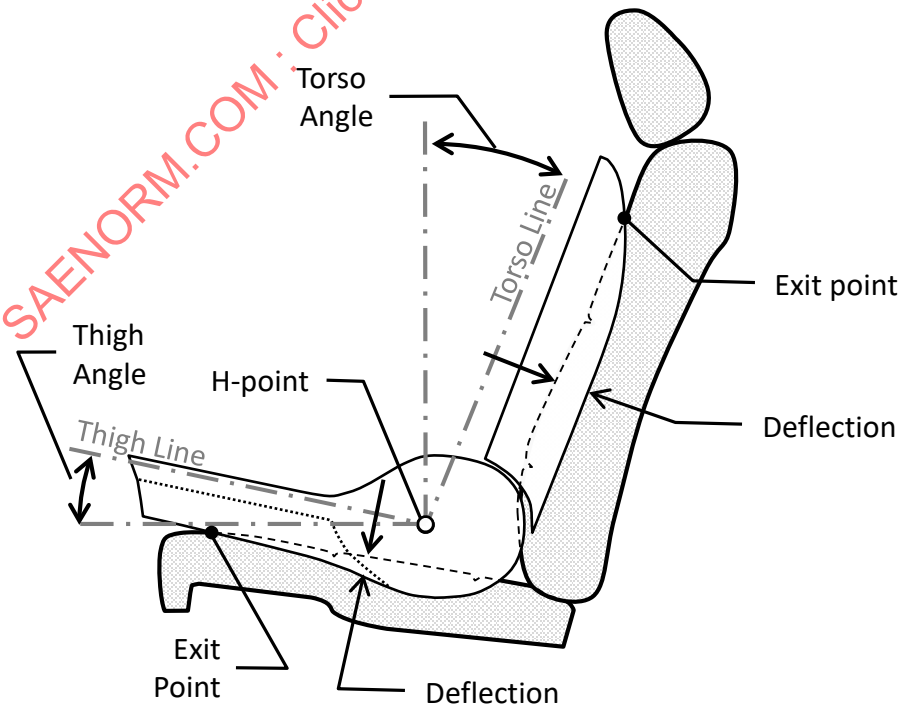

Figure 3 - HPD-specific definitions

4. DIMNESIONAL CODES AND DOCUMENTATION

4.1 Seat Setup and Feature Adjustment Documentation

Although not recorded in the dimensional codes, users shall document pertinent design, setup, and measurement information including settings for user adjustable features (e.g., lumbar support or thigh extender), CAD versus field measurement, and the HPM (SAE J826 or SAE J4002) used to set the reference position and attitude.

4.2 Prefix Codes

Each dimension is assigned a code, which consists of an alpha prefix and a number. The letters denote the direction or type of measurement (e.g., W - Width, A - Angle). See Table 3. Numeric codes relate to the type of vehicle dimension. Seat specific dimension codes range between 1000 and 1999 (e.g., W1020). See Table 4.

Table 3 - Prefixes

Letter	Meaning
W	Widths associated with seats (cross car distance).
L	Lengths associated with seats.
H	Heights associated with seats.
A	Angles associated with seats.
R	Radii associated with seats.

Table 4 - Numeric scheme

Number Range	Type of Dimension
1-99	Interior (general seat dimensions).
1000-1199	Seat cushion lateral dimensions.
1200-1399	Seat cushion centerline dimensions.
1400-1599	Seat back lateral dimensions.
1600-1799	Seat back centerline dimensions.
1800-1999	Seat head restraint dimensions.

4.3 Seat Position Codes

These dimensions can be applied to several designated seating positions. In order to indicate a specific seat position, the basic alphanumeric code remains the same, but an additional alphanumeric code is added (e.g., H30-1-L, H30-2-R, H30-3-C). The number in the additional code indicates the designated seating row. See Table 5. The letter indicates the seating position in that particular row. See Table 6 (e.g., W1015-1-L).

Table 5 - Seating row

Row Number	Designated Seating Row
-1	Front row measurement.
-2	Second row measurement.
-3	Third row measurement.
-4	Fourth row measurement.
-5	Fifth row measurement.

Table 6 - Seating position (suffix)

Letter	Designated Seating Position
-L	Measurement taken for the left, outboard designated seating position. (-Y in vehicle coordinates.)
-R	Measurement taken for the right, outboard designated seating position. (+Y in vehicle coordinates.)
-C	Measurement taken for the center designated seating position.
-B	Measurement taken for an entire bench seat (such as overall width).

4.4 Cross-Sectional Code

Selected dimensions are measured at a given distance from H-point along or normal to a given reference line and are denoted with _X (where X equals the distance in mm from the reference line) following the alphanumeric prefix (e.g., W1020_100). See Figure 4A and Appendix A.

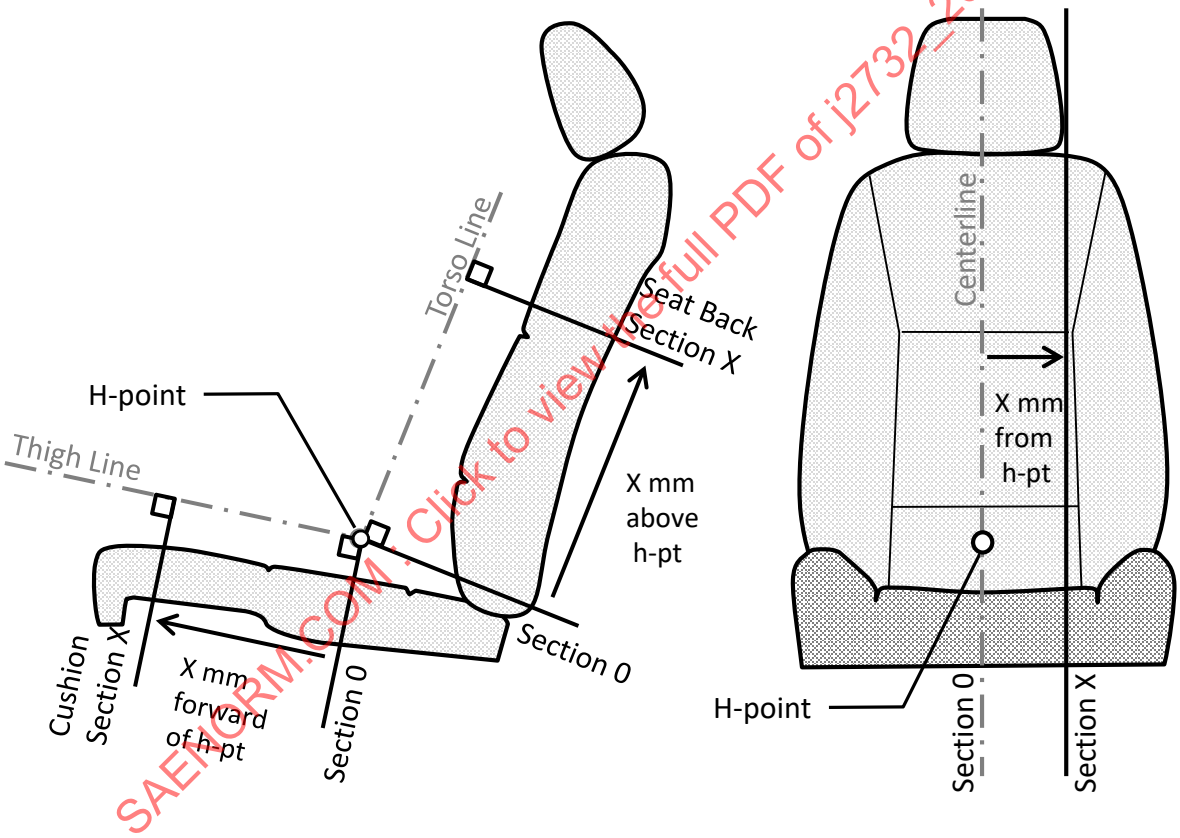

Figure 4A - Cross sections and centerline sections

Head restraint cross-section dimensions are measured through horizontal sections and are denoted with _X (where X equals the distance in mm from reference section 0 located 350 mm above the weight hanger center). See Figure 4B and Appendix A.

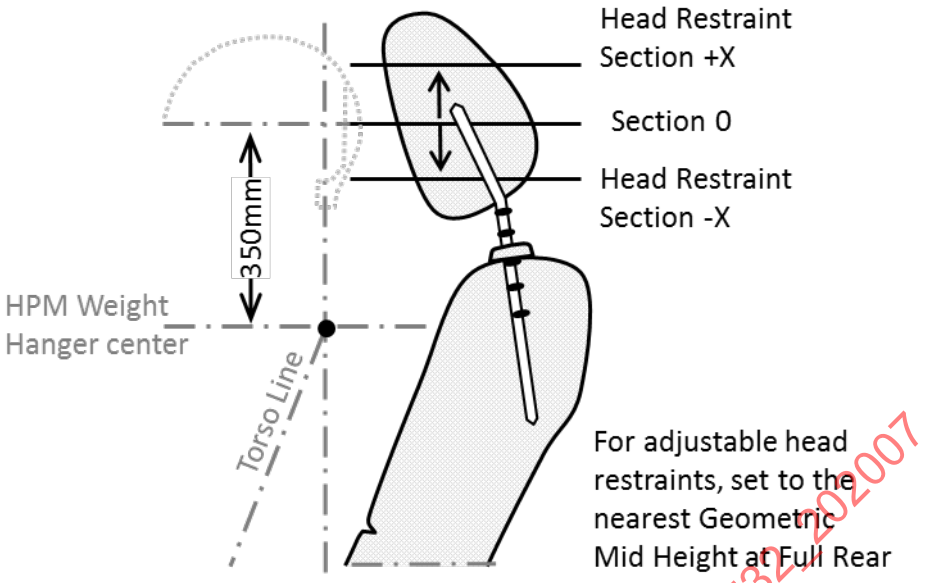

Figure 4B - Cross sections head restraint sections

5. SEAT DIMENSIONS

The dimension definitions that follow are shown with no suffix codes to indicate seat row or position. In practice, the proper suffix codes should be added to identify seat aspects. Note also that certain seat and package dimensions are repeated in this section for convenience.

Center seats or seats with no clear inboard and outboard side should use the same inboard and outboard measurement convention as the front passenger seat position.

For scans with incomplete sections or gaps, it may be necessary to fil the void by projecting the openings into a connected surface.

Table 7 - Seat cushion lateral cross-section dimensions

Code	Dimension	Definition	Figure
W1000_X	**Seat Cushion Width**	Widest width across the seat cushion STO within the defined lateral cross-sectional plane.	**5A**
W1001_X	Seat Cushion Width - Outboard Side	Width element of W1000_X from the outboard seat cushion STO to the C/LO.	n/a
W1002_X	Seat Cushion Width - Inboard Side	Width element of W1000_X from the inboard seat cushion STO to the C/LO.	n/a
W1020_X	**Seat Cushion Bolster Width**	Width between the highest points on the outboard and inboard bolsters within the defined lateral cross-sectional plane.	**5A**
W1021_X	Seat Cushion Bolster Width - Outboard Side	Width element of W1020_X between the highest outboard bolster point in the seat cushion STO to the C/LO.	n/a
W1022_X	Seat Cushion Bolster Width - Inboard Side	Width element of W1020_X between the highest inboard bolster point in the seat cushion STO to the C/LO.	n/a

Code	Dimension	Definition	Figure
W1040_X	**Seat Cushion Insert Width**	Width of the seat cushion insert between the bolsters within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	5A
W1041_X	Seat Cushion Insert Width - Outboard Side	Width element of W1040_X between the outboard insert trench or limit in the seat cushion STO to the C/LO.	n/a
W1042_X	Seat Cushion Insert Width - Inboard Side	Width element of W1040_X between the inboard insert trench or limit in the seat cushion STO to the C/LO .	n/a
H1060_X	**Seat Cushion Bolster Height - Outboard Side**	Peak height of the outboard bolster above the seat cushion C/LO STO within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	5A
H1062_X	Seat Cushion Bolster Height - Inboard Side	Peak height of the inboard bolster above the seat cushion C/LO STO within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	n/a
H1065_X	**Effective Seat Cushion Bolster Height - Outboard Side**	The sum of measured values for the seat cushion outboard bolster height (H1060_X) and the seat cushion trim HPD deflection (H1120_X) for the defined lateral cross-sectional plane.	5C
H1066_X	Effective Seat Cushion Bolster Height - Inboard Side	The sum of measured values for seat cushion inboard bolster height (H1062_X) and the seat cushion trim HPD deflection (H1120_X) for the defined lateral cross-sectional plane.	n/a
R1070_X	**Seat Cushion Insert Curvature**	Radius defined by 3 pts on the seat cushion STO located at the C/LO +110mm, C/LO -110, and C/LO within the defined lateral cross-sectional plane.	5B
R1075_X	**Seat Cushion Bolster Radius - Outboard Side**	Radius defined by the highest point of the outboard bolster, a point in the outboard trench between the outboard bolster and insert, and a point on the outboard bolster mid-height between the two points within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	5B
R1076_X	Seat Cushion Bolster Radius - Inboard Side	Radius defined by the highest point on the inboard bolster, a point in the inboard trench between the inboard bolster and insert, and a point on the inboard bolster mid-height between the two points within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	n/a
R1080_X	**Seat Cushion Bolster Insert Radius**	Radius defined by the highest point of the outboard bolster, the highest point of the inboard bolster, and a point on the seat cushion STO at C/LO within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	5D

Code	Dimension	Definition	Figure
R1085_X	**Effective Seat Cushion Bolster Insert Radius**	Radius defined by the highest point of the outboard bolster, the highest point of the inboard bolster, and the lowest point of the HPD translated to the centerline of occupant within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	5D
A1090_X	**Seat Cushion Bolster Angle - Outboard Side**	Included angle between a horizontal line and a line defined by a point in the outboard trench between the outboard bolster and insert and a point on the outboard bolster mid-height between the trench and the peak bolster within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	5F
A1091_X	Seat Cushion Bolster Angle - Inboard Side	Included angle between a horizontal line and a line defined by a point in the inboard trench between the inboard bolster and insert and a point on the inboard bolster mid-height between the trench and the peak bolster within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	n/a
H1090_X	**Seat Cushion Bolster Deflection (Gap) - Outboard Side**	Distance from the line defining the outboard bolster angle A1090_X and a parallel line contacting the outermost edge of the outboard side of HPD contour within the defined lateral cross-sectional plane. In certain cases, this measure is not definable. Value is negative if HPD contour is above bolster STO.	5F
H1091_X	Seat Cushion Bolster Deflection (Gap) - Inboard Side	Distance from the line defining the inboard bolster angle A1091_X and a parallel line contacting the outermost edge of the inboard side of HPD contour within the defined lateral cross-sectional plane. In certain cases, this measure is not definable. Value is negative if HPD contour is above bolster STO.	n/a
R1100_X	**Seat Cushion Lateral Contact Radius**	Radius defined by the outboard lateral exit point, the inboard lateral exit point, the lowest point of the HPD translated to the centerline of occupant within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	5E
A1100_X	**Seat Cushion Lateral Exit Angle - Outboard Side**	Included angle between a horizontal line through H-point to a line defined by the H-point and the outboard exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	5E
A1102_X	Seat Cushion Exit Angle - Inboard Side	Included angle between a horizontal line through H-point to a line defined by the H-point and the inboard exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	n/a

Code	Dimension	Definition	Figure
W1100_X	**Seat Cushion Lateral Exit Point Width - Outboard Side**	Width from the C/LO to the furthest outboard lateral exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	5E
W1102_X	Seat Cushion Lateral Exit Point Width - Inboard Side	Width from the C/LO to the furthest inboard lateral exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	n/a
H1120_X	**Seat Cushion Projected Trim Deflection**	Height from the lowest point of the HPD to a point on the STO at C/LO within the defined lateral cross-sectional plane. Value is negative if HPD contour is above Cushion STO.	5C
H1140_X	**Seat Cushion Bolster Asymmetry**	Height difference between the highest outboard bolster point and highest inboard bolster point within the defined lateral cross-sectional plane. Value is negative if inboard bolster is higher than outboard bolster.	5D
L1170_X	**Seat Cushion Meat-to-Metal/Structural-Clearance**	Minimum distance from the surface of the HPD to the any point on the seat structure excluding suspension and other deformable or compressible components within the defined lateral cross-sectional plane.	n/a

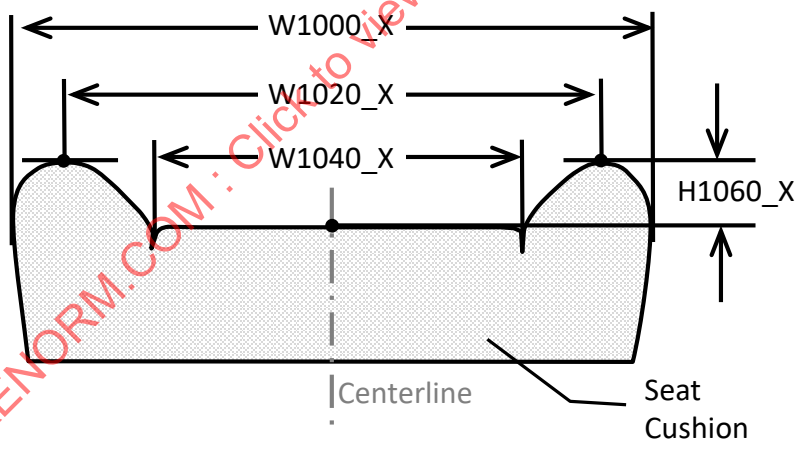

Figure 5A - Seat cushion lateral cross-section dimensions

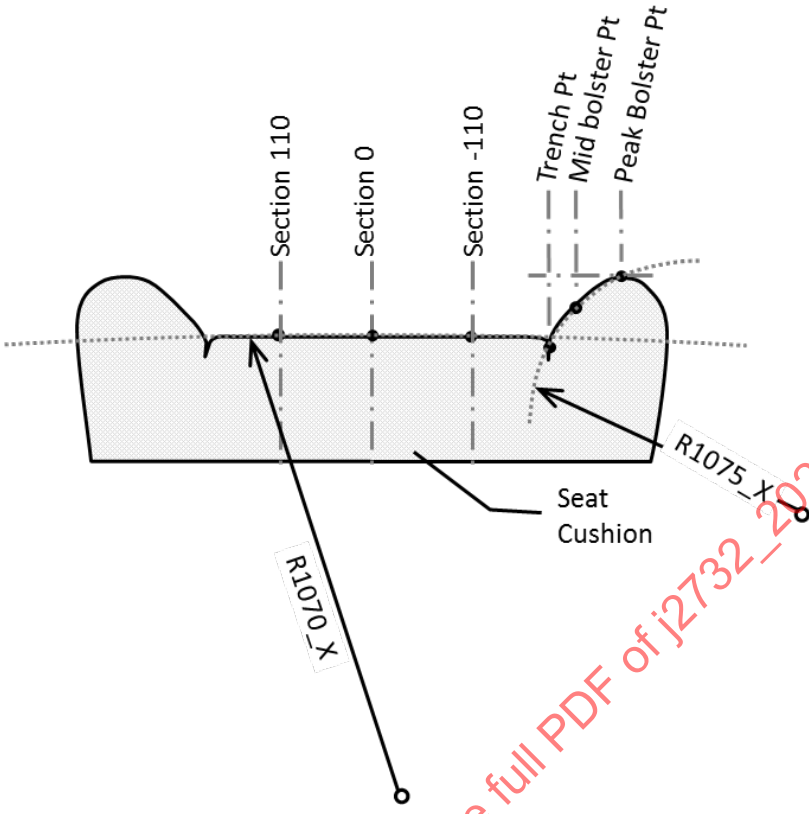

Figure 5B - Seat cushion lateral cross-section dimensions

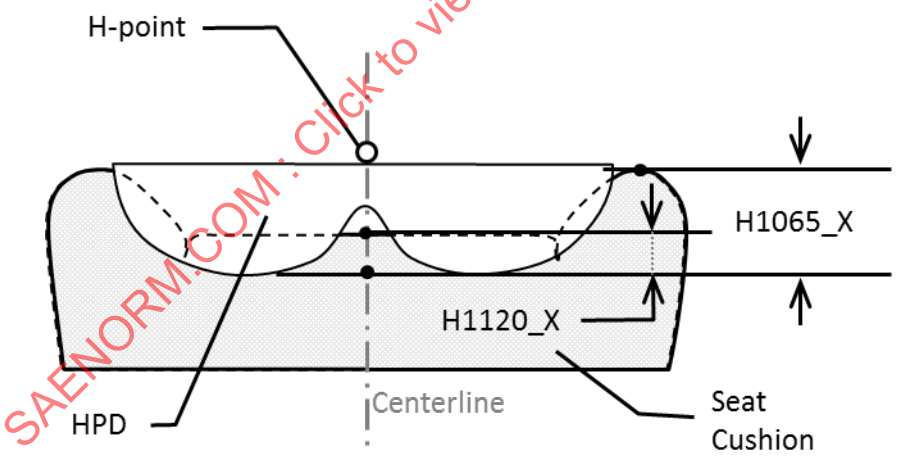

Figure 5C - HPD-specific seat cushion lateral cross-section dimensions

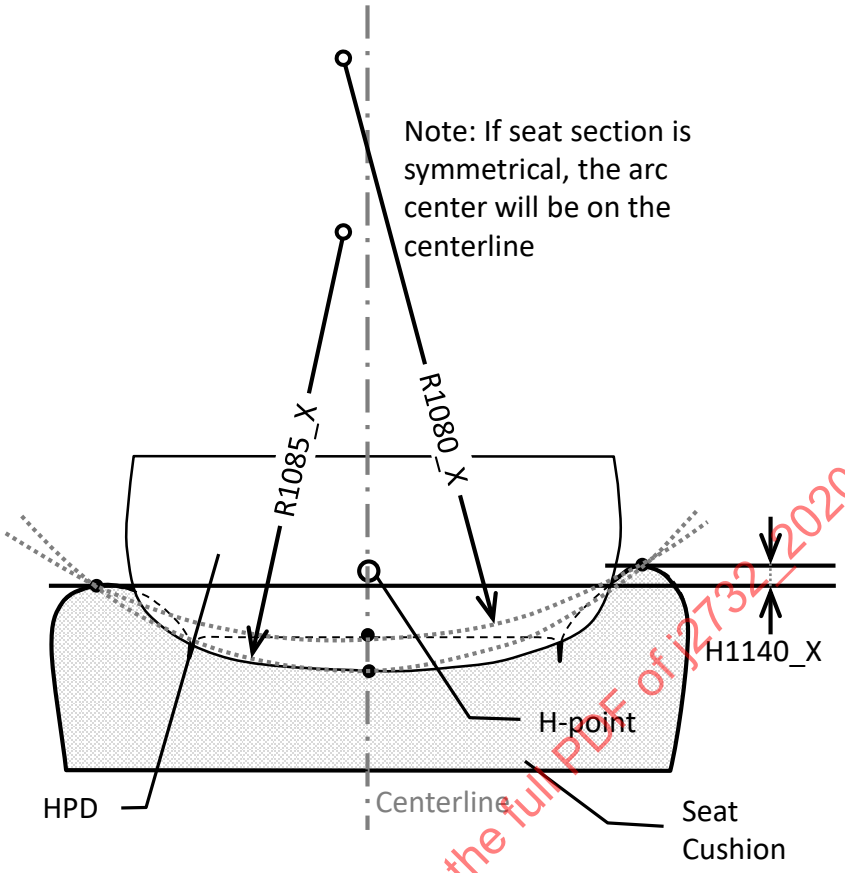

Figure 5D - Seat cushion lateral cross-section - bolster asymmetry and radial dimensions

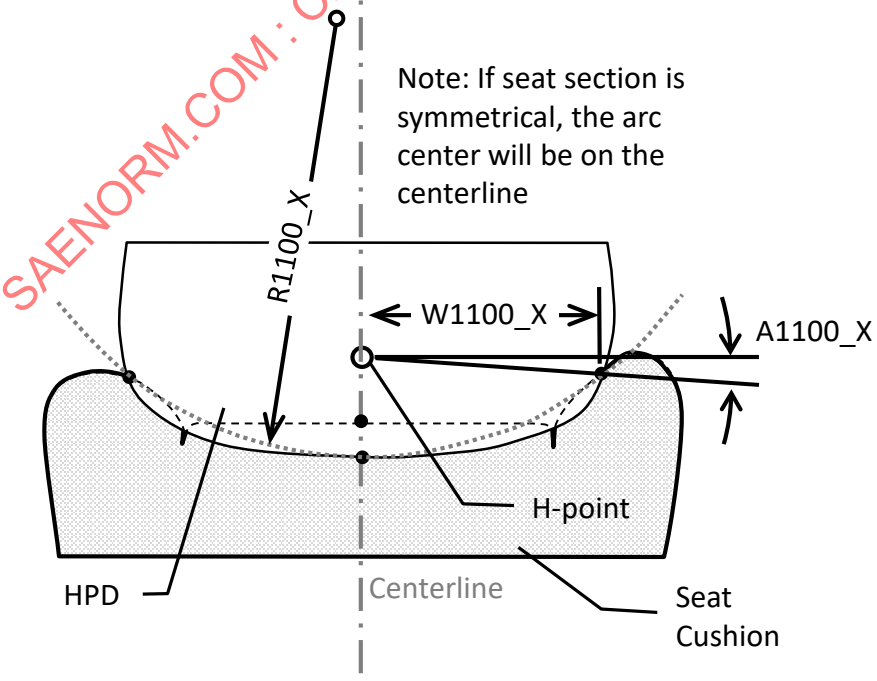

Figure 5E - Seat cushion lateral cross-section dimensions

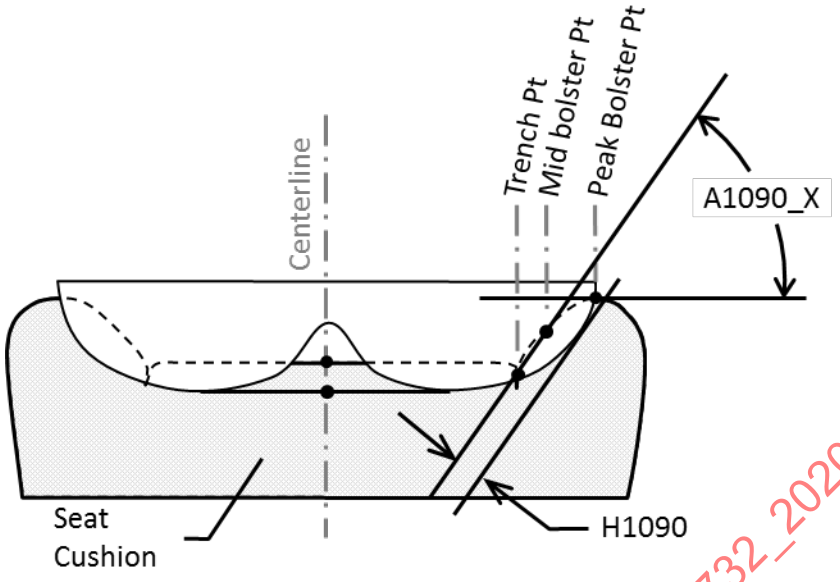

Figure 5F - Seat cushion lateral cross-section dimensions

Table 8 - Seat cushion centerline section dimensions

Code	Dimension	Definition	Figure
A1200_X	**Seat Cushion STO Angle**	Included angle between a horizontal line and a line connecting the foremost seat cushion trim prominence point to the projected point on the seat cushion STO normal to the thigh line through the H- point within the defined CL cross-sectional plane.	6C
H1200_X	**Seat Cushion Trim Prominence to Thigh Line**	Minimum distance from the seat cushion trim prominence point to the thigh line within the defined CL cross-sectional plane.	6A
L1220_X	**Seat Cushion Trim Prominence to H-Point**	Minimum distance from a line that is perpendicular to the thigh line located at the foremost seat cushion trim prominence point to the H-point within the defined CL cross-sectional plane.	6A
L1240_X	**Rear Seat Cushion Exit Point**	Minimum distance from a line that is perpendicular to the thigh line and contains the rearmost seat cushion exit point to the H-point within the defined CL cross-sectional plane. If the HPD exits the cushion seat surface behind the exposed biteline STO, this measure is not definable	6B
L1260_X	**Foremost Seat Cushion Thigh Exit Point**	Minimum distance from a line that is perpendicular to the thigh line and contains the foremost seat cushion exit point to the H-point within the defined CL cross-sectional plane. Usually these sections are defined as an offset from C/L0 by ±110 mm.	6B
L1280_X	**Seat Cushion Length to H-point**	Minimum distance from a line that is perpendicular to the thigh line and tangent to the front of the seat cushion STO to the H-point within the defined CL cross-sectional plane.	6A
L1300_X	**Seat Cushion Tie-Down Location**	Minimum distance from a line that is perpendicular to the thigh line and runs through the closest lateral STO tie-down to the H-point within the defined CL cross-sectional plane. This measurement is positive (forward of H-point) or negative (rearward of H-point).	6A

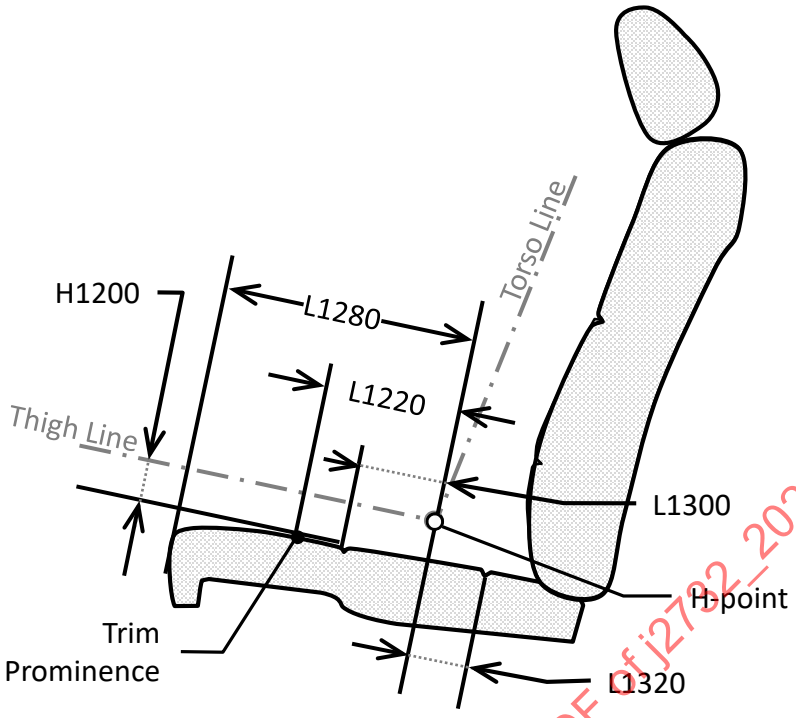

Figure 6A - Seat cushion centerline section

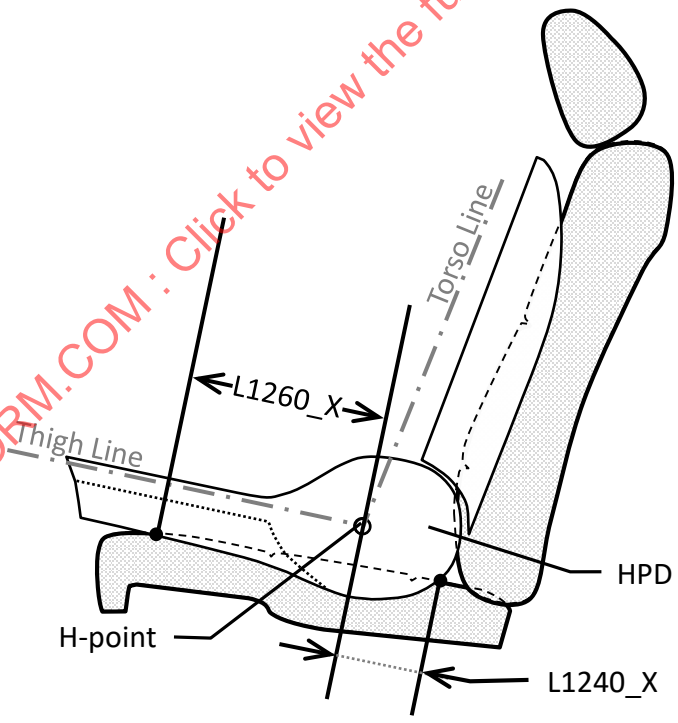

Figure 6B - HPD-specific seat cushion centerline section

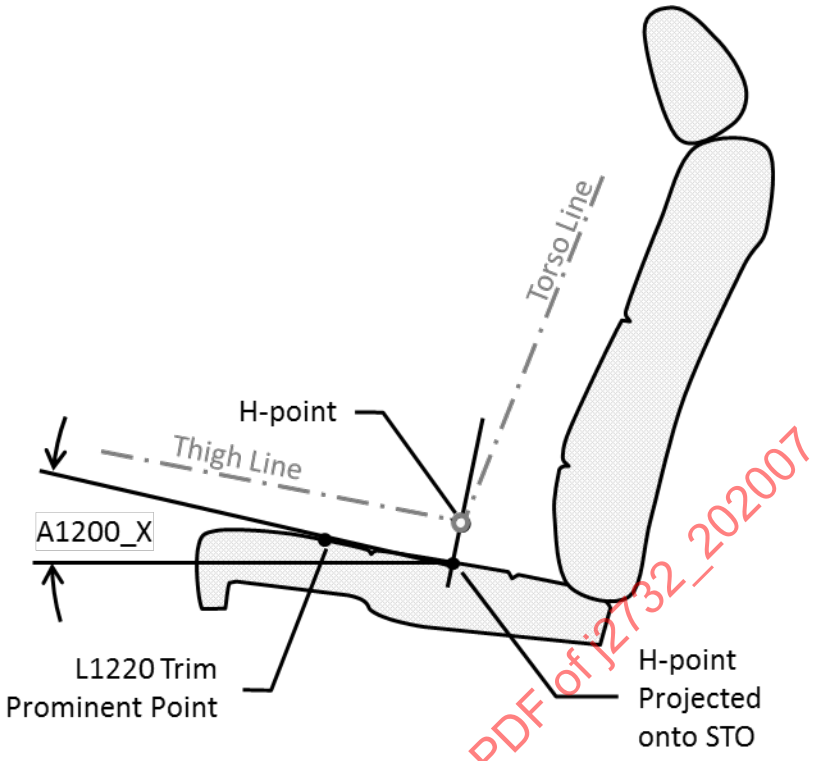

Figure 6C - Seat cushion centerline section

Table 9 - Seat back lateral cross-section dimensions

Code	Dimension	Definition	Figure
W1400_X	**Seat Back Width**	Widest width across the seat back STO within the defined lateral cross-sectional plane.	7A
W1401_X	Seat Back Width - Outboard Side	Width element of W1400_X from the outboard seat back STO to the C/LO.	n/a
W1402_X	Seat Back Width - Inboard Side	Width element of W1400_X from the inboard seat back STO to the C/LO.	n/a
W1420_X	**Seat Back Bolster Width**	Width between the highest points on the outboard and inboard bolsters within the defined lateral cross-sectional plane.	7A
W1421_X	Seat Back Bolster Width - Outboard Side	Width element of W1420_X between the highest outboard bolster point in the seat back STO to the C/LO.	n/a
W1422_X	Seat Back Bolster Width - Inboard Side	Width element of W1420_X between the highest inboard bolster point in the seat back STO to the C/LO.	n/a
W1440_X	**Seat Back Insert Width**	Width of the insert between the bolsters within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	7A
W1441_X	Seat Back Insert Width - Outboard Side	Width element of W1440_X between the outboard insert trench or limit in the seat back STO to the C/LO.	n/a

Code	Dimension	Definition	Figure
W1442_X	Seat Back Insert Width - Inboard Side	Width element of W1440_X between the inboard insert trench or limit in the seat back STO to the C/LO .	n/a
H1460_X	**Seat Back Bolster Height - Outboard Side**	Peak height of the outboard bolster above the seat back C/LO STO within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	7A
H1462_X	Seat Back Bolster Height - Inboard Side	Peak height of the inboard bolster above the seat back C/LO STO within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	n/a
H1465_X	**Effective Seat Back Bolster Height - Outboard Side**	The sum of measured values seat back outboard bolster height (H1460_X) and the seat back trim HPD deflection (H1520_X) for the defined lateral cross-sectional plane.	7C
H1466_X	Effective Seat Back Bolster Height - Inboard Side	The sum of measured values seat back inboard bolster height (H1462_X) and the seat back trim HPD deflection (H1520_X) for the defined lateral cross-sectional plane.	n/a
R1470_X	**Seat Back Insert Curvature**	Radius defined by 3 pts on the seat back STO located at the C/LO +110 mm, C/LO -110, and C/LO within the defined lateral cross-sectional plane.	7B
R1475_X	**Seat Back Bolster Radius - Outboard Side**	Radius defined by the highest point of the outboard bolster, a point in the outboard trench between the outboard bolster and insert, and a point on the outboard bolster mid-height between the two points within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	7B
R1476_X	Seat Back Bolster Radius - Inboard Side	Radius defined by the highest point on the inboard bolster, a point in the inboard trench between the inboard bolster and insert, and a point on the inboard bolster mid-height between the two points within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	n/a
R1480_X	**Seat Back Bolster Insert Radius**	Radius defined by the highest point of the outboard bolster, the highest point of the inboard bolster, and a point on the insert STO at C/LO within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	7D
H1485_X	**Effective Seat Back Bolster Insert Radius**	Radius defined by the highest point of the outboard bolster, the highest point of the inboard bolster, and the lowest point of the HPD translated to the centerline of occupant within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	7D

Code	Dimension	Definition	Figure
A1490_X	**Seat Back Bolster Angle - Outboard Side**	Included angle between a horizontal line and a line defined by a point in the outboard trench between the outboard bolster and insert and a point on the outboard bolster mid-height between the trench and the peak bolster within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	7F
A1491_X	Seat Back Bolster Angle - Inboard Side	Included angle between a horizontal line and a line defined by a point in the inboard trench between the inboard bolster and insert and a point on the inboard bolster mid-height between the trench and the peak bolster within the defined lateral cross-sectional plane. In certain cases, this measure is not definable.	n/a
H1490_X	**Seat Back Bolster Deflection (Gap) - Outboard Side**	Distance from the line defining the outboard bolster angle A1490_X and a parallel line contacting the outermost edge of the outboard side of HPD contour within the defined lateral cross-sectional plane. In certain cases, this measure is not definable. Value is negative if HPD contour is above bolster STO.	7F
H1491_X	Seat Back Bolster Deflection (Gap) - Inboard Side	Distance from the line defining the inboard bolster angle A1491_X and a parallel line contacting the outermost edge of the inboard side of HPD contour within the defined lateral cross-sectional plane. In certain cases, this measure is not definable. Value is negative if HPD contour is above bolster STO.	n/a
R1500_X	**Seat Back Lateral Contact Radius**	Radius defined by the outboard lateral exit point, the inboard lateral exit point, the lowest point of the HPD translated to the centerline of occupant within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	7E
A1500_X	**Seat Back Lateral Exit Angle - Outboard Side**	Included angle between a horizontal line through H-point to a line defined by the H-point and the outboard exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	7E
A1502_x	Seat Back Lateral Exit Angle - Inboard Side	Included angle between a horizontal line through H-point to a line defined by the H-point and the inboard exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	n/a

Code	Dimension	Definition	Figure
W1500_X	**Seat Back Lateral Exit Point Width - Outboard Side**	Width from the C/LO to the furthest outboard lateral exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	7E
W1502_X	Seat Back Lateral Exit Point Width - Inboard Side	Width from the C/LO to the furthest inboard lateral exit point within the defined lateral cross-sectional plane. If the HPD does not contact the seat surface within the section, this measure is not definable.	n/a
H1520_X	**Seat Back Trim HPD Deflection**	Height from the lowest point of the HPD to a point on the STO at C/LO within the defined lateral cross-sectional plane.	7C
H1540_X	**Seat Back Bolster Asymmetry**	Height difference between the highest outboard bolster point and highest inboard bolster point within the defined lateral cross-sectional plane. Value is negative if inboard bolster is higher than outboard bolster.	7D
L1570_X	**Seat Back Structural Clearance (Meat-to-Metal)**	Minimum distance from any point on the HPD to the any point on the seat structure excluding suspension and other deformable or compressible components within the defined lateral cross-sectional plane.	n/a

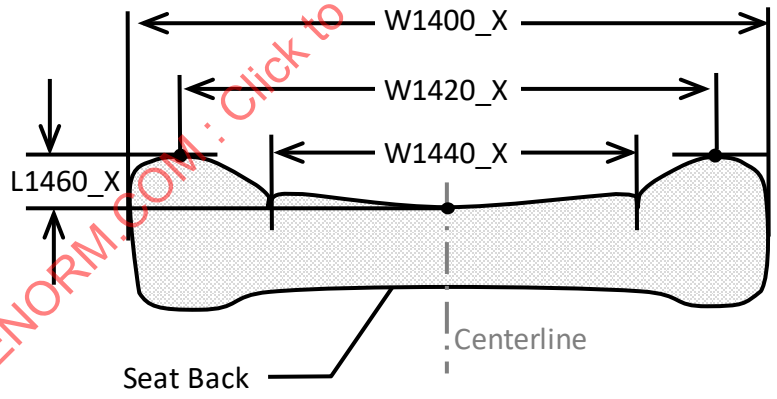

Figure 7A - Seat back lateral cross-section dimensions

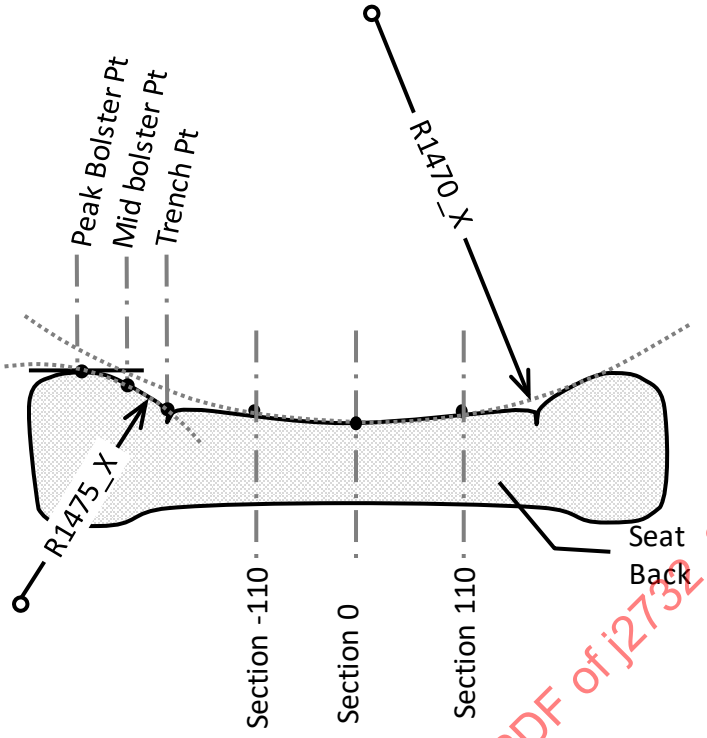

Figure 7B - Seat back lateral cross-section dimensions

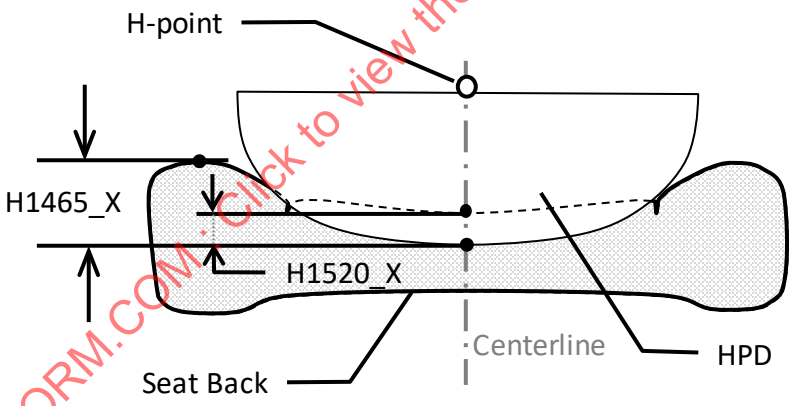

Figure 7C - HPD-specific seat back lateral cross-section dimensions

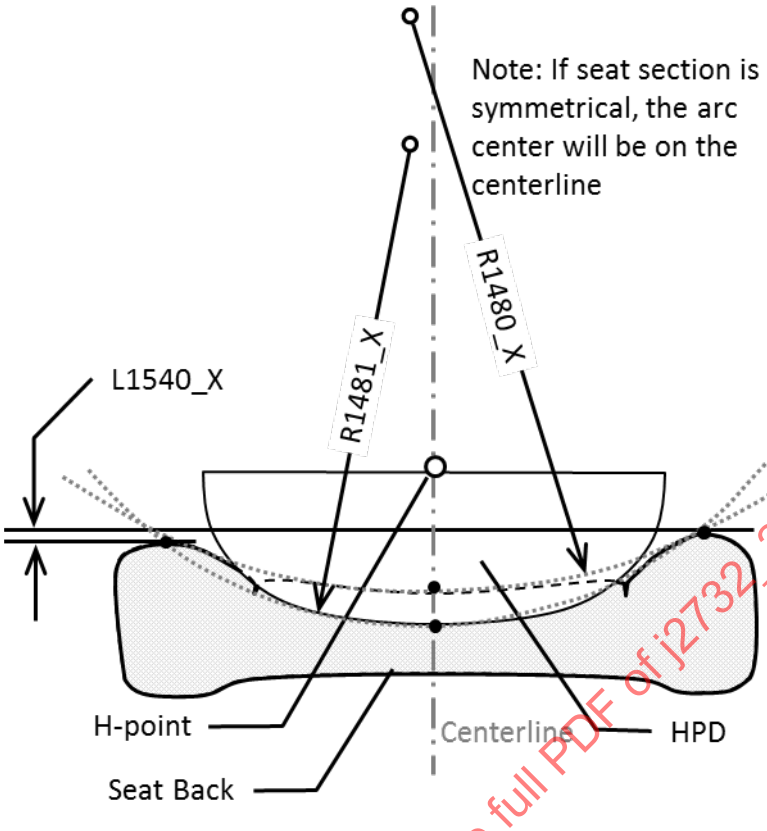

Figure 7D - Seat back lateral cross-section - bolster asymmetry and radial dimensions

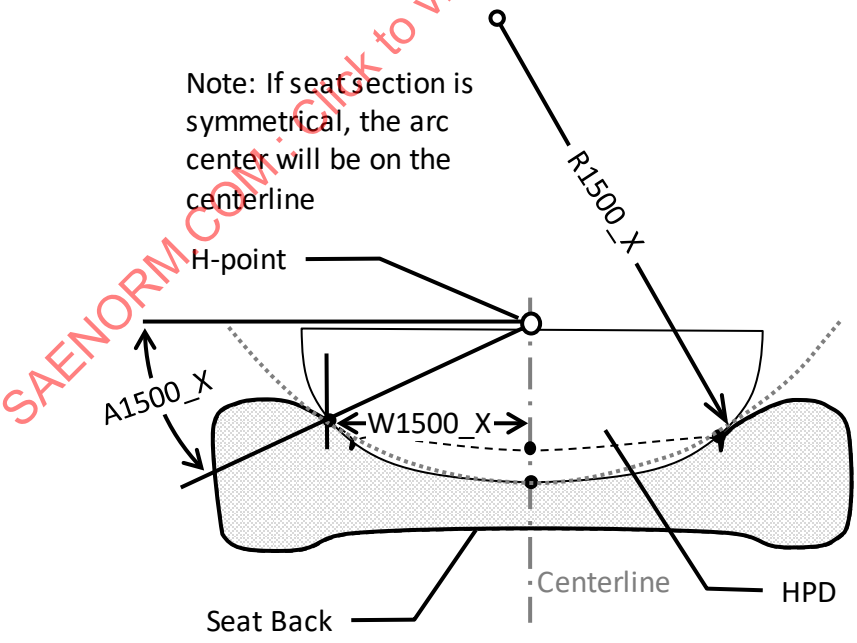

Figure 7E - Seat back lateral cross-section dimensions

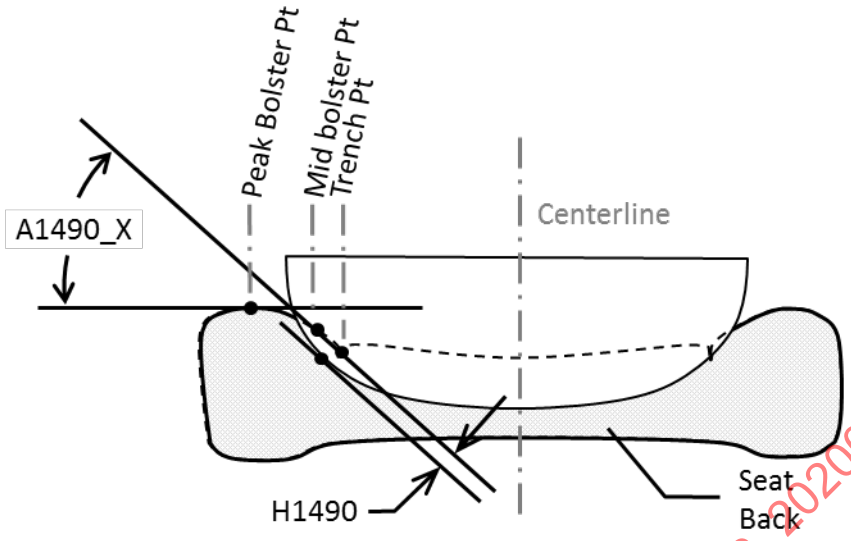

Figure 7F - Seat back lateral cross-section dimensions

Table 10 - Seat back centerline section dimensions

Code	Dimension	Definition	Figure
L1600_X	**Seat Back Trim Prominence to Torso (Back) Line**	Minimum distance from the seat back trim prominence point to the torso line within the defined CL cross-sectional plane.	8A
L1605_X	**Lumbar Prominence**	Minimum distance from the seat back trim prominence point bounded within the section 50 to 250 mm above H-point along torso line to the torso line within the defined CL cross-sectional plane In certain cases, this maybe the same as L1600. In certain cases, this measure is not definable.	n/a
H1620_X	**Seat Back Trim Prominence to H-Point**	Minimum distance from a line that is perpendicular to the torso line located at the highest seat back trim prominence point to the H-point within the defined CL cross-sectional plane.	8A
H1625_X	**Lumbar Apex Height**	Minimum distance from a line that is perpendicular to the torso line and contains the highest seat back trim prominence point bounded within the section 50 to 250 mm above H-point along torso line to the H-point within the defined CL cross-sectional plane. In certain cases, this maybe the same as L1620. In certain cases, this measure is not definable.	n/a
H1640_X	**Lowest Back Exit Point**	Minimum distance from a line that is perpendicular to the torso line and contains the lowest seat back exit point to the H-point within the defined CL cross-sectional plane. If the HPD exits the cushion seat surface behind the exposed biteline STO, this measure is not definable. This measure is positive (above H-point) or negative (below H-point).	8B

H1660_X	**Upper Back Exit Point**	Minimum distance from a line that is perpendicular to the torso line and contains the highest seat back exit point to the H-point within the defined CL cross-sectional plane.	8B
H1680_X	**Seat Back Height From H-Point - Without Head Restraint**	Minimum distance from a line that is perpendicular to the torso line and tangent to the top of the seat back STO to the H-point within the defined CL cross-sectional plane. Integrated head restraints are included as part of the seat back STO, but adjustable head restraints are excluded.	8A
H1700_X	**Seat Back Tie-Down Location**	Minimum distance from a line that is perpendicular to the torso line and runs through the closest lateral STO tie-down above H-point within the defined CL cross-sectional plane. This measurement is positive (above H-point) or negative (below H-point).	8A

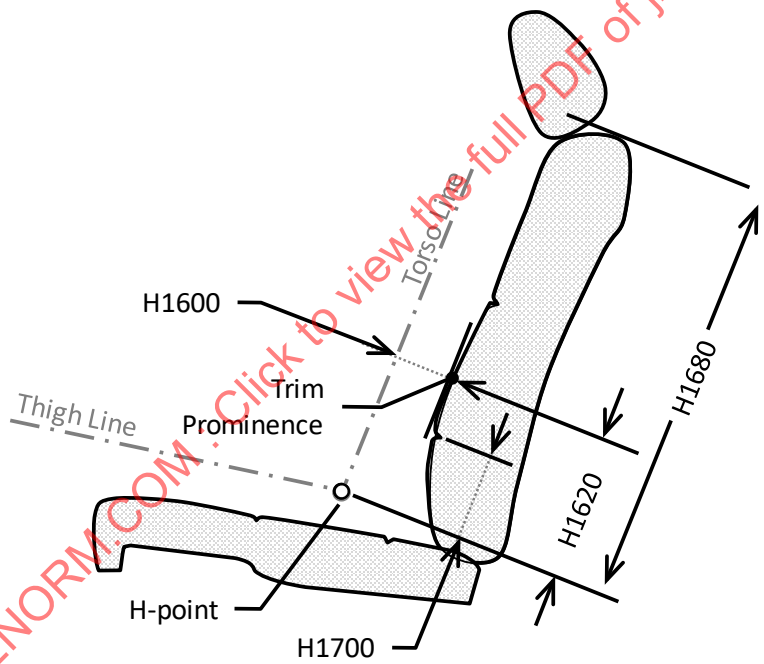

Figure 8A - Seat back centerline section dimensions

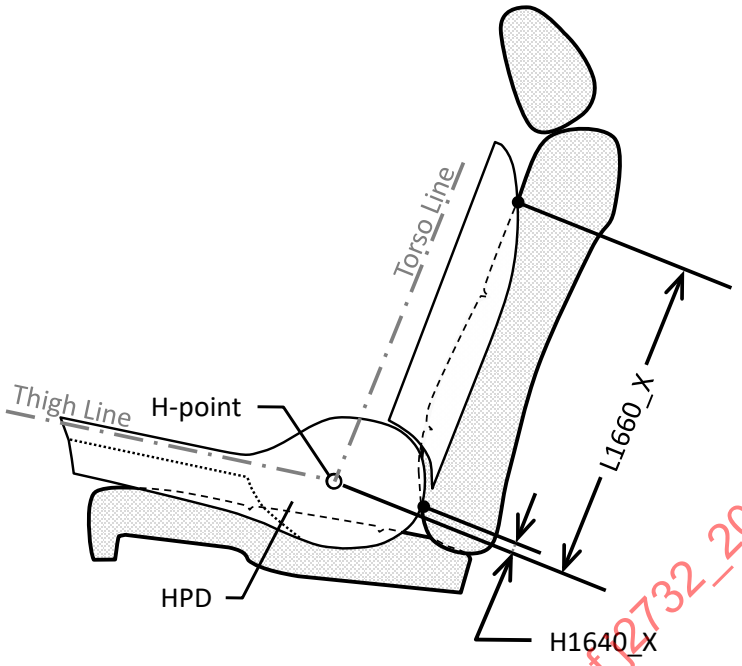

Figure 8B - HPD-specific seat back centerline section dimensions

Table 11 - Head restraint dimensions

Code	Dimension	Definition	Figure
H1800	**Seat Back Height from H-Point with Head Restraint**	Minimum distance from a line that is perpendicular to the torso line and tangent to the top of the head restraint STO to the H-point within the C/LO cross-sectional plane. If the head restraint is adjustable, it is placed in the lowest usable seated position.	9A
W1820	**Maximum Head Restraint Width**	Widest width across the STO of the head restraint.	9A
H1840	**Head Restraint Height**	Minimum distance from a line that is perpendicular to the torso line and tangent to the top of the head restraint STO to a parallel line that is tangent to the bottom of the head restraint STO. If the head restraint is adjustable, the bottom STO must be clear of the seat back STO. This measure is not definable for integrated head restraints.	9A
W1900_X	**Head Restraint Width**	Widest width across the STO of the head restraint within the defined lateral cross-sectional plane.	9B
L1900_X	**Head Restraint Depth**	Distance from a lateral line contacting the foremost point on the head restraint STO to a lateral line contacting the rearmost point on the head restraint STO within the defined lateral cross-sectional plane.	9B
L1920_X	**Head Restraint Centerline Depth**	Distance from the head restraint STO C/LO point to a lateral line contacting the rearmost point on the head restraint STO within the defined lateral cross-sectional plane.	9B

L1940_X	**Effective Rear Head Clearance**	Distance from a lateral YZ plane running through the weight hanger center point to the head restraint STO C/LO within the defined lateral cross-sectional plane.	9B
R1950_X	**Head Restraint Lateral Radius**	Radius defined by 3 pts on the head restraint STO located at C/LO +50 mm, C/LO -50 mm and the C/LO within the defined lateral cross-sectional plane. Value is positive if the arc center is on the A-surface side and negative if the arc center is on the B-surface side.	9C
A1960_X	**Effective Head Restraint Angle**	Included angle between a vertical line and a line connecting the head restraint STO points intersecting the head restraint reference planes +50 mm and -50 mm within the defined CL sectional plane. Value is negative if the top surface is closer to the occupant and positive if the top surface is further from the occupant.	9D
R1970_X	**Head Restraint Contour (Vertical Radius)**	Radius of the vertical head restraint contour defined from the surface points intersecting the planes +50 mm, -50 mm, and 0 mm from the head restraint reference section or as specified by the manufacturer. Positive value if the radius is on the A-surface side of the HR and negative value if the radius is on the B-surface side of the HR.	9E
L1985	**Head Restraint Prominence**	Distance from the weight hanger point to the most forward point on the head restraint STO within the C/LO cross-sectional plane.	9F
H1985	**Head Restraint Prominence Point Height**	Vertical distance from the weight hanger point to the most forward point on the head restraint STO within the C/LO cross-sectional plane.	9F

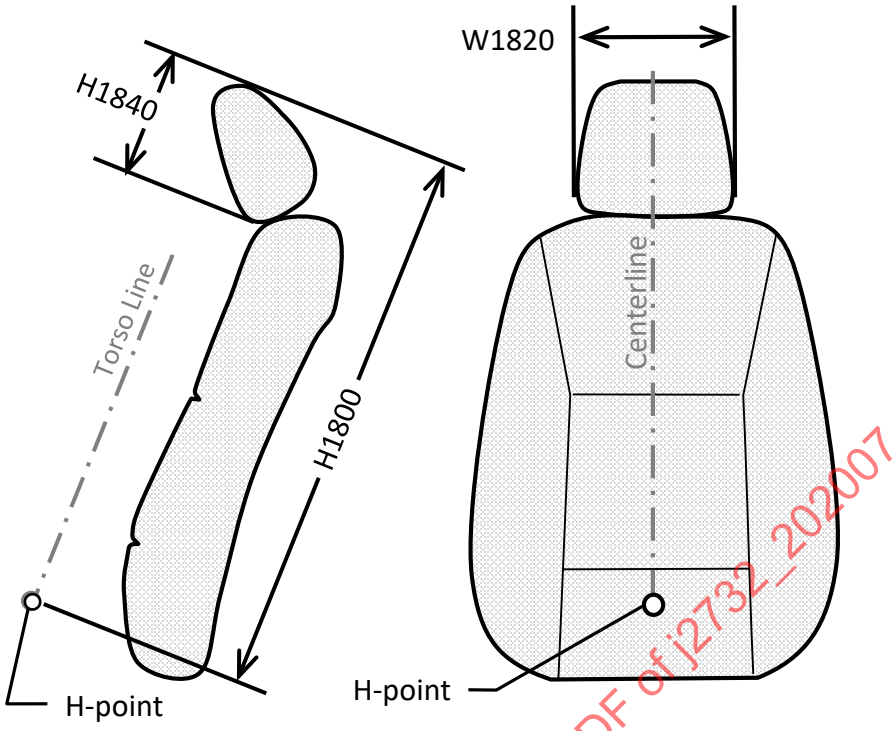

Figure 9A - Head restraint dimensions

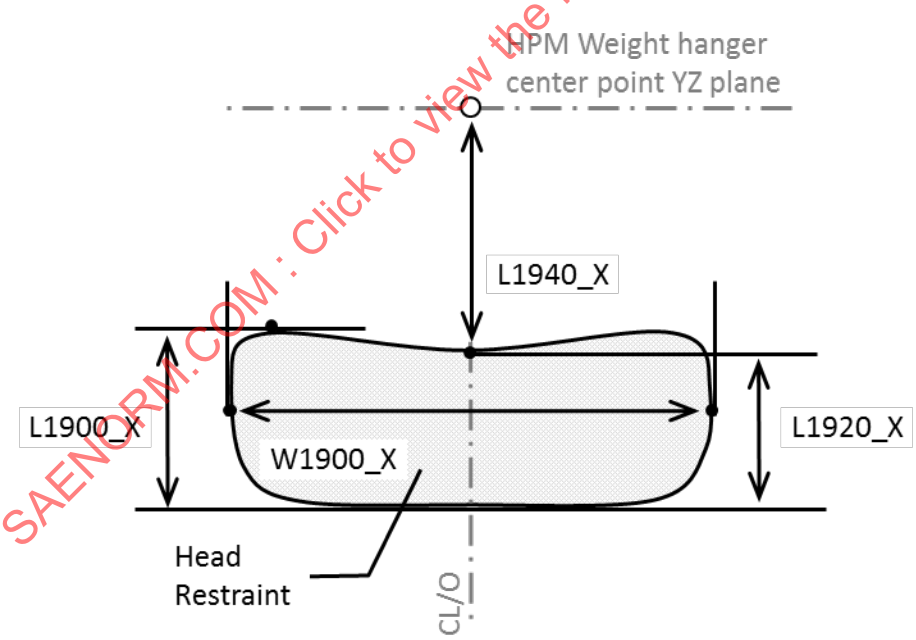

Figure 9B - Head restraint lateral cross-section dimensions