

15. DATA SHEETS

**DATA SHEET 1
TEST VEHICLE RECEIVING-INSPECTION**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

1. First compliance test by laboratory for this vehicle is S210 test.

___ Yes ___ No (Go to item 2)

___ 1.1 Label test vehicle with NHTSA Number

___ 1.2 Verify all options on the "window sticker" are present on the vehicle

___ 1.3 Verify tires and wheel rims are new and the same as listed

___ 1.4 Verify there are no dents or other interior or exterior flaws

___ 1.5 Verify the glove box contains an owner's manual, warranty document, consumer information, and extra keys

___ 1.6 Verify the vehicle is equipped with the proper fuel filler cap

___ 1.7 If the vehicle has been delivered from the dealer, verify the vehicle has been properly prepared and is in running condition

2. Verify seat adjusters are working

___ Yes ___ No

3. Verify there is a seat belt at each seating position

___ Yes ___ No

(Continued on next page)

15. DATA SHEETS....Continued

4. Without disturbing the integrity of each seat belt and anchorage, verify that each seat belt is attached to the anchorage. For seat belts that are attached to the seat, also verify the seats are attached to the seat anchors and the seat anchors are attached to the vehicle.

___ Yes ___ No

COMMENTS: (Explain any problems here)

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued

DATA SHEET 2
SEATING SYSTEM TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

SEAT CONFIGURATION: (See Figure 1) _____

FOR FRONT BENCH SEAT —

LEGEND: Wa - Weight of Seat Assembly
 Wb - Weight of Seat Back
 Wc - Weight of Seat Cushion
 Z - Distance from Seat SRP to Uppermost Crossmember = ____ "

COMPONENT	LOAD DIRECTION	COMPONENT WEIGHT (lbs)	REQUIRED LOAD (lbs)	ACTUAL LOAD (lbs)	PEAK DEFLECT. (inches)	ATTACHMENT (PASS/FAIL)
Seat Back	Forward	Wb =	20 x Wb =			
Seat Assy.	Forward	Wa =	20 x Wa =			
	Rearward	Wa =	20 x Wa =			
Seat Back Moment	Rearward	N/A	3275 in-lb/Z x # of occupants			

FOR FRONT BUCKET SEATS - - LEFT SIDE

COMPONENT	LOAD DIRECTION	COMPONENT WEIGHT (lbs)	REQUIRED LOAD (lbs)	ACTUAL LOAD (lbs)	PEAK DEFLECT. (inches)	ATTACHMENT (PASS/FAIL)
Seat Back	Forward	Wb =	20 x Wb =			
Seat Assy.	Forward	Wa =	20 x Wa =			
	Rearward	Wa =	20 x Wa =			
Seat Back Moment	Rearward	N/A	3275 in-lb/Z			

15. DATA SHEETS....Continued

FOR FRONT BUCKET SEATS - - RIGHT SIDE

COMPONENT	LOAD DIRECTION	COMPONENT WEIGHT (lbs)	REQUIRED LOAD (lbs)	ACTUAL LOAD (lbs)	PEAK DEFLECT. (inches)	ATTACHMENT (PASS/FAIL)
Seat Back	Forward	Wb =	20 x Wb =			
Seat Assy.	Forward	Wa =	20 x Wa =			
	Rearward	Wa =	20 x Wa =			
Seat Back Moment	Rearward	N/A	3275 in-lb/Z			

FOR REAR SEATS - -

COMPONENT	LOAD DIRECTION	COMPONENT WEIGHT (lbs)	REQUIRED LOAD (lbs)	ACTUAL LOAD (lbs)	PEAK DEFLECT. (inches)	ATTACHMENT (PASS/FAIL)
Cushion	Forward	Wc =	20 x Wc =			
Back	Forward	Wb =	20 x Wb =			

COMMENTS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued

**DATA SHEET 3
CALIBRATION DATA**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

INSTRUMENT/ EQUIP. ITEM	MFR.	FULL- SCALE CAPACITY	FULL-SCALE OUTPUT	ACCURACY	LAST CAL. DATE
Load Cell					
Oscillograph					
X-Y Plotter					
Steel Rule					
String Potentiometer					
Servo Controller					
Platform Scale					
Torque Wrench					
Other					

COMMENTS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued

DATA SHEET 4
REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING

CONTRACT NO.: DTNH22-_____ DATE: _____

FROM: _____

TO: _____

The following vehicle has been subjected to compliance testing for FMVSS No. _____

The vehicle was inspected upon arrival at the laboratory for the test and found to contain all of the equipment listed below. All variances have been reported within 2 working days of vehicle arrival, by letter, to the NHTSA Industrial Property Manager (NAD-30), with a copy to the OVSC COTR. The vehicle is again inspected, after the above test has been conducted, and all changes are noted below. The final condition of the vehicle is also noted in detail.

MODEL YEAR/MAKE/MODEL/BODY STYLE: _____

NHTSA NO.: _____ BODY COLOR: _____ VIN: _____

ODOMETER READINGS: ARRIVAL - _____ miles DATE - _____

COMPLETION - _____ miles DATE - _____

PURCHASE PRICE: \$ _____ DEALER'S NAME: _____

ENGINE DATA: _____ Cylinders _____ Liters _____ Cubic Inches

TRANSMISSION DATA: _____ Automatic _____ Manual _____ No. of Speeds

FINAL DRIVE DATA: _____ Rear Drive _____ Front Drive _____ 4 Wheel Drive

TIRE DATA: Size - _____ Mfr. - _____

CHECK APPROPRIATE BOXES FOR VEHICLE EQUIPMENT:

<input type="checkbox"/>	Air Conditioning	<input type="checkbox"/>	Traction Control	<input type="checkbox"/>	Clock
<input type="checkbox"/>	Tinted Glass	<input type="checkbox"/>	All Wheel Drive	<input type="checkbox"/>	Roof Rack
<input type="checkbox"/>	Power Steering	<input type="checkbox"/>	Speed Control	<input type="checkbox"/>	Console
<input type="checkbox"/>	Power Windows	<input type="checkbox"/>	Rear Window Defroster	<input type="checkbox"/>	Driver Air Bag
<input type="checkbox"/>	Power Door Locks	<input type="checkbox"/>	Sun Roof or T-Top	<input type="checkbox"/>	Passenger Air Bag
<input type="checkbox"/>	Power Seat(s)	<input type="checkbox"/>	Tachometer	<input type="checkbox"/>	Front Disc Brakes
<input type="checkbox"/>	Power Brakes	<input type="checkbox"/>	Tilt Steering Wheel	<input type="checkbox"/>	Rear Disc Brakes
<input type="checkbox"/>	Antilock Brake System	<input type="checkbox"/>	AM/FM/Cassette Radio	<input type="checkbox"/>	Other-

LIST OTHER PERTINENT OPTIONAL EQUIPMENT ON NEXT PAGE (REMARKS SECTION)

15. DATA SHEETS....Continued

REMARKS:

Equipment that is no longer on the test vehicle as noted on previous page:

Explanation for equipment removal:

Test Vehicle Condition:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

16. FORMS

LABORATORY NOTICE OF TEST FAILURE TO OVSC

FMVSS NO.: 207 TEST DATE: _____

LABORATORY: _____

CONTRACT NO.: DTNH22-_____ ; DELV. ORDER NO: _____

LABORATORY PROJECT ENGINEER'S NAME: _____

TEST VEHICLE MAKE/MODEL/BODY STYLE: _____

VEHICLE NHTSA NO.: _____ ; VIN: _____

VEHICLE MODEL YEAR: _____ ; BUILD DATE: _____

TEST FAILURE DESCRIPTION: _____

S210 REQUIREMENT, PARAGRAPH ____ : _____

NOTIFICATION TO NHTSA (COTR): _____

DATE: _____ BY: _____

REMARKS: _____

16. FORMS...Continued

MONTHLY TEST STATUS REPORT

FMVSS 207

DATE OF REPORT: _____

No.	VEHICLE NHTSA No., MAKE & MODEL	COMPLIANCE TEST DATE	PASS/ FAIL	DATE REPORT SUBMITTED	DATE INVOICE SUBMITTED	INVOICE PAYMENT DATE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

16. REPORT FORMS....Continued

MONTHLY VEHICLE STATUS REPORT

FMVSS 207

DATE OF REPORT: _____

No.	VEHICLE NHTSA No., MAKE & MODEL	DATE OF DELIVERY	TEST COMPLETE DATE	VEHICLE SHIPMENT DATE	CONDITION OF VEHICLE
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

APPENDIX A
MOTOR VEHICLE SAFETY STANDARD NO. 207
Seating Systems — Passenger Cars,
Multipurpose Passenger Vehicles (MPVs), Trucks and Buses
(Docket No. 2-12; Notice No. 3)

S1. PURPOSE AND SCOPE

This standard establishes requirements for seats, their attachment assemblies, and their installation to minimize the possibility of their failure by forces acting on them as a result of vehicle impact.

S2. APPLICATION

This standard applies to passenger cars, multipurpose passenger vehicles, trucks and buses.

S3. DEFINITION

OCCUPANT SEAT

A seat that provides at least one designated seating position (DSP).

S4. REQUIREMENTS

S4.1 DRIVER SEAT

Each vehicle shall have an occupant seat for the driver.

S4.2 GENERAL PERFORMANCE REQUIREMENTS

When tested in accordance with S5, each occupant seat, other than a side-facing seat or a passenger seat on a bus, shall withstand the following forces:

- (a) In any position to which it can be adjusted — 20 times the weight of the seat applied in a forward longitudinal direction;
- (b) In any position to which it can be adjusted — 20 times the weight of the seat applied in a rearward longitudinal direction;
- (c) For a seat belt assembly attached to the seat — the force specified in subparagraph (a), if it is a forward facing seat, or subparagraph (b), if it is a rearward facing seat, in each case applied simultaneously with the forces imposed on the seat by the seat belt assembly when it is loaded in accordance with section S4.2 of Federal Motor Vehicle Safety Standard No. 210; and

APPENDIX A...Continued

- (d) In its rearmost position — a force that produces a 3,300 inch-pound moment about the seating reference point (SRP) for each designated seating position (DSP) that the seat provides, applied to the upper cross-member of the seat back or the upper seat back, in a rearward longitudinal direction for forward-facing seats and in a forward longitudinal direction for rearward-facing seats.

S4.2.1 SEAT ADJUSTMENT

Except for vertical movement of nonlocking suspension type occupant seats in trucks or buses, the seat shall remain in its adjusted position during the application of each force specified in S4.2.

S4.3 RESTRAINING DEVICE FOR HINGED OR FOLDING SEATS OR SEAT BACKS

Except for a passenger seat in a bus or a seat having a back that is adjustable only for the comfort of its occupants, a hinged or folding occupant seat or occupant seat back shall —

- (a) be equipped with a self-locking device for restraining the hinged or folding seat or seat back, and
- (b) if there are any designated seating positions (DSPs) or auxiliary seating accommodations behind the seat, either immediately to the rear or to the sides, be equipped with a control for releasing that restraining device.

S4.3.1 ACCESSIBILITY OF RELEASE CONTROL

If there is a designated seating position (DSP) immediately behind a seat equipped with a restraining device, the control for releasing the device shall be readily accessible to the occupant of the seat equipped with the device and, if access to the control is required in order to exit from the vehicle, to the occupant of the designated seating position (DSP) immediately behind the seat.

S4.3.2 PERFORMANCE OF RESTRAINING DEVICE

S4.3.2.1 STATIC FORCE

- (a) Once engaged, the restraining device for forward-facing seat shall not release or fail when a forward longitudinal force equal to 20 times the weight of the hinged or folding portion of the seat is applied through the center of gravity (CG) of that portion of the seat.
- (b) Once engaged, the restraining device for a rearward facing seat shall not

APPENDIX A...Continued

release or fail when a rearward longitudinal force equal to 8 times the weight of the hinged or folding portion of the seat is applied to the center of gravity (CG) of that portion of the seat.

S4.3.2.2 ACCELERATION

Once engaged, the restraining device shall not release or fail when the device is subjected to an acceleration of 20 g in the longitudinal direction opposite to that in which the seat folds.

S4.4 LABELING

Seats not designated for occupancy while the vehicle is in motion shall be conspicuously labeled to that effect.

S5. TEST PROCEDURES

S5.1 Apply the forces specified in S4.2(a) and S4.2(b) as follows:

S5.1.1 If the seat back and the seat bench are attached to the vehicle by the same attachments, secure a strut on each side of the seat from a point on the outside of the seat frame in the horizontal plane of the seat's center of gravity (CG) to a point on the frame as far forward as possible of the seat anchorages. Between the upper ends of the struts place a rigid cross-member, in front of the seat back frame for rearward loading and behind the seat back frame for forward loading. Apply the force specified by S4.2(a) or S4.2(b) horizontally through the rigid cross-member as shown in Figure 1 on the next page.

S5.1.2 If the seat back and the seat bench are attached to the vehicle by different attachments, attach to each component a fixture capable of transmitting a force to that component. Apply forces equal to 20 times the weight of the seat back horizontally through the center of gravity (CG) of the seat back, as shown in Figure 2, and apply forces equal to 20 times the weight of the seat bench horizontally through the center of gravity (CG) of the seat bench, as shown in Figure 3.

S5.2 Develop the moment specified in S4.2(d) as shown in Figure 4.

S5.3 Apply the forces specified in S4.3.2.1 (a) and (b) to a hinged or folding seat as shown in Figure 1 and to a hinged or folding seat back as shown in Figure 5.

APPENDIX A...Continued

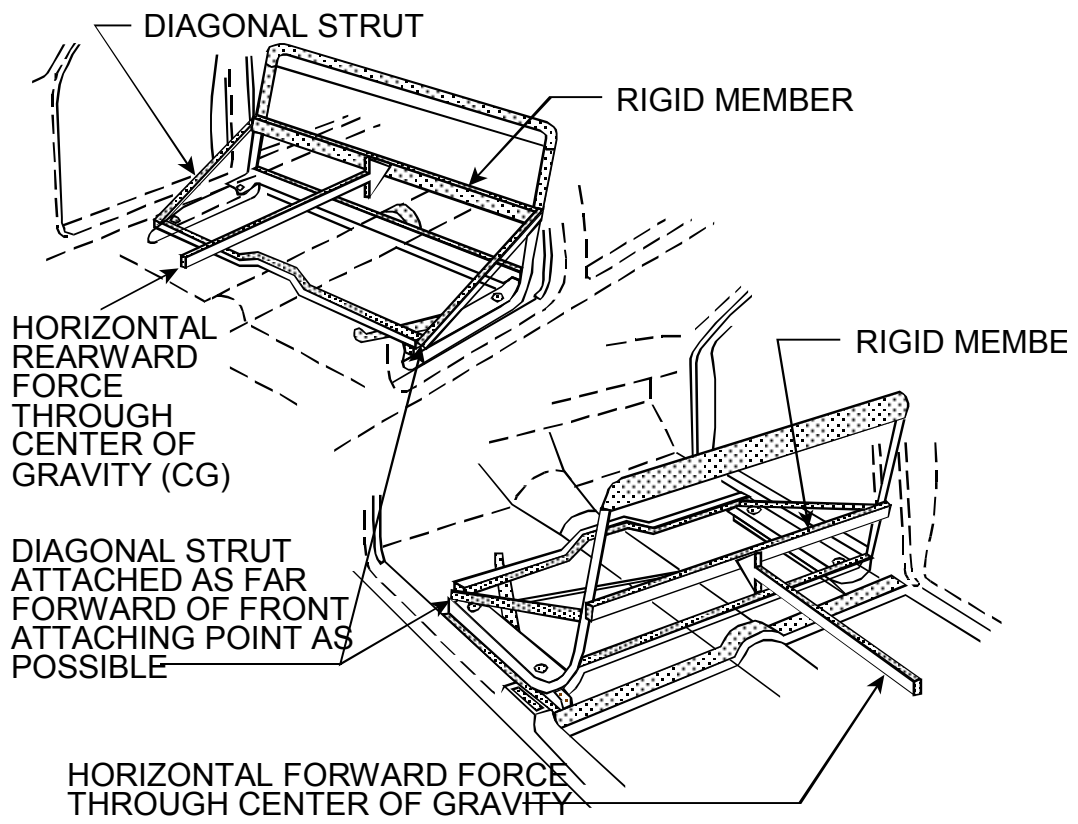


FIGURE 1

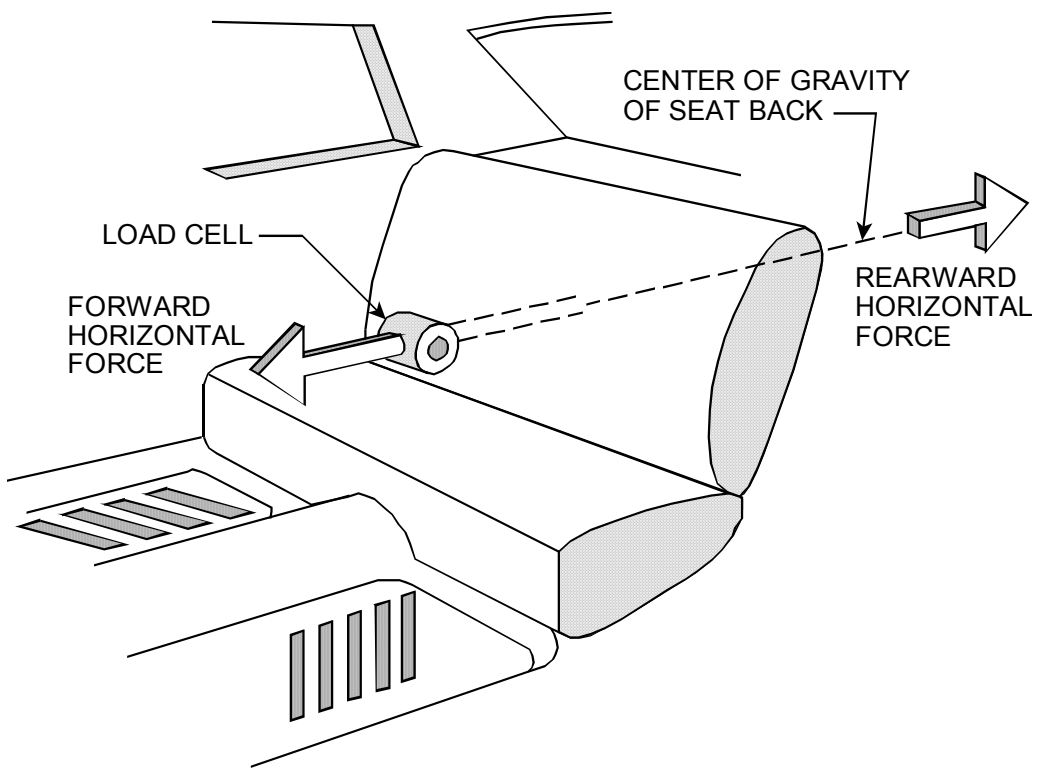


FIGURE 2

APPENDIX A...Continued

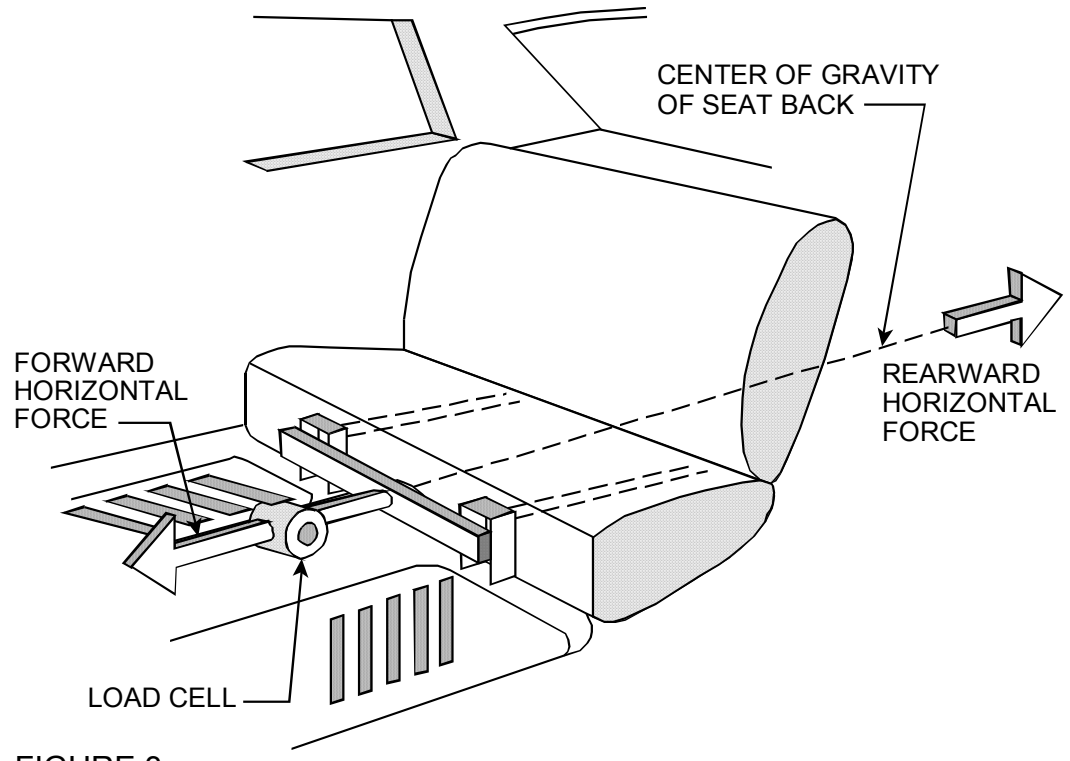


FIGURE 3

MOMENT ($P \times D$) COMPUTED ABOUT THE SEATING REFERENCE POINT (SRP)

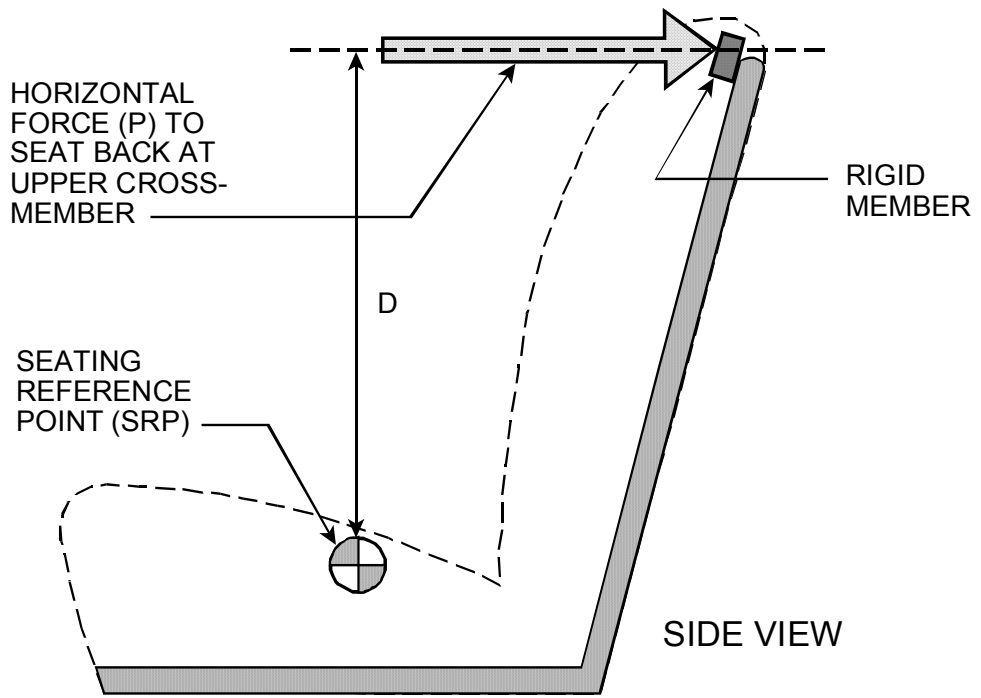


FIGURE 4

APPENDIX A...Continued

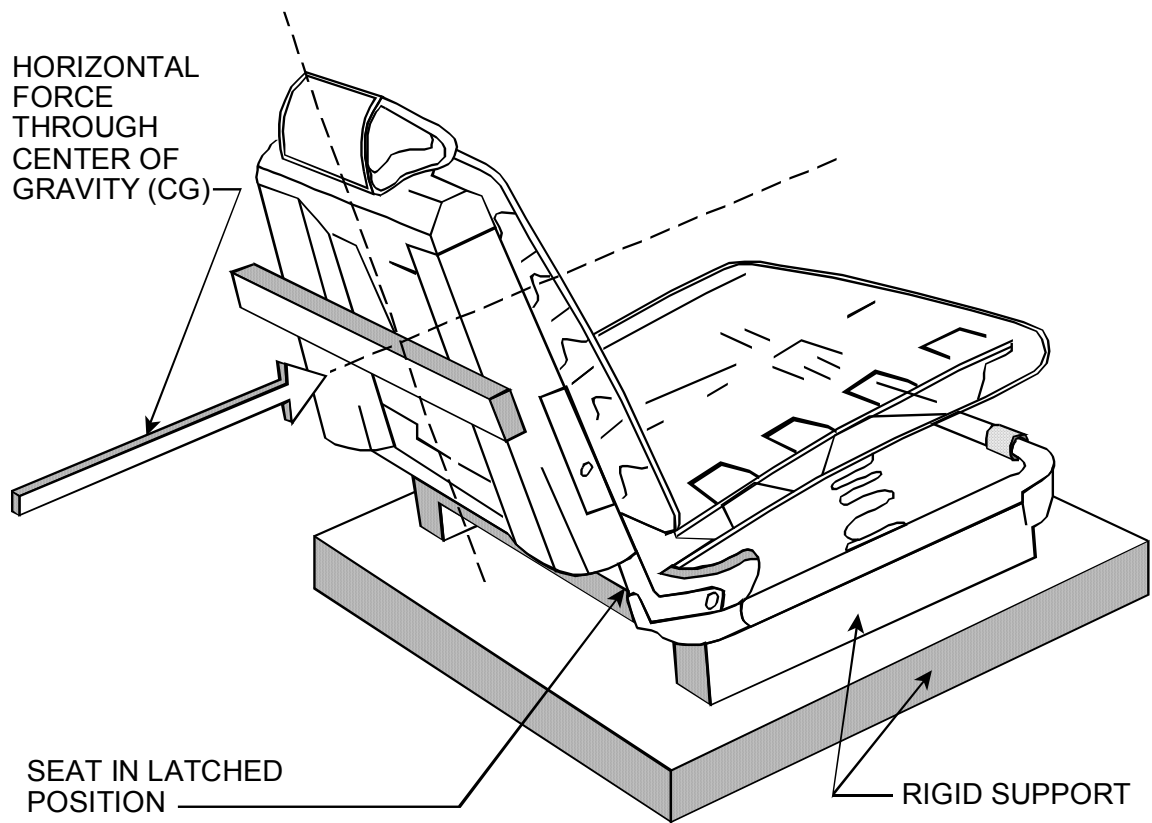


FIGURE 5

- S5.4 Determine the center of gravity (CG) of a seat or seat component with all cushions and upholstery in place and with the head restraint in its fully extended design position.

**APPENDIX B
DEVICES FOR USE IN DEFINING AND MEASURING
VEHICLE SEATING ACCOMMODATION
SAE J826 JUN92**

1. SCOPE

The devices of this SAE Standard provide the means by which passenger compartment dimensions can be obtained using a deflected seat rather than a free seat contour as a reference for defining seating space. All definitions and dimensions used in conjunction with this document are described in SAE J1100. The devices described in this document are intended for applications concerning seated driver side or center occupant accommodation spaces only and are not to be construed as instruments which measure or indicate occupant capabilities or comfort. This document covers only one H-point machine installed on a seat during each test. Certified H-point templates and machines can be purchased from:

Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale, PA 15096-0001

1.1 PURPOSE

This document specifies two-dimensional H-point template and three-dimensional H-point machine devices for use in defining and measuring vehicle seating accommodations.

2. REFERENCES

2.1 APPLICABLE DOCUMENTS

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

2.1.1 SAE PUBLICATIONS

Available from the following:

SAE
400 Commonwealth Drive
Warrendale, PA 15096-0001

SAE J182 - Motor Vehicle Fiducial Marks
SAE J1100 - Motor Vehicle Dimensions
S.P.Geoffrey, "A 2-D Manikin - The Inside Story." Paper 267A presented at SAE Automotive Engineering Congress, Detroit, Michigan, January 1961.

APPENDIX B....Continued

3. H-POINT TEMPLATE - DESCRIPTION, APPLICATION, AND POSITIONING PROCEDURE

3.1 DESCRIPTION

A template (Figure 1) constructed to represent in profile an adult male wearing shoes and corresponds to the profile of the deflected seating contour of the H-point machine. Individual torso, thigh, lower leg, and foot segments are provided with locking pivot joints which can be used to fix the angular relationships of the segments. A seatback angle reference bar is included to orient the template in relation to the vertical.

3.2 APPLICATION - AID IN DISPLAYING

- 3.2.1 Passenger compartment space and seating attitude during conception, engineering, and development stages of any new vehicle.
- 3.2.2 Passenger compartment space and seating attitude for comparison and reporting purposes.
- 3.2.3 Data obtained from checks made with the H-point machine. (See Section 4.)

3.3 POSITIONING PROCEDURE

- 3.3.1 Torso positioning for any specified Seating Reference Point (SRP) and back angle.
 - 3.3.1.1 Position the H-point of the H-point template on the Seating Reference Point (SRP) location on the layout.
 - 3.3.1.2 Set seatback angle reference bar quadrant scribe line marked on torso back angle quadrant to the specified back angle. Lock this quadrant in place.
 - 3.3.1.3 Position the vertical reference scribe lines on the seatback angle reference bar parallel to the body grid lines on the layout drawing.

3.3.2 FRONT SEAT - DRIVER POSITION

Leg and foot positioning for any specified accelerator heel point location.

- 3.3.2.1 Holding the torso portion of the template in position as outlined in 3.3.1.1 to 3.3.1.3, position the heel point of the template at the specified heel point location. This point on the layout is located on top of the heel pad or the depressed floor covering surface at the Y plane centerline of the accelerator pedal.

APPENDIX B...Continued

H-POINT TEMPLATE

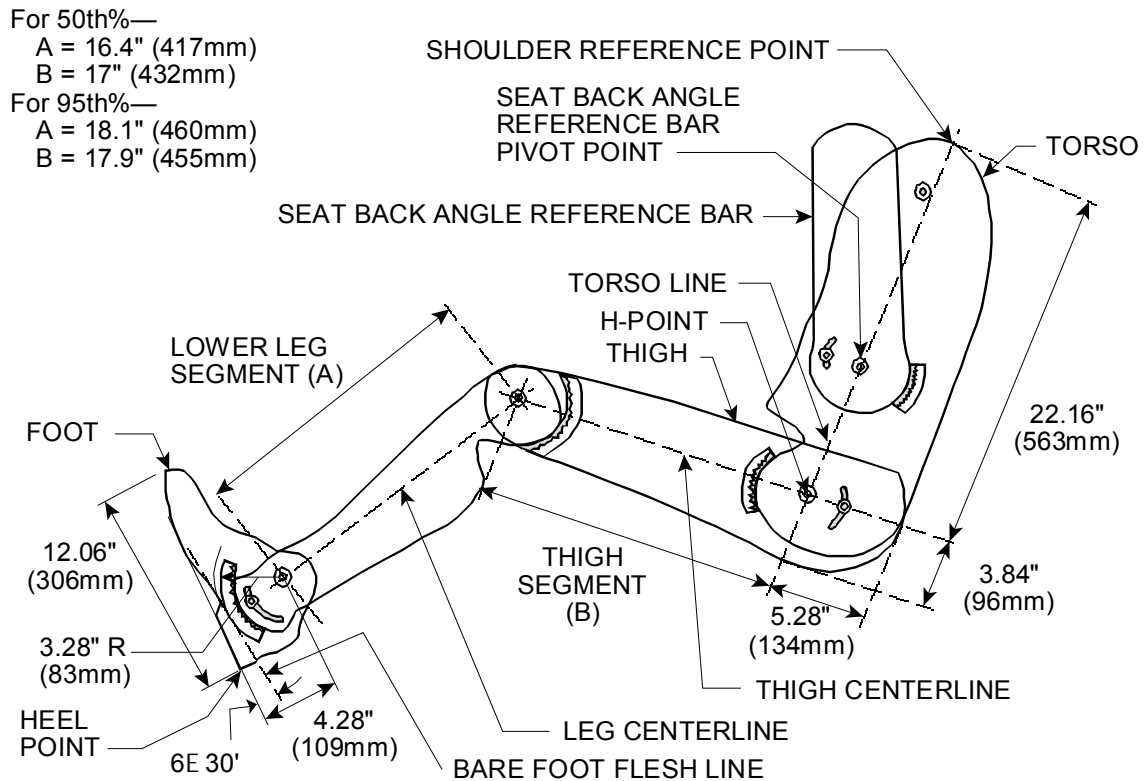


FIGURE 1

- 3.3.2.2 Holding the heel point at the specified location, rotate the foot forward until the ball of the foot contacts the undepressed accelerator pedal without infringing upon the 87 degrees minimum foot angle.
- 3.3.2.3 The undepressed accelerator pedal (point of contact with ball of foot) may be determined by locating the heel point as described above and presetting and locking the foot angle to 87 degrees.
- 3.3.2.4 Draw in the template outline and pivot centers.

3.3.3 FRONT SEAT - DRIVER POSITION

Leg and foot positioning for any specified undepressed accelerator pedal location.

- 3.3.3.1 Holding the torso portion of the template in position as outlined in 3.3.1.1 to 3.3.1.3, position the ball of the foot on the specified undepressed accelerator pedal with the sole of the foot on the pedal and the heel as far forward as allowable. However, the foot angle is never less than 87 degrees. Lock foot angle quadrant.

APPENDIX B...Continued

3.3.3.2 Draw in the template outline and pivot centers.

3.3.4 FRONT SEAT - DRIVER POSITION

Leg and foot positioning for any specified leg room and SRP-front to heel.

- 3.3.4.1 Holding the torso portion of the template in position, as outlined in 3.3.1.1 to 3.3.1.3, position the heel point of the template at the specified height. SRP-front to heel, and the foot angle locked at 87 degrees.
- 3.3.4.2 Move the foot forward along the heel point line until the distance between the angle pivot point and the SRP is equal to the specified leg room less 254 mm (10 inches).
- 3.3.4.3 Draw in the template outline and pivot centers.

3.3.5 SECOND SEAT - LEFT SIDE OCCUPANT POSITION

Leg and foot positioning with the front seat in its rearmost normal driving and riding position.

- 3.3.5.1 Holding the torso portion of the template in position as outlined in 3.3.1.1 to 3.3.1.3 but on the SRP second, place the foot (heel and ball) on the depressed floor covering line. The foot is to be placed on the Y plane centerline of the occupant or up to 127 mm (5 inches) on either side of the Y plane centerline on the floor pan section.

NOTE: Locating the foot either side of the Y plane centerline of the occupant position will make the foot location compatible to the foot location in the existing H-point machine installation procedure.

- 3.3.5.2 Move the foot forward along the depressed floor covering line to the nearest interference of the toe, instep, lower leg, or knee with the front seat. The foot angle is to be restricted to a maximum of 130 degrees.
- 3.3.5.3 Draw in the template outline and pivot centers.

3.3.6 THIRD SEAT - LEFT SIDE OCCUPANT POSITION

- 3.3.6.1 Follow the procedure as outlined for the second seat, left side occupant position except that the template is positioned in the third seat compartment.

APPENDIX B...Continued

3.3.7 THIRD SEAT - LEFT SIDE OCCUPANT POSITION

- 3.3.7.1 Follow the same procedure as outlined for the third seat -side occupant position - forward facing except that the foot is positioned in the footwell to the interference with the rear end or closure.
- 3.3.8 H-point template layout using data obtained during H-point machine installation.
 - 3.3.8.1 Position the H-point pivot of the template at the measured H-point location on a layout drawing or grid system.
 - 3.3.8.2 Follow the procedure as outlined in 3.3.1.1 to 3.3.1.3 using the measured back angle instead of the design back angle.
 - 3.3.8.3 Holding the torso portion of the template in position as outlined above, move the upper leg segment to measured hip angle shown on the hip angle quadrant.
 - 3.3.8.4 Lock this quadrant in place.
 - 3.3.8.5 Position and lock the foot angle quadrant to the measured foot angle.
 - 3.3.8.6 Allowing the knee angle to vary as necessary, position the ankle pivot center on an arc from the hip pivot center equal to the measured effective leg room less 254 mm (10 inches).

4. H-POINT MACHINE - DESCRIPTION, APPLICATION, AND INSTALLATION PROCEDURE

4.1 DESCRIPTION

A machine (Figures 2) with back and seat pan representations of deflected seat contours of adult males. Constructed of reinforced plastic and metal, these separate back and seat pans simulate the human torso and thigh and are mechanically hinged at the H-point. A graduated sliding probe is hinged from the H-point to measure the headroom in the compartment. A quadrant is fastened to the probe to measure the back angle. An adjustable thigh bar, attached to the seat pan, establishes the thigh centerline and serves as a baseline for the hip angle quadrant. Lower leg segments, also adjustable in length, are connected to the seat pan assembly at the knee joining T-bar, 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 angular relation to the lower leg segment. Positive stops are provided in the thigh and lower leg segments for the 10th, 50th, and 95th percentile of adult male

APPENDIX B...Continued

dimensions (Table 1). Two spirit levels orient the device in space. Body segment weights are placed at the center of gravity (CG) locations to provide seat penetration equivalent to a 76 kg (167 lb) male. The adult male dimensions were in part taken from the 50th percentile data as acquired by Geoffrey (See Table 1, Note 1). The remaining dimensions were developed from U. S. Department of Health, Education, and Welfare data by the Design Devices Subcommittee of the SAE Human Factors Engineering Committee, March, 1969.

The lower leg and thigh segments are available in 10th, 50th, and 95th percentile lengths. (See Table 1.)

TABLE 1 - LEG SEGMENT LENGTH

	10th Percentile¹ mm	50th Percentile¹ mm	95th Percentile¹ mm
Lower leg segment (A)	390.4	417.5	459.1
Thigh segment (B)	407.7	431.5	456.0
Source	1	1	2

¹ S.P. Geoffrey, "A 2-D Manikin - The Inside Story." Paper 267A presented at SAE Automotive Engineering Congress, Detroit, Michigan, January 1961.

² Values for the 95th percentile leg lengths were developed on the basis of best judgement of available data by the Design Devices Subcommittee of the SAE Human Factors Engineering Committee at the July 1968 and March 1969 meetings.

4.2 APPLICATION

4.2.1 Aid in the design and development of seats and seat materials.

4.2.2 Check vehicle seating compartments for conformance to design specifications, that is, relationship of H-point to body structures, seats, controls, etc.

4.3 INSTALLATION PROCEDURE

4.3.1 Dimensions are measured relative to the X and Z body zero planes by setting up the vehicle relative to the front and rear fiducial mark (see SAE J182a) height (H163 and H164). Curb and gross weight rating loads require different fiducial mark heights (See SAE J1100). All interior dimensions are measured with the front seat in the rearmost normal driving and riding position as specified by the

APPENDIX B...Continued

manufacturer. When the seatback has an angular adjustment separate from the seat cushion, the normal driving or riding seatback angle is specified by the manufacturer (L40). Use 25 degrees if not specified. The tilt adjustment, if available, should be in the design position.

- 4.3.2 Sufficient time shall be allowed to ensure that the seat material reaches room temperature to avoid extreme temperature variations. If the seat to be checked has never been sat upon, a 68 to 79 kg (150 to 175 lb) person shall sit on the seat twice for 1 minute to flex the cushion and back. All seat assemblies are to remain unloaded for a minimum period of 1/2 hour (1 hour preferred) prior to the H-point machine installation.
- 4.3.3 Place a piece of muslin cotton cloth over the seat area to be checked. The muslin cloth should be 910 mm (36 inches) square and be of a quality comparable to a grade described as a weave of 48 threads/in² and density of 2.85 yd/lb. The muslin should be tucked in a sufficient amount to prevent hammocking of the material. If the test is run in a buck, suitable floor covering sections, or equivalent, are to be placed under the H-point machine's feet.
- 4.3.4 Place seat and back assembly of the H-point machine at the centerline of occupant (C/LO). C/LO is also the centerline of H-point machine and is 381 mm (15 inches) outboard from the vehicle centerline on the driver's side, unless otherwise specified by the manufacturer. The C/LO is moved inboard from the 381 mm (15 inches) line when the H-point machine is sitting far enough outboard that the seat edge will not permit leveling of the H-point machine. It is moved inboard the necessary distance to permit leveling of the H-point machine and the new dimension from centerline of vehicle to C/LO noted in recording measurements. In vehicles with bucket front seats or individual auxiliary seats, the centerline of the seat is the basis for interior dimensions relating to these seats.
- 4.3.5 Use 95th percentile leg and thigh segments specified in Table 1.
- 4.3.6 Attach foot and lower leg assemblies to the seat pan assembly, either individually at the knee joint or by using the T-bar lateral segment and lower leg assembly.
- The T-bar lateral segment should be parallel to the ground and perpendicular to the Y plane of the vehicle unless otherwise specified by the manufacturer.
- 4.3.7 The feet and leg positions of the H-point machine for the various individual seat positions to be checked are as follows:

APPENDIX B...Continued

4.3.7.1 FRONT SEAT - DRIVER POSITION

The right foot and leg assembly is placed on the undepressed (blocked or mechanically restrained) accelerator pedal with the sole of the foot on the pedal and the heel as far forward as allowable. The heel may not be placed on the toeboard. However, the foot angle is never less than 87 degrees. The 87 degree limit can be fixed by inserting the pin into the foot assembly.

The left foot is positioned on the floor or toe pan and located approximately the same distance to the left of the H-point machine centerline as the right foot is to the right. The T-bar should be maintained parallel to the ground.

4.3.7.2 FRONT SEAT - OCCUPANT IN VEHICLE CENTERLINE POSITION

The H-point machine is installed in the front seat vehicle centerline position with both legs extended at the specified percentile, one on either side of the tunnel. The left foot is placed on the undepressed accelerator pedal and the right foot is located to the right of the tunnel, approximately opposite and symmetrical in a manner that levels the knee joint T-bar. A T-bar extension may be required to straddle the knee segments on either side of tie tunnel. In vehicles having no tunnel, the feet are set approximately 254 mm (10 inches) apart. The leg comfort angles are determined from the H-point machine's left leg.

4.3.7.3 SECOND SEAT - SIDE OCCUPANT POSITION

The H-point machine is installed in the second seat outboard occupant position 381 mm (15 inches) outboard from the vehicle centerline, unless otherwise specified by the manufacturer. (Check applicable seating arrangement drawing for specified location.) The two feet are placed together and positioned to the nearest interference of the toe, instep, or lower leg with the front seat, unless otherwise specified by the manufacturer. In instances where one foot reaches interference before the other, the one with the nearest interference will be used for dimensioning purposes. For additional H-point machine leg location conditions and restrictions, see Sections 5 and 6 for H-point machine installation in long- and short-coupled vehicle.

4.3.7.4 SECOND SEAT - OCCUPANT IN VEHICLE CENTERLINE POSITION

The H-point machine is installed in the second seat vehicle centerline position with both the foot and lower leg assemblies placed astride the tunnel on the normal floor. Both leg assemblies are extended to the nearest interference of the toe, instep, or lower leg with the front seat.

APPENDIX B...Continued

If necessary, in order to clear lateral obstructions, such as seat belt anchors, tunnel width, etc., the T-bar may be extended. In vehicles with no tunnel, set the H-point machine's feet approximately 254 mm (10 inches) apart.

- 4.3.8 Apply lower leg and thigh weights and level the H-point machine.
- 4.3.9 Tilt the back pan forward against the forward stop and draw the H-point machine away from the seatback using the T-bar. Reposition the H-point machine on the seat by one of the following methods:
 - 4.3.9.1 If the H-point machine tends to slide rearward, use the following procedure:

Allow the H-point machine to slide rearward until a forward horizontal restraining load on the T-bar is no longer required due to the seat pan contacting the seatback.
 - 4.3.9.2 If the H-point machine does not tend to slide rearward, use the following procedure:

Slide the H-point machine rearward by a horizontal rearward load applied at the T-bar until the seat pan contacts the seatback.
- 4.3.10 Apply a 10 kg (22 lb) load twice to the back and pan assembly positioned at the intersection of the hip angle quadrant and the T-bar housing (Figure 2). The direction of load application should be maintained along a line from the above intersection to a point just above the thigh bar housing. Then carefully return the back pan to the seatback. Care must be exercised through the remainder of the procedure to prevent the H-point machine from sliding forward.
- 4.3.11 Install the right and left buttock weights and then alternately the eight torso weights. Maintain H-point machine level.
- 4.3.12 Tilt the back pan forward until the stop is contacted. Rock the H-point machine from side to side over a 10 degree arc (5 degrees to each side of the vertical centerline) for three complete cycles to release any accumulated friction between the H-point machine and the seat. During the rocking, the T-bar of the H-point machine may tend to change from the specified horizontal and vertical alignment; therefore, the T-bar must be restrained and properly aligned by applying an appropriate lateral load during the rocking motions. Care shall be exercised in holding the T-bar and rocking the H-point machine to minimize inadvertent exterior loads applied in a vertical or fore-and-aft direction. The H-point machine's feet are not to be restrained or held during this step, and if the feet change position, they

APPENDIX B....Continued

should be allowed to remain in that attitude at this time. Due to the movement of the feet during the H-point machine rocking operation, the feet are repositioned as follows:

a. FRONT SEAT

Alternately lift each foot off the floor the minimum necessary amount until no additional forward 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 floor and the ball (sole) of the foot is to be in contact with the floor, toeboard, or undepressed accelerator pedal.

b. SECOND SEAT

Alternately move each foot forward by applying a forward load to the heel of the foot, sliding the feet forward until the feet or leg interfere with the rear of the front seatback. This operation releases any accumulated foot friction and movement incurred during the lateral rocking step.

H-POINT MACHINE

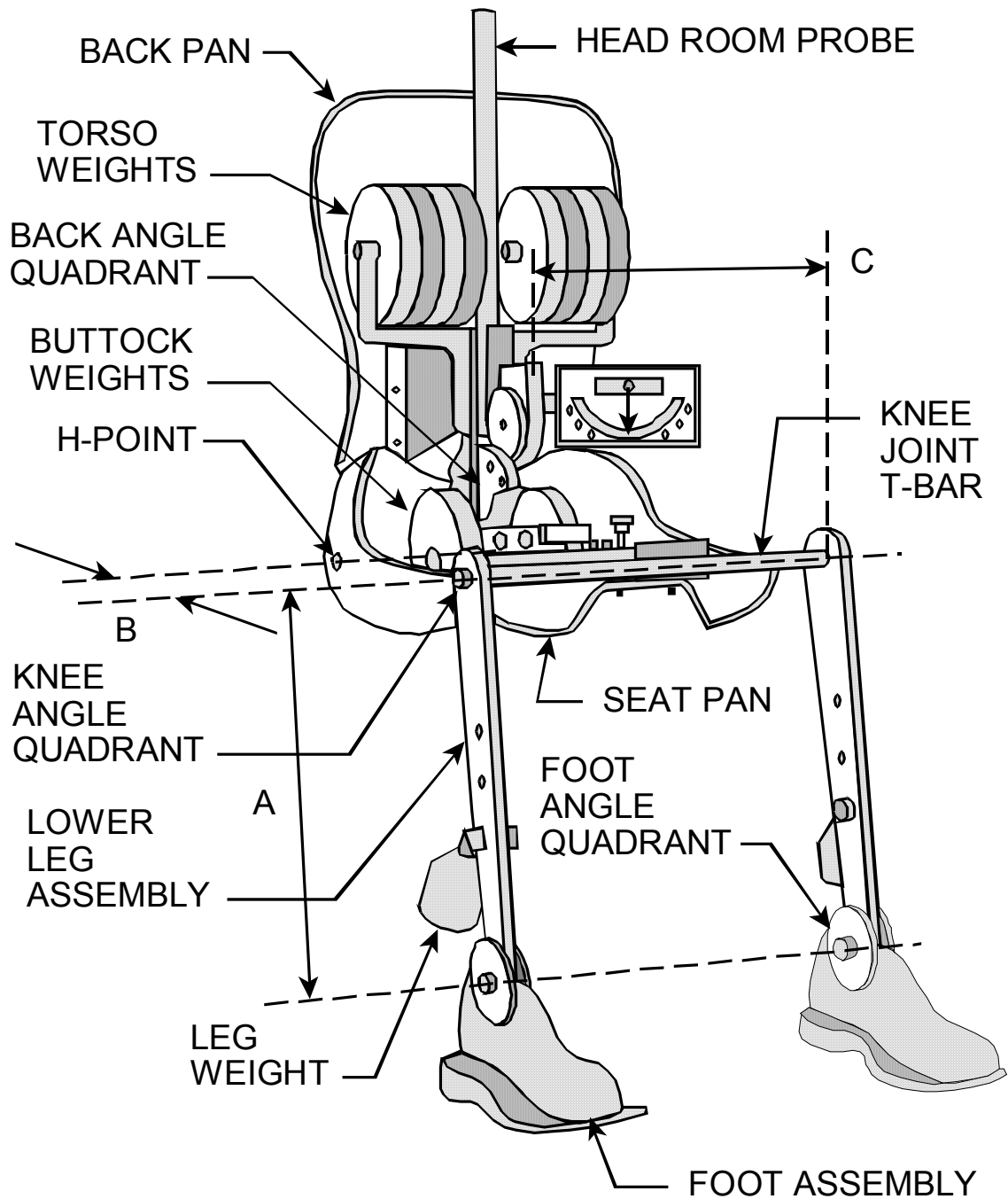


FIGURE 2

APPENDIX B...Continued

If the seat pan is not level at the completion of this step, apply a sufficient lateral load to the top of the seatback pan to level the H-point machine seat pan on the seat.

4.3.13 Holding the T-bar to prevent the H-point machine from sliding forward on the seat cushion, proceed as follows:

- a. Return the back pan to the seatback.
- b. Apply a rearward force perpendicular to the back angle bar just above the torso weights using either one of the following methods:
 1. Sufficient force to increase the hip angle by 3 degrees, or
 2. Increasing the hip angle up to 3 degrees by increasing the applied force up to a maximum of 66 N (15 lb).

Alternately apply and release this force until the hip angle readout indicates that the back pan has reached a stable position after the applied force has been released, that is, repeated identical hip angle readouts. Care shall be exercised to minimize exterior downward or side forces applied to the H-point machine. If an H-point machine level adjustment is necessary, rotate the back pan forward, relevel, and repeat the H-point machine back rocking.

4.3.14 If a rerun of the H-point machine installation is desired, the seat assembly should remain unloaded for a minimum period of 1/2 hour prior to the rerun. The loaded H-point machine should not be left on the assembly longer than the time required to perform the test.

5. SECOND SEAT INSTALLATION PROCEDURE FOR SHORT-COUPLED VEHICLES

If the H-point couple distance is such that the H-point machine with 95th percentile leg will not fit into the second seat with the front seat in the rearmost normal driving and riding position (that is, the leg interferes with the front seatback), install the machine in the second seat in accordance with either of the methods (A or B) shown in Appendix A.

6. H-POINT MACHINE SECOND SEAT INSTALLATION FOR LONG-COUPLED VEHICLES

In large vehicles where the ankle or foot does not normally touch the nearest interference with the front seat, the sole of the H-point machine's foot is placed on the foot support and the heel is located as indicated on the seating arrangement drawing. All angles are measured with the H-point machine in this position. If foot support does not exist, extend the H-point machine legs to the full limit of the seat deflection with both feet flat on the floor.

APPENDIX B....Continued

The foot angle should not exceed 130 degrees.

7. H-POINT MACHINE AND TEMPLATE FABRICATION

Fabrication of the H-point machine and the H-point template must conform to design as specified in the Society of Automotive Engineers Standard SAE J826 specifications.

- 7.1 Each H-point machine must have a permanently attached identification plate showing the following information:

**Three-Dimension H-Point Machine
No.**

**This measuring device is constructed in full accordance with the
Society of Automotive Engineers Standard SAE J826 specifications.**

- 7.2 Three H-point template leg segments are available duplicating 10th, 50th, and 95th percentile leg lengths of the H-point machine.

APPENDIX B...Continued

SAE J826 - APPENDIX A
SECOND SEAT INSTALLATION PROCEDURE FOR SHORT-
COUPLED VEHICLES

A.1 Either Method A or B may be used to install the H-point machine in the second seat of short-coupled vehicles. These procedures are both currently in use, and while they will not necessarily produce the same seating dimensions, there is no strong technical basis that exists thus far to favor one method over the other.

A.1.1 METHOD A

- a. Follow the installation procedure through 4.3.5.
- b. Detach one of the lower leg-foot assemblies of the H-point machine and place it on the second seat floor covering in as close to an expected second seat passenger foot position as possible.
- c. Slide the lower leg and foot forward on the floor until it is obstructed by the front seat cushion structure and mark a lateral line at the rear of the heel point. Move the front seat forward out of the way.
- d. Resume the general installation procedures except when positioning the feet on the floor in 4.3.7.3. The shoe should be located with the rearmost point on the heel at the lateral line drawn on the floor in the above Section 3.
- e. Determine L48, minimum knee clearance, as the distance from the knee joint less 51 mm (2 inches) to the back of the front seat in its rearmost position. In most cases, it is necessary to determine this graphically.
- f. Determine L51, minimum effective leg room, by measuring the diagonal distance from the ankle pivot center to the H-point plus a constant of 254 mm (10 inches).
- g. Other second seat compartment dimensions are recorded directly with the H-point machine as positioned in A.1.1 "a" through "d", except that L50, SRP couple distance, is determined using the front seat in its normal driving and riding position.

A.1.2 METHOD B

- a. Follow the general installation procedure through 4.3.5.
- b. Move the front seat forward as indicated on the seating arrangement drawing; or the amount required to clear the foot and leg assembly.

APPENDIX B...Continued

- c. Tilt the front seatback forward out of the way to facilitate H-point machine installation and loading.
- d. Resume the general installation procedure except when rocking the H-point machine as outlined in 4.3.12.
- e. Restrict the rearward movement of the feet during the rocking motion to prevent jackknifing of the legs which causes forward movement of the seat pan on the seat cushion.
- f. Upon completion of the rocking motion and repositioning the H-point machine's feet under the seat, move the front seat back to its normal riding position. Check for front seatback to H-point machine's knee and/or leg clearance. If an interference does exist, move the front seat forward as much as may be necessary (one seat adjuster position at a time) repositioning the feet under the front seat cushion frame.
- g. Resume the general installation procedure, 4.3.13.
- h. Determine L48, minimum knee clearance, as the distance from the knee joint less 51 mm (2 inches) and less the longitudinal movement of the front seat at a tangent to the top of the rear cushion.
- i. Determine L51, minimum effective leg room, by measuring the diagonal distance from the ankle point center to the H-point plus a constant of 254 mm (10 inches) less the longitudinal movement of the front seat at a height tangent to the top of the rear seat cushion.
- j. Other rear compartment dimensions are recorded directly with the H-point machine positioned as outlined in steps A.1.2 "a" through "g" except that the L50 dimension, H-point couple distance, is determined using the rearmost normal driving and riding front seat position. Comfort angles are not adjusted.

APPENDIX C
MOTOR VEHICLE SEAT BELT ANCHORAGES — DESIGN RECOMMENDATIONS
SAE J383 APR86
SAE Recommended Practice

1. SCOPE

This SAE Recommended Practice specifies design recommendations for location of seat belt assembly anchorages. It applies to seat belt anchorages attached to vehicle structure or installed to seat assemblies in the vehicle (this SAE Recommended Practice supersedes the Design Section of SAE J787b). Test Procedures and Performance Requirements are specified in SAE J384, Motor Vehicle Seat Belt Anchorages — Test Procedure, and SAE J385, Motor Vehicle Seat Belt Anchorages — Performance Requirements, respectively.

2. DEFINITIONS

2.1 ANCHORAGE

The final point of attachment for transferring seat belt assembly loads to the vehicle structure.

2.2 SEATING REFERENCE POINT (SRP)

The Design H-Point with the seat in the rearmost, lowest normal design position. (The "Design H-Point" has coordinates relative to the design vehicle structure. It is located at the H-Point of the two-dimensional drafting template placed in any designated seating position (DSP).)

2.3 SHOULDER REFERENCE POINT (SRP)

A point 22.16 inches (563 mm) above the "H" Point along the torso centerline of the two-dimensional drafting template described in SAE J826. This dimension added to the dimension of 3.84 inches (97.5 mm) from the "H" Point to the buttocks fleshline and an angular relationship of 90 degrees between the torso and thigh segment of the two-dimensional drafting template has been indicated to represent 99 percent of the male driver population.

2.4 ATTACHMENT HARDWARE

Any or all hardware designed for securing a seat belt assembly to the anchorage(s) in a motor vehicle.

2.5 SEAT BELT ASSEMBLY

Any strap, webbing, or similar device designed to secure a person in a motor vehicle with the intention of minimizing the risk of bodily harm in an accident,

APPENDIX C....Continued

including all buckles, adjusting mechanism, fasteners, and related hardware. This SAE Recommended Practice covers anchorages for the following types of assemblies:

- Type 1 — Pelvic restrain belt (lap belt).
- Type 2 — Combination of pelvic (lap) and upper torso (shoulder) restraints belts.
- Type 2a — Upper torso (shoulder) restraint for use only in conjunction with a pelvic restraint (lap) belt as a Type 2 seat belt assembly.

2.6 BELT CONTACT POINT

The point where the seat belt webbing's longitudinal centerline would make contact with the load bearing member of the seat structure, body structure, retractor hardware (or webbing wound on the spool of a retractor), or attachment hardware such as a swivel plate which may be bolted to the seat belt anchorage. The components on which belt contact point is located must be capable of sustaining a load that might be imposed by the webbing of a seat belt assembly.

2.7 BELT ANGLE REFERENCE POINT

The point 2.50 inches (63.5 mm) forward of and 0.375 inches (9.5 mm) above the seating reference point (SRP).

3. GENERAL

3.1 INSTALLATION AND REPLACEMENT

Anchorage shall permit seat belt assemblies to be readily installed or replaced, and shall comply with the strength requirements of SAE J385.

3.2 COMMON ANCHORAGE(S)

A common anchorage point may be used for more than one belt end, provided it meets the pertinent requirements of paragraph 4.4 and SAE J385. The location of the lower anchorage(s) of the upper torso restraint may be common with the pelvic restraint anchorage(s).

4. LOCATION OF PELVIC RESTRAINT ANCHORAGES

4.1 PELVIC RESTRAINT ANGLE GUIDELINES

Many factors affect the preferred more vertical pelvic restraint belt angle which is basically intended to prevent the lap belt from sliding over the iliac crest during the forward and downward movement of the restrained individual.

APPENDIX C....Continued

Ideally, component tests, sled tests or vehicle crash tests should be run, utilizing a test device containing a humanlike illium with appropriate "soft tissue" damping in relation to the spine and femur along with humanlike abdominal contents, to determine the preferred pelvic restraint belt angle which is influenced by any or all of the following factors:

- (a) Seat cushion compression and/or seat deflection
- (b) Seat cushion angle and seat back angle
- (c) Proximity of "hard" vehicle structures in front of the restrained occupant
- (d) Initial length and elongation characteristics of belt webbing
- (e) Type of restraint system
- (f) Presence or absence of upper torso restraint belt
- (g) Placement of upper torso restraint anchorage
- (h) Stiffness of components or structures on which are found the belt contact points

In the absence of component tests, sled tests or vehicle crash tests, a more vertical pelvic restraint belt angle is preferred and should be selected within the range of 20 to 75 degrees from the horizontal.

4.2 ANCHORAGES ON VEHICLE STRUCTURE FOR PELVIC RESTRAINT BELTS

4.2.1 MOVABLE SEATS

The location of anchorages for occupants of seats which are adjustable or movable in the fore and aft direction and in which the belt passes outside of the seat or through the seat cushions shall be as follows:

A line from the belt contact point to the belt angle reference point 2.50 inches (63.5 mm) forward of and 0.375 inches (9.5 mm) above the seating reference point (SRP) will form an angle as determined from the guidelines in paragraph 4.1 and as shown in Figure 1.

4.2.2 FIXED SEATS

The location of anchorages for occupants of fixed seats in which the belt passes outside the seat or through the seat springs shall be as follows:

APPENDIX C...Continued

A line from the belt contact point to the seating reference point (SRP) will form an angle as determined from the guidelines in paragraph 4.1 and as shown in Figure 2.

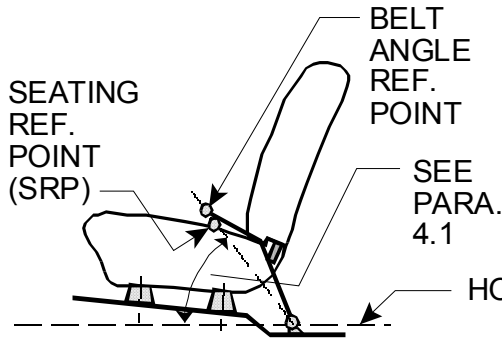


FIG. 1 - BELT OUTSIDE SEAT OR THROUGH SEAT SPRINGS SEAT CROSS BAR

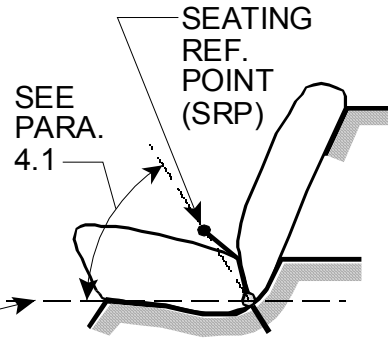


FIG. 2 - REAR SEAT BELT INSTALLATION

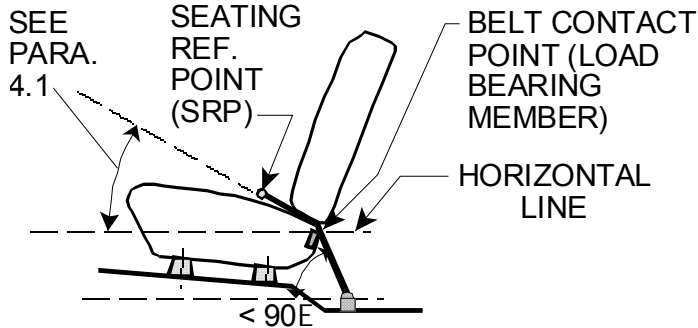


FIG. 3 - BELT OVER SEAT CROSS BAR

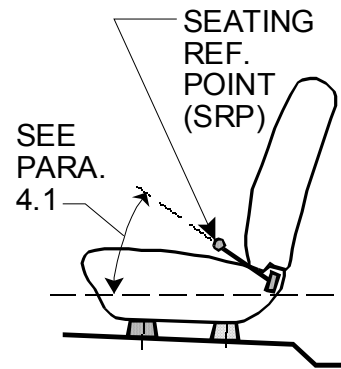


FIG. 4 - BELT ATTACHED TO SEAT FRAME

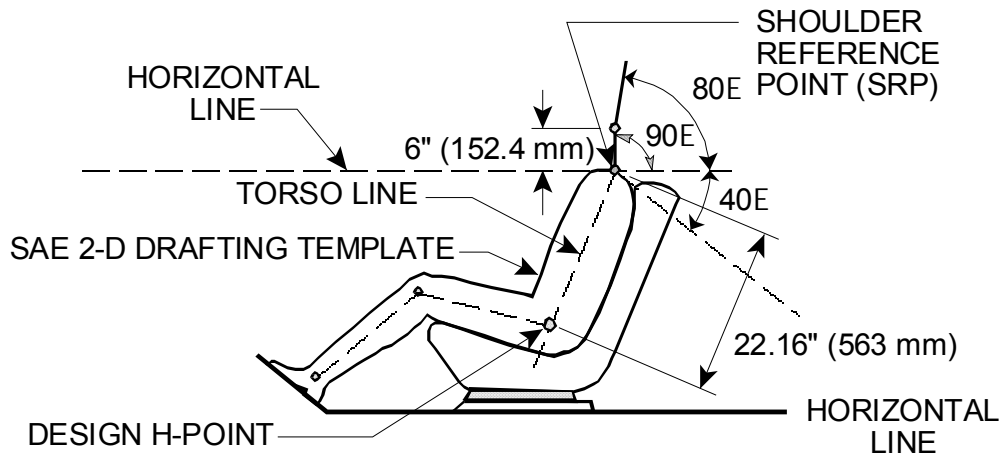


FIG. 5 - UPPER TORSO RESTRAINT

APPENDIX C....Continued

4.2.3 SEAT BELT ROUTING TO ANCHORAGE

In the side view where a direct belt routing is interrupted by intervening load bearing member (refer to Belt Contact Point definition in paragraph 2.6) the anchorage shall not be located forward of the rearmost point at which the webbing passes over that intervening member. Movable seats should be measured in the rearmost normal position. See Figure 3.

4.3 ANCHORAGES ON SEAT STRUCTURE FOR PELVIC RESTRAINT BELTS

The location of anchorages for occupants of seats in which the belts are anchored to seat structure shall be as follows:

A line from the belt contact point to the seating reference point (SRP) will form an angle as determined from the guidelines in paragraph 4.1 and as shown in Figure 4.

4.4 LATERAL LOCATION FOR ALL PELVIC RESTRAINT BELTS

Anchorage for any individual pelvic restraint belt assembly shall be located at least 6.5 inches (165.1 mm) apart and preferably shall be placed equidistant from the longitudinal centerline of the designated seating position (DSP) unless intervening load bearing members provide the spacing desired.

5. LOCATION OF UPPER TORSO RESTRAINT ANCHORAGES

5.1 SIDE VIEW LOCATION

With the seat in its full rearward and downward position and the seatback in its most upright design position, the upper anchorage(s) shall be longitudinally in line with, or rearward of, a line extending 6 inches (152.4 mm) vertically above the shoulder reference point (SRP) and then extending rearward at an angle of 80 degrees above the horizontal (see Figure 5). If there is a downward angle of the belt, passing from the shoulder reference point (SRP) to an anchorage or over suitable structure to an anchorage, this anchorage shall be (on or) above a line extending rearward and 40 degrees below the horizontal.

5.2 FRONT VIEW LOCATION

The upper torso restraint anchorage shall be positioned to minimize contact of the seat belt assembly with the neck and avoid it sliding off the shoulder of the occupant in a reasonably erect position.

APPENDIX C....Continued**6. CORROSION PROTECTION**

Design consideration shall be given to providing protection from corrosion for the seat belt anchorage(s) and the adjacent body structure. Special consideration shall be given to that portion or portions of the structure which must sustain the anchorage test loads. The degree or type of protection required will be determined by the location of the anchorage(s) in the vehicle structure, the amount of exposure to corrosive elements, the configuration of the structure (if configuration may tend to induce corrosion). and the thickness of the supportive structure.