

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J287

REAF.
JUN88

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Submitted for recognition as an American National Standard

(R) DRIVER HAND CONTROL REACH

Foreword—This document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. **Scope**—This recommended practice describes boundaries of hand control locations that can be reached by desired proportions of different driver populations in passenger cars, multi-purpose passenger vehicles, and light and medium trucks. This practice is not applicable to heavy trucks.

1.1 **Introduction**—The description of driver hand control reach envelopes was developed using data acquired from test subjects performing reach tasks in test fixtures simulating a range of actual vehicle configurations (Reference 1 and 2¹). The test subjects included equal numbers of men and women selected to represent the (United States) driving population on the basis of stature and age, and were tested both with and without upper torso three-point restrain (a diagonal non-extending shoulder strap attached separately to the lap belt, that is, not a continuous loop). The envelopes constructed using the non-extending shoulder and lap belt are meant to define a restrained reach and the envelopes constructed using the lap belt only will describe an unrestrained upper torso hand reach. The hand reach envelopes are three-dimensional surfaces described in table form and can be referenced to a particular vehicle seating configuration according to procedures described in Sections 5 and 6. Only the 95% boundaries are presented in the tables.

2. References

2.1 **Applicable Publications**—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

1. SAE J182a—Motor Vehicle Fiducial Marks
2. SAE J826 MAY87—Devices for Use in Defining and Measuring Vehicle Seating Accommodation
3. SAE J1100 JUN84—Motor Vehicle Dimensions
4. D. Hammond and R. Roe, "SAE Controls Reach Study." Paper 720199 presented at SAE Automotive Engineering Congress and Exposition, Detroit, January 1972.
5. D. Hammond, D. Maurer, and L. Razgunas, "Controls Reach—The Hand Reach of Drivers." Paper 750357 presented at SAE Automotive Congress and Exposition, Detroit, February 1975.
6. R. W. Roe, "Reach to Other Types of Controls." Minutes of meeting of Design Devices Subcommittee, SAE Human Factors Engineering Committee, April 18, 1972.

1. See References Section under Applicable Publications for References.

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2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1052 MAY87—Motor Vehicle Driver and Passenger Head Position

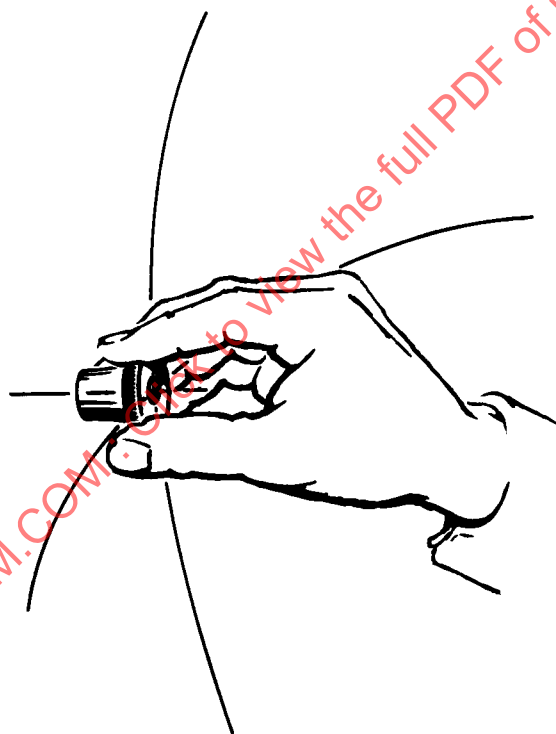
SAE J1516 M AR90—Accommodation Tool Reference Point

SAE J941 JUN92—Motor Vehicle Drivers' Eye Locations

3. Definitions

3.1 Driver Hand Reach Capability—The maximum reach capability of drivers in a simulated driving situation with the non-reaching hand on the steering wheel and the right foot on the accelerator pedal.

3.2 Basic Reach Task—The hand reach to a forward mounted control with the control held in a three-finger grasp. See Figure 1.



This diagram represents a three-finger grasping reach to a 25 mm (1.0 in.) diameter control knob. All measurements for the hand-reach envelope are referenced to the centre of the control knob face.

FIGURE 1—

3.3 Hand Reach Envelopes—Geometric description of the hand reach capability for a specified proportion of a driver population and type of torso restraint system. The contour of the hand reach envelope refers to the geometric center of the control knob face. If the control knob face is at, or rearward of, the contour, it is estimated that at least the specified proportion of the indicated driver population can reach and operate the control. (See Reference¹.)

- 3.4 Hand Reach Reference Plane (HR Plane)**—A vertical reference plane extending laterally across the vehicle used to properly position the hand reach envelopes with respect to the geometry of the vehicle seating configuration. The horizontal location of the HR plane rearward of the Accelerator Heel Point is determined by application of the General Package Factor (G) as shown below:

$$HR = 786 - (99) G, \text{ mm} \quad (\text{Eq. 1})$$

- 3.5 Interior Dimensions**—All interior dimensions referred to in this recommended practice, except where noted, are defined in SAE J1100a—Motor Vehicle Dimensions. All dimensions are defined normal to the three-dimensional reference system of the vehicle loaded to design load weight and oriented to a ground reference plane using fiducial marks as described in SAE J182a—Motor Vehicle Fiducial Marks.

The characteristics of seat geometry are described in terms of the two- and three-dimensional H-point devices with 95 percentile leg length adjustments as described in SAE J826—Devices for Use in Defining and Measuring Vehicle Seating Accommodation. The interior dimensions are measured with the front seat in the rearmost normal driving position as specified by the manufacturer. All other adjustable features, such as steering wheel, seat height, or tilt adjustment for the seat back or seat cushion, are also located as specified by the manufacturer, and if not specified will be positioned at a normal driving position.

- 3.5.1 GENERAL PACKAGE FACTOR (G)**—An algebraic equation that expresses and summarizes the geometry of a particular vehicle seating configuration in terms of a single index value. See Figures 2 and 3. The range of package dimensions for which this recommended practice is applicable is shown below:

TABLE 1—

L40	Back angle-front	9.0 deg	33.0 deg
H30	Vertical SgRP to heel pt	130 mm	to 520 mm
L23	Horizontal Hpt travel, SgRP	130 mm	nominal
W9	Steering wheel diameter	330 mm	to 600 mm
H18	Steering wheel angle	10.0 deg	to 70.0 deg
L11	Horizontal steering wheel center	660 mm	to 152 mm
H17	Vertical steering wheel center	530 mm	to 838 mm

- 3.5.2 CENTERLINE OF OCCUPANT (C/LO)**—Centerline of occupant is the “Y” coordinate of the H-point and is represented by the centerplane of the occupant or H-point machine in each designated seating position.
- 3.5.3 ACCELERATOR HEEL POINT (AHP)**—Accelerator heel point is located at the intersection of the two- or three-dimensional device heel point and the depressed floor covering with the shoe on the undepressed accelerator pedal and the foot angle at a minimum of 87 deg. For vehicles with SgRP to heel (H30) greater than 457 mm, the accelerator pedal may be depressed as specified by the manufacturer. If the depressed pedal is used, the foot must be flat on the accelerator pedal.

L40	Back angle-front	9.0 deg	33.0 deg
H30	Vertical SgRP to heel pt	130 mm	to 520 mm
L23	Horizontal Hpt travel, SgRP	130 mm	nominal
W9	Steering wheel diameter	330 mm	to 600 mm
H18	Steering wheel angle	10.0 deg	to 70.0 deg
L11	Horizontal steering wheel center	660 mm	to 152 mm
H17	Vertical steering wheel center	530 mm	to 838 mm

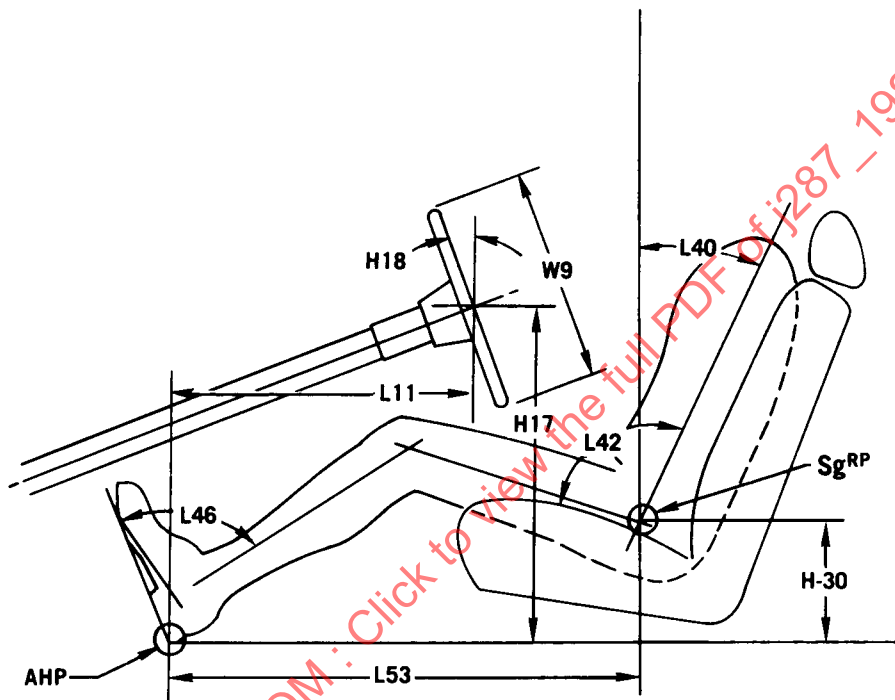


FIGURE 2—

The General Package Factor (G) is a synthesized variable that provides a quantitative index of a vehicle's workspace geometry. The G value for a vehicle can be calculated by substituting the principal package dimensions in millimeters into the equation shown below.

$$G = 0.0018 (H30) - 0.0197 (L40) + 0.0027 (W9) + 0.0106 (H18) \\ - 0.0011 (L11) + 0.0024 (H17) + 0.0027 (L42) - 3.0853$$

FIGURE 3—

4. Field of Application

- 4.1** This practice is primarily directed towards the initial design stages of a new vehicle program, where reference to H-point or Rearmost H-point implies Rearmost Design H-point or Seating Reference Point (SgRP). Its application for checking purposes in actual vehicles and prototype seat models will take into account an allowable tolerance for actual H-point.
- 4.2** The hand reach envelopes are directly applicable to left hand drive motor vehicles designed for seated operators in full width or single width seats having fore and aft seat adjustment approximately horizontal. Application to right hand drive vehicles is assumed to be symmetrically opposite.
- 4.3** The hand reach envelopes are directly applicable for a three-finger grasping reach to a forward mounted control knob of 25 mm diameter maneuvered horizontally in the fore-aft direction. The hand reach envelopes are also applicable to other types of reach to forward controls by using an appropriate adjustment factor that will account for the mode of operation at the control.
- 4.3.1** EXTENDED FINGER OPERATED CONTROL—An adjustment factor of 50 mm is added to the tabled values of the reach envelope in order to describe the center of the finger pad contact surface which will be within the reach of drivers.
- 4.3.2** FULL HAND GRASPED CONTROLS—An adjustment factor of 50 mm is subtracted from the tabled values of the reach envelope in order to describe the center of the face of the control knob which will be within the reach of drivers.

5. Required Characteristics

- 5.1** The ranges of the interior dimensions for which this recommended practice is applicable are described in 3.5.
- 5.2** The envelopes describe the boundaries of control locations that can be reached by at least 95% of certain driver populations that include mixtures of 50/50, 75/25, and 90/10 male to female driver population ratios. The envelopes for each of these categories are described as referenced in a fore and aft direction to specified seating coordinates. The envelopes extend from 400 mm outboard to 600 mm inboard of operator centerline and from -100 mm below H-point to 800 mm above H-point. See Figure 4.

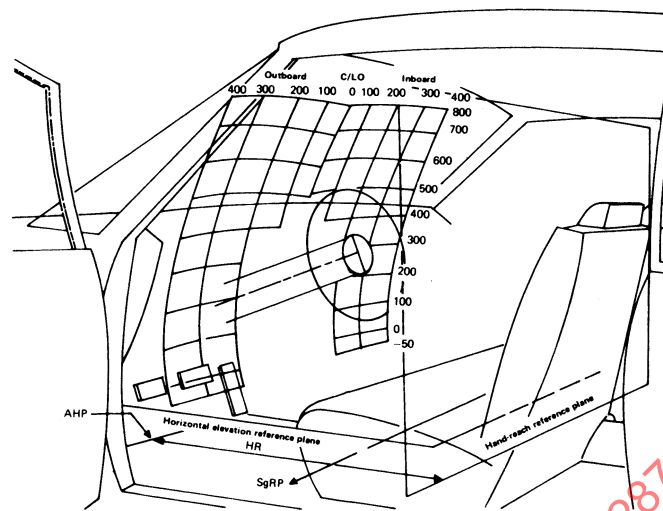


FIGURE 4—

5.3 Hand reach envelopes are provided in the attached tables for seven different seating configurations, three male to female driver population ratios and two types of restraint systems which account for drivers wearing a lap belt only permitting a free upper torso and unrestrained reach; and secondly, both lap and shoulder belt permitting only a restrained reach. The selection of an envelope for a vehicle is based on the calculated value of the General Package Factor (G), identification of the male to female driver population appropriate for the vehicle, and the identification of the appropriate restraint system. The General Package Factor (G) is calculated using the dimensions describing the vehicle seating configuration as shown in Figures 2 and 3.

5.4 The Hand Reach Envelope is located in the vehicle by employing a relationship that utilizes the value of the General Package Factor (G). The horizontal component of the envelopes is measured as a distance forward of a Hand Reach Reference Plane. The fore and aft location of this plane rearward from the Accelerator Heel Point is determined from the value of the General Package Factor (G) as shown in 3.4.

6. Procedure for Using the Hand Reach Envelopes

6.1 The envelopes are located in the vehicle according to a set of orthogonal reference planes: A horizontal elevation reference plane through the H-point of the rearmost normal driving position, the lateral HR plane, and a vertical plane extending along the C/LO. See Figure 4.

6.1.1 Establish a reference origin.

6.1.1.1 Specify the dimensions describing the geometry of the vehicle seating configuration and calculate the value of the General Package Factor (G) as described in Figure 3.

6.1.1.2 Calculate HR from the value of the General Package Factor (G) as shown in 3.4.

6.1.1.2.1 If (HR-L53) is less than zero, then the hand reach reference plane is located longitudinally at a distance (HR) rearward of the Accelerator Heel Point.

6.1.1.2.2 IF (HR-L53) is greater than zero, the hand reach reference plane is located longitudinally at the H-point of the rearmost normal driving position.

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6.1.2 Identify the appropriate hand reach envelope.

6.1.2.1 Referring to the attached tables, identify the hand reach envelope appropriate for the value of the General Package Factor (G) calculated for this vehicle, the specified driver population, and the appropriate type of restraint system.

6.1.2.2 Determine the lateral locations of the controls of interest. These locations will be described as lateral locations from the (C/LO). Determine the height of the control above the horizontal elevation reference plane described in 6.1.

6.1.3 Determine if the control is within reach.¹

HAND REACH-RESTRAINED		VEHICLE RANGE: (G LESS THAN -1.25)						POPULATION MIX: 50/50 MALES-TO-FEMALES											
		(INCH)																	
HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.																			
ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)											
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5		
35.0	12.4	13.8	15.0	15.9	16.5	16.9	17.0	16.9	17.0	17.1	16.9	16.3	15.4	14.8	18.7	11.3			
32.5	14.8	16.1	17.1	17.9	18.4	18.8	19.1	18.7	19.0	19.1	18.8	18.3	17.4	16.3	15.1	13.8			
30.0	16.9	18.1	18.9	19.6	20.0	20.4	20.7	20.3	20.8	20.8	20.5	20.0	19.8	18.3	17.8	15.9			
27.5	18.7	19.7	20.5	21.0	21.4	21.7	21.9	21.7	22.2	22.3	22.0	21.5	20.8	19.9	19.0	17.8	16.4		
25.0	20.1	21.0	21.7	22.2	22.5	22.7	22.7	22.7	23.4	23.5	23.3	22.8	22.1	21.4	20.5	19.4	17.9		
22.5	21.2	22.1	22.7	23.1	23.4	23.4	23.8	23.6	24.3	24.4	24.3	23.9	23.3	22.6	21.7	20.6	19.0		
20.0	22.0	22.8	23.4	23.8	24.0	23.8	23.8	24.1	24.9	25.1	25.0	24.7	24.2	23.6	22.7	21.5	19.9		
17.5	22.6	23.3	23.9	24.3	24.4	23.9	22.9	24.4	25.2	25.5	25.6	25.4	24.9	24.3	23.3	22.1	20.5		
15.0	22.8	23.5	24.1	24.5	24.5	23.8	22.3	24.4	25.2	25.7	25.9	25.8	25.4	24.7	23.7	22.4	20.8		
12.5	22.8	23.4	24.1	24.6	24.4	23.4	21.3	24.2	24.9	25.5	26.0	26.1	25.7	25.0	23.8	22.4	20.8		
10.0	22.4	23.0	23.8	24.3	24.2					25.1	25.8	26.1	25.8	24.9	23.6	22.0	20.5		
7.5	21.9	22.4	23.3	23.9	23.6					24.4	25.4	25.9	25.6	24.7	23.1	21.4	19.9		
5.0	21.0	21.6	22.6	23.3						24.7	25.4	25.3	24.2	22.3	20.4	19.0			
2.5	19.9	20.5	21.6	22.4						23.9	24.8	24.7	23.4	21.3	19.0	17.8			
0.0	18.6	19.2								22.7	23.9	23.8	22.4	19.9	17.4	16.2			
-2.5	17.0	17.6								21.4	22.9	22.8	21.1	18.3	15.4	14.4			

1. The blank areas in the hand reach tables are regions where hand reach was not measured or where design limit values could not be established. The gray areas are regions where the difference between the hand reach model and the observed design limit values exceeded 25 mm. The reach values shown in these areas should be used cautiously.

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TABLE 2

HAND REACH-RESTRAINED

VEHICLE RANGE: (G LESS THAN -1.25)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2_a RESTRAINT.

ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF CL/O (inch)							STATIONS INBOARD OF C L/O (inch)									
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	13.8	15.2	16.4	17.2	17.8	18.1	18.2	18.5	18.7	18.7	18.5	17.9	17.0	15.8	14.5	13.1	
32.5	16.2	17.4	18.4	19.1	19.6	20.0	20.3	20.2	20.6	20.6	20.3	19.8	18.9	17.9	16.7	15.5	
30.0	18.2	19.3	20.2	20.8	21.2	21.5	21.9	21.7	22.2	22.2	21.9	21.4	20.6	19.7	18.7	17.5	
27.5	19.9	20.9	21.7	22.2	22.5	22.8	23.0	22.9	23.5	23.6	23.3	22.8	22.1	21.3	20.4	19.2	17.8
25.0	21.3	22.2	22.9	23.3	23.6	23.7	23.7	23.9	24.6	24.7	24.5	24.0	23.4	22.7	21.8	20.7	19.1
22.5	22.4	23.2	23.8	24.2	24.4	24.4	24.1	24.6	25.4	25.6	25.4	25.0	24.5	23.8	22.9	21.8	20.2
20.0	23.2	23.9	24.5	24.9	25.0	24.7	24.0	25.1	25.8	26.1	26.1	25.8	25.3	24.7	23.8	22.6	21.0
17.5	23.6	24.3	24.9	25.3	25.3	24.8	23.6	25.3	26.0	26.4	26.5	26.4	26.0	25.3	24.3	23.1	21.5
15.0	23.8	24.5	25.1	25.5	25.4	24.6	22.9	25.2	25.9	26.5	26.8	26.7	26.4	25.7	24.6	23.2	21.6
12.5	23.7	24.4	25.1	25.5	25.3	24.1	21.7	24.9	25.5	26.2	26.8	26.9	26.6	25.8	24.6	23.1	21.5
10.0	23.4	24.0	24.8	25.3	25.0					25.7	26.5	26.8	26.6	25.7	24.3	22.6	21.1
7.5	22.7	23.4	24.3	24.8	24.4					24.9	26.0	26.5	26.3	25.3	23.7	21.8	20.4
5.0	21.9	22.5	23.5	24.2							25.3	26.0	25.9	24.7	22.8	20.7	19.4
2.5	20.7	21.4	22.6	23.3							24.3	25.3	25.2	23.8	21.6	19.2	18.0
0.0	19.3	20.1									23.1	24.4	24.3	22.7	20.1	17.5	16.4
-2.5	17.7	18.5									21.6	23.2	23.1	21.3	18.3	15.4	14.4

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TABLE 3

HAND REACH-RESTRAINED

VEHICLE RANGE:(G LESS THAN -1.25)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)		STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)										
		15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	
35.0		14.7	16.1	17.1	18.0	18.5	18.9	19.0	19.4	19.6	19.7	19.4	18.9	18.0	16.8	15.5	14.2		
32.5		17.0	18.2	19.2	19.9	20.3	20.7	21.0	21.1	21.5	21.5	21.2	20.7	19.8	18.8	17.7	16.4		
30.0		19.0	20.1	20.9	21.5	21.9	22.2	22.5	22.5	23.0	23.1	22.8	22.2	21.5	20.6	19.6	18.4		
27.5		20.7	21.7	22.4	22.8	23.2	23.4	23.7	23.7	24.3	24.4	24.1	23.6	22.9	22.1	21.2	20.1	18.6	
25.0		22.0	22.9	23.5	24.0	24.2	24.3	24.4	24.6	25.3	25.4	25.2	24.8	24.2	23.4	22.6	21.4	19.9	
22.5		23.1	23.9	24.5	24.9	25.0	24.9	24.6	25.3	26.0	26.2	26.1	25.7	25.2	24.5	23.6	22.5	20.9	
20.0		23.8	24.6	25.2	25.5	25.6	25.3	24.5	25.7	26.4	26.7	26.7	26.4	26.0	25.3	24.4	23.2	21.6	
17.5		24.3	25.0	25.6	25.9	25.9	25.3	24.0	25.8	26.5	27.0	27.1	27.0	26.6	25.9	24.9	23.6	22.0	
15.0		24.4	25.1	25.8	26.1	26.0	25.0	23.2	25.7	26.4	26.9	27.3	27.3	26.9	26.2	25.1	23.7	22.1	
12.5		24.3	25.0	25.7	26.1	25.8	24.5	22.0	25.3	25.9	26.7	27.2	27.4	27.1	26.3	25.0	23.5	21.9	
10.0		23.9	24.6	25.4	25.8	25.4			26.1	26.9	27.3	27.3	27.0	26.1	24.6	22.9	21.4		
7.5		23.3	24.0	24.9	25.4	24.8			25.2	26.4	26.9	26.7	25.7	24.0	22.1	20.7			
5.0		22.4	23.1	24.1	24.7					25.6	26.4	26.2	25.0	23.0	20.9	19.6			
2.5		21.2	22.0	23.1	23.8					24.5	25.6	25.5	24.0	21.7	19.3	18.2			
0.0		19.8	20.6							23.3	24.6	24.5	22.9	20.2	17.5	16.5			
-2.5		18.2	19.0							21.8	23.4	23.3	21.4	18.3	15.3	14.4			

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TABLE 4

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-1.24 < G < -0.75)$

POPULATION MIX: 50/50 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)		STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)										
		15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	
35.0		12.5	14.0	15.2	16.1	16.7	17.1	17.2	17.2	17.3	17.4	17.2	16.6	15.7	14.5	13.0	11.6		
32.5		15.0	16.3	17.3	18.0	18.6	19.0	19.3	19.0	19.3	19.4	19.1	18.6	17.7	16.6	15.4	14.1		
30.0		17.0	18.2	19.1	19.7	20.2	20.6	20.9	20.6	21.1	21.1	20.8	20.3	19.5	18.6	17.5	16.3		
27.5		18.8	19.8	20.6	21.2	21.5	21.8	22.1	21.9	22.5	22.6	22.3	21.8	21.1	20.3	19.3	18.1	16.7	
25.0		20.2	21.1	21.8	22.3	22.6	22.8	22.9	23.0	23.6	23.8	23.5	23.1	22.4	21.7	20.8	19.7	18.1	
22.5		21.3	22.2	22.8	23.3	23.5	23.5	23.3	23.8	24.5	24.7	24.5	24.1	23.6	22.9	22.0	20.9	19.3	
20.0		22.1	22.9	23.5	23.9	24.1	23.9	23.4	24.3	25.1	25.3	25.3	25.0	24.5	23.8	22.9	21.8	20.2	
17.5		22.6	23.4	24.0	24.4	24.5	24.1	23.1	24.6	25.3	25.7	25.8	25.6	25.2	24.5	23.6	22.3	20.7	
15.0		22.9	23.5	24.2	24.6	24.6	24.0	22.5	24.6	25.3	25.8	26.1	26.1	25.7	25.0	23.9	22.6	21.0	
12.5		22.8	23.4	24.2	24.6	24.6	23.6	21.5	24.3	25.0	25.7	26.1	26.3	26.0	25.2	24.0	22.5	21.0	
10.0		22.5	23.1	23.9	24.4	24.3			25.2	25.9	26.3	26.0	26.0	25.1	23.8	22.1	20.6		
7.5		21.9	22.5	23.4	24.0	23.8			24.5	25.5	26.0	25.8	24.8	23.2	21.4	20.0			
5.0		21.1	21.6	22.6	23.3					24.9	25.6	25.4	24.3	22.4	20.4	19.0			
2.5		20.0	20.5	21.6	22.5					23.9	24.9	24.8	23.5	21.3	19.1	17.8			
0.0		18.6	19.1							22.8	24.1	24.0	22.5	20.0	17.4	16.3			
-2.5		17.0	17.6							21.4	23.0	22.9	21.2	18.3	15.4	14.4			

SAE J287 Reaffirmed JUN88

TABLE 5

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-1.24 < G < -0.75)$

POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)									
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	14.0	15.5	16.6	17.5	18.0	18.4	18.5	18.7	18.9	19.0	18.7	18.2	17.3	16.1	14.8	13.4	
32.5	16.4	17.7	18.6	19.3	19.9	20.2	20.5	20.5	20.8	20.9	20.6	20.0	19.2	18.2	17.0	15.8	
30.0	18.4	19.5	20.4	21.0	21.4	21.8	22.1	22.0	22.5	22.5	22.2	21.7	20.9	20.0	19.0	17.8	
27.5	20.1	21.1	21.8	22.3	22.7	23.0	23.2	23.2	23.8	23.9	23.6	23.1	22.4	21.6	20.7	19.5	18.1
25.0	21.5	22.4	23.0	23.5	23.8	23.9	24.0	24.2	24.8	25.0	24.8	24.3	23.7	23.0	22.1	21.0	19.4
22.5	22.5	23.3	24.0	24.4	24.6	24.6	24.3	24.9	25.6	25.8	25.7	25.3	24.8	24.1	23.2	22.1	20.5
20.0	23.3	24.0	24.6	25.0	25.1	24.9	24.3	25.3	26.1	26.4	26.3	26.1	25.6	24.9	24.0	22.8	21.2
17.5	23.8	24.5	25.1	25.5	25.5	25.0	23.9	25.5	26.2	26.7	26.8	26.6	26.2	25.5	24.6	23.3	21.7
15.0	23.9	24.6	25.2	25.7	25.6	24.8	23.2	25.4	26.1	26.7	27.0	27.0	26.6	25.9	24.8	23.4	21.9
12.5	23.8	24.5	25.2	25.6	25.5	24.4	22.1	25.0	25.7	26.4	27.0	27.1	26.8	26.0	24.8	23.3	21.7
10.0	23.5	24.1	24.9	25.4	25.1				25.9	26.7	27.1	27.1	26.8	25.9	24.5	22.8	21.3
7.5	22.8	23.5	24.3	24.9	24.6				25.1	26.2	26.8	26.8	26.5	25.5	23.8	22.0	20.5
5.0	21.9	22.6	23.6	24.2						25.4	26.3	26.3	26.1	24.9	22.9	20.8	19.5
2.5	20.8	21.4	22.6	23.4							24.5	25.5	25.4	24.0	21.7	19.4	18.2
0.0	19.4	20.1									23.2	24.6	24.5	22.9	20.2	17.6	16.5
-2.5	17.7	18.5									21.8	23.4	23.4	21.5	18.4	15.5	14.6

SAE J287 Reaffirmed JUN88

TABLE 6

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-1.24 < G < -0.75)$

POPULATION MIX: 90/10 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	14.9	16.3	17.4	18.3	18.8	19.2	19.3	19.6	19.9	19.9	19.7	19.1	18.2	17.1	15.8	14.4	
32.5	17.2	18.5	19.4	20.1	20.6	21.0	21.3	21.3	21.7	21.8	21.5	20.9	20.1	19.1	18.0	16.7	
30.0	19.2	20.3	21.1	21.7	22.1	22.5	22.8	22.8	23.3	23.3	23.0	22.5	21.8	20.9	19.9	18.7	
27.5	20.9	21.8	22.6	23.1	23.4	23.7	23.9	23.9	24.6	24.6	24.4	23.9	23.2	22.4	21.5	20.4	18.9
25.0	22.2	23.1	23.7	24.2	24.4	24.6	24.6	24.9	25.5	25.7	25.5	25.0	24.4	23.7	22.8	21.7	20.2
22.5	23.2	24.0	24.7	25.0	25.2	25.2	24.9	25.5	26.2	26.5	26.3	26.0	25.5	24.8	23.9	22.7	21.2
20.0	24.0	24.7	25.3	25.7	25.8	25.5	24.8	25.9	26.6	27.0	27.0	26.7	26.3	25.6	24.7	23.5	21.9
17.5	24.4	25.1	25.7	26.1	26.1	25.5	24.4	26.0	26.7	27.2	27.4	27.2	26.8	26.1	25.1	23.9	22.3
15.0	24.6	25.2	25.9	26.3	26.1	25.3	23.6	25.9	26.6	27.2	27.5	27.6	27.2	26.5	25.3	23.9	22.4
12.5	24.4	25.1	25.8	26.2	26.0	24.8	22.4	25.5	26.1	26.8	27.4	27.6	27.3	26.5	25.2	23.7	22.2
10.0	24.1	24.7	25.5	26.0	25.6					26.3	27.1	27.5	27.3	26.3	24.9	23.1	21.7
7.5	23.4	24.0	24.9	25.5	25.0				25.4	26.6	27.2	27.0	25.9	24.2	22.3	20.9	
5.0	22.5	23.1	24.2	24.8						25.8	26.6	26.5	25.2	23.2	21.1	19.8	
2.5	21.3	22.0	23.2	23.9							24.7	25.9	25.7	24.3	21.9	19.5	18.4
0.0	19.9	20.6									23.5	24.9	24.8	23.1	20.4	17.7	16.7
-2.5	18.2	19.0									22.0	23.7	23.6	21.7	18.5	15.5	14.7

SAE J287 Reaffirmed JUN88

TABLE 7

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.74 < G < -0.25)$

POPULATION MIX: 50/50 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)										
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	
35.0	12.7	14.2	15.4	16.3	16.9	17.3	17.4	17.5	17.6	17.7	17.5	16.9	16.0	14.8	13.4	12.0		
32.5	15.1	16.4	17.4	18.2	18.8	19.2	19.4	19.3	19.7	19.7	19.4	18.9	18.0	17.0	15.8	14.5		
30.0	17.2	18.3	19.2	19.9	20.4	20.7	21.0	20.9	21.4	21.4	21.1	20.6	19.8	18.9	17.8	16.6		
27.5	18.9	20.0	20.7	21.3	21.7	22.0	22.2	22.2	22.8	22.9	22.6	22.1	21.4	20.6	19.6	18.5	17.0	
25.0	20.3	21.3	22.0	22.5	22.8	23.0	23.0	23.2	23.9	24.0	23.8	23.4	22.7	22.0	21.1	20.0	18.4	
22.5	21.4	22.3	22.9	23.4	23.6	23.6	23.5	24.0	24.7	24.9	24.8	24.4	23.9	23.2	22.3	21.2	19.6	
20.0	22.2	23.0	23.6	24.1	24.2	24.1	23.6	24.5	25.2	25.6	25.5	25.3	24.8	24.1	23.2	22.0	20.4	
17.5	22.7	23.4	24.1	24.5	24.6	24.2	23.3	24.7	25.5	25.9	26.0	25.9	25.5	24.8	23.8	22.6	21.0	
15.0	23.0	23.6	24.3	24.7	24.7					26.0	26.3	26.3	25.9	25.2	24.1	22.8	21.2	
12.5	22.9	23.5	24.2	24.7	24.7					25.8	26.3	26.5	26.2	25.4	24.2	22.7	21.1	
10.0	22.6	23.1	23.9	24.5	24.4					25.3	26.1	26.5	26.2	25.3	23.9	22.2	20.7	
7.5	22.0	22.5	23.4	24.0	23.9					24.6	25.6	26.2	26.0	25.0	23.4	21.5	20.1	
5.0	21.1	21.6	22.6	23.4						25.0	25.8	25.6	24.4	22.5	20.5	19.1		
2.5	20.0	20.5	21.6	22.5						24.0	25.1	25.0	23.6	21.4	19.1	17.9		
0.0	18.6	19.1	20.4	21.4						22.9	24.2	24.1	22.6	20.0	17.4			
-2.5	17.0	17.5	19.0	20.1						21.5	23.1	23.1	21.3	18.3	15.4			

SAE J287 Reaffirmed JUN88

TABLE 8

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.74 < G < -0.25)$

POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)										
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	
35.0	14.3	15.7	16.8	17.7	18.3	18.7	18.8	19.0	19.2	19.3	19.0	18.4	17.6	16.4	15.0	13.7		
32.5	16.6	17.9	18.8	19.6	20.1	20.5	20.7	20.7	21.1	21.2	20.9	20.3	19.5	18.5	17.3	16.1		
30.0	18.6	19.7	20.6	21.2	21.6	22.0	22.3	22.2	22.7	22.8	22.5	22.0	21.2	20.3	19.3	18.1		
27.5	20.2	21.3	22.0	22.5	22.9	23.2	23.4	23.4	24.1	24.2	23.9	23.4	22.7	21.9	21.0	19.8	18.3	
25.0	21.6	22.5	23.2	23.7	23.9	24.1	24.2	24.4	25.1	25.2	25.0	24.6	24.0	23.3	22.4	21.2	19.7	
22.5	22.6	23.5	24.1	24.5	24.7	24.7	24.5	25.1	25.8	26.1	25.9	25.6	25.1	24.4	23.5	22.3	20.7	
20.0	23.4	24.2	24.8	25.2	25.3	25.1	24.5	25.5	26.3	26.6	26.6	26.4	25.9	25.2	24.3	23.1	21.5	
17.5	23.9	24.6	25.2	25.6	25.6	25.2	24.2	25.7	26.4	26.9	27.0	26.9	26.5	25.8	24.8	23.5	21.9	
15.0	24.0	24.7	25.4	25.8	25.7			26.9	27.2	27.3	27.3	26.9	26.2	25.1	23.7	22.1		
12.5	23.9	24.6	25.3	25.7	25.6			26.6	27.2	27.4	27.4	27.1	26.3	25.0	23.5	21.9		
10.0	23.6	24.2	25.0	25.5	25.3			26.0	26.9	27.3	27.3	27.0	26.1	24.6	22.9	21.5		
7.5	22.9	23.5	24.4	25.0	24.7			25.2	26.4	27.0	27.0	26.8	25.7	24.0	22.1	20.7		
5.0	22.0	22.6	23.6	24.3					25.6	26.5	26.3	25.1	23.1	21.0	19.7			
2.5	20.9	21.5	22.6	23.4					24.6	25.7	25.6	24.2	21.9	19.5	18.3			
0.0	19.4	20.1	21.4	22.3					23.4	24.8	24.7	23.1	20.4	17.7				
-2.5	17.8	18.4	19.9	21.0					21.9	23.6	23.6	21.7	18.6	15.6				

SAE J287 Reaffirmed JUN88

TABLE 9

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.74 < G < -0.25)$

POPULATION MIX: 90/10 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION

ABOVE

H PT

(inch)

STATIONS OUTBOARD OF C L/O (inch)

15.0 12.5 10.0 7.5 5.0 2.5 0.0

STATIONS INBOARD OF C L/O (inch)

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0

35.0	15.2	16.6	17.7	18.5	19.1	19.5	19.6
32.5	17.5	18.7	19.7	20.4	20.9	21.2	21.5
30.0	19.4	20.5	21.3	21.9	22.4	22.7	23.0
27.5	21.0	22.0	22.8	23.3	23.6	23.9	24.1
25.0	22.4	23.3	23.9	24.4	24.7	24.8	24.8
22.5	23.4	24.2	24.8	25.2	25.4	25.4	25.2
20.0	24.1	24.9	25.5	25.9	26.0	25.7	25.1
17.5	24.5	25.2	25.9	26.2	26.3	25.8	24.7
15.0	24.7	25.4	26.0	26.4	26.3		
12.5	24.6	25.2	25.9	26.4	26.2		
10.0	24.2	24.8	25.6	26.1	25.8		
7.5	23.5	24.1	25.0	25.6	25.2		
5.0	22.6	23.2	24.2	24.9			
2.5	21.4	22.0	23.2	23.9			
0.0	19.9	20.6	21.9	22.8			
-2.5	18.2	18.9	20.5	21.5			

19.9	20.1	20.2	19.9	19.4	18.5	17.3	16.0	14.7
21.6	22.0	22.0	21.7	21.2	20.4	19.4	18.2	17.0
23.0	23.6	23.6	23.3	22.8	22.0	21.2	20.2	19.0
24.2	24.8	24.9	24.6	24.1	23.5	22.7	21.8	20.6
25.1	25.8	25.9	25.7	25.3	24.7	24.0	23.1	22.0
25.7	26.5	26.7	26.6	26.3	25.7	25.1	24.2	23.0
26.1	26.9	27.2	27.2	27.0	26.5	25.9	24.9	23.7
26.2	26.9	27.4	27.6	27.5	27.1	26.4	25.4	24.1
		27.4	27.8	27.8	27.5	26.7	25.6	24.2
		27.0	27.7	27.9	27.6	26.8	25.5	23.9
		26.5	27.4	27.8	27.5	26.6	25.1	23.3
		25.6	26.8	27.4	27.2	26.1	24.4	22.4
			26.0	26.9	26.7	25.5	23.4	21.2
			25.0	26.1	26.0	24.5	22.1	19.7
			23.7	25.1	25.0	23.3	20.6	17.9
			22.2	23.9	23.8	21.9	18.7	15.7

SAE J287 Reaffirmed JUN88

TABLE 10

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.24 < G < +0.24)$

POPULATION MIX: 50/50 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	12.9	14.4	15.6	16.5	17.1	17.5	17.7	17.7	18.0	18.0	17.8	17.2	16.3	15.1	13.7	12.3	
32.5	15.2	16.6	17.6	18.4	18.9	19.3	19.6	19.6	20.0	20.0	19.7	19.1	18.3	17.3	16.1	14.8	
30.0	17.3	18.5	19.4	20.0	20.5	20.9	21.2	21.1	21.7	21.7	21.4	20.9	20.1	19.2	18.2	17.0	
27.5	19.0	20.1	20.9	21.4	21.8	22.1	22.4	22.4	23.1	23.2	22.9	22.4	21.7	20.9	20.0	18.8	17.3
25.0	20.4	21.4	22.1	22.6	22.9	23.1	23.2	23.4	24.1	24.3	24.1	23.6	23.0	22.3	21.4	20.3	18.7
22.5	21.5	22.4	23.0	23.5	23.7	23.8	23.6	24.2	24.9	25.2	25.1	24.7	24.2	23.5	22.6	21.4	19.5
20.0	22.3	23.1	23.7	24.2	24.3	24.2	23.7	24.7	25.4	25.8	25.8	25.5	25.1	24.4	23.5	22.3	20.7
17.5	22.8	23.5	24.2	24.6	24.7	24.4	23.5	24.9	25.6	26.1	26.2	26.1	25.7	25.0	24.0	22.8	21.2
15.0	23.0	23.7	24.4	24.8	24.9					26.1	26.5	26.5	26.2	25.4	24.3	22.9	21.4
12.5	23.0	23.6	24.3	24.8	24.8					25.9	26.5	26.7	26.4	25.6	24.3	22.8	21.3
10.0	22.7	23.2	24.0	24.6	24.5					25.4	26.2	26.7	26.4	25.5	24.0	22.4	20.9
7.5	22.1	22.6	23.4	24.1	24.0					24.6	25.8	26.4	26.2	25.2	23.5	21.6	20.2
5.0	21.2	21.7	22.7	23.4							25.1	25.9	25.8	24.6	22.6	20.5	19.2
2.5	20.1	20.5	21.6	22.5							24.1	25.2	25.1	23.8	21.5	19.1	17.9
0.0	18.7	19.1	20.4	21.4							23.0	24.3	24.3	22.7	20.1	17.4	
-2.5	17.1	17.5	18.9	20.1							21.6	23.2	23.2	21.4	18.4	15.5	

SAE J287 Reaffirmed JUN88

TABLE 11

HAND REACH-RESTRAINED

VEHICLE RANGE: (-0.24<G<+0.24)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	14.5	15.9	17.1	17.9	18.6	18.9	19.1	19.2	19.5	19.5	19.3	18.7	17.8	16.7	15.3	14.0	
32.5	16.8	18.1	19.0	19.8	20.3	20.7	21.0	21.0	21.4	21.4	21.2	20.6	19.8	18.8	17.6	16.4	
30.0	18.7	19.9	20.7	21.4	21.8	22.2	22.5	22.5	23.0	23.1	22.8	22.2	21.5	20.6	19.6	18.4	
27.5	20.4	21.4	22.2	22.7	23.1	23.4	23.6	23.7	24.3	24.4	24.2	23.7	23.0	22.2	21.3	20.1	18.6
25.0	21.7	22.7	23.4	23.8	24.1	24.3	24.4	24.6	25.3	25.5	25.3	24.9	24.3	23.6	22.7	21.5	20.0
22.5	22.8	23.6	24.3	24.7	24.9	24.9	24.8	25.3	26.0	26.3	26.2	25.9	25.3	24.7	23.8	22.6	21.0
20.0	23.5	24.3	24.9	25.3	25.5	25.3	24.8	25.7	26.5	26.8	26.8	26.6	26.2	25.5	24.6	23.3	21.7
17.5	24.0	24.7	25.3	25.7	25.8	25.4	24.4	25.9	26.6	27.1	27.3	27.2	26.8	26.1	25.1	23.8	22.2
15.0	24.2	24.8	25.5	25.9	25.9					27.0	27.4	27.5	27.2	26.4	25.3	23.9	22.3
12.5	24.1	24.7	25.4	25.9	25.8					26.7	27.4	27.6	27.3	26.5	25.2	23.6	22.1
10.0	23.7	24.3	25.0	25.6	25.4					26.2	27.1	27.5	27.3	26.3	24.8	23.1	21.6
7.5	23.0	23.6	24.5	25.1	24.9					25.3	26.5	27.2	27.0	25.9	24.2	22.3	20.9
5.0	22.1	22.7	23.7	24.4							25.8	26.7	26.5	25.3	23.2	21.1	19.8
2.5	20.9	21.5	22.6	23.5							24.8	25.9	25.8	24.4	22.0	19.6	18.5
0.0	19.5	20.0	21.4	22.3							23.6	25.0	24.9	23.2	20.5	17.8	
-2.5	17.8	18.4	19.9	21.0							22.1	23.8	23.8	21.9	18.7	15.8	

SAE J287 Reaffirmed JUN88

TABLE 12

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.24 < G < +0.24)$

POPULATION MIX: 90/10 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION

ABOVE

H PT

(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	15.4	16.8	18.0	18.8	19.4	19.8	19.9	20.1	20.4	20.4	20.2	19.6	18.7	17.6	16.3	14.9	
32.5	17.7	18.9	19.9	20.6	21.1	21.5	21.8	21.8	22.3	22.3	22.0	21.4	20.6	19.7	18.5	17.3	
30.0	19.6	20.7	21.6	22.2	22.6	23.0	23.3	23.3	23.8	23.9	23.6	23.0	22.3	21.5	20.5	19.3	
27.5	21.2	22.2	23.0	23.5	23.9	24.1	24.4	24.4	25.1	25.2	24.9	24.4	23.8	23.0	22.1	20.9	19.4
25.0	22.5	23.4	24.1	24.6	24.9	25.0	25.1	25.3	26.0	26.2	26.0	25.6	25.0	24.3	23.4	22.3	20.7
22.5	23.5	24.4	25.0	25.4	25.6	25.6	25.4	26.0	26.7	27.0	26.9	26.5	26.0	25.4	24.5	23.3	21.7
20.0	24.2	25.0	25.6	26.0	26.2	26.0	25.4	26.3	27.1	27.4	27.5	27.3	26.8	26.1	25.2	24.0	22.4
17.5	24.7	25.4	26.0	26.4	26.4	26.0	25.0	26.4	27.2	27.6	27.9	27.4	27.4	26.7	25.7	24.3	22.8
15.0	24.8	25.5	26.1	26.6	26.5					27.6	28.0	28.1	27.8	27.0	25.8	24.4	22.8
12.5	24.7	25.3	26.0	26.5	26.4					27.2	27.9	28.2	27.9	27.0	25.7	24.1	22.6
10.0	24.3	24.9	25.7	26.2	26.0					26.6	27.6	28.0	27.8	26.8	25.3	23.5	22.1
7.5	23.6	24.2	25.1	25.7	25.4					25.8	27.0	27.7	27.5	26.4	24.6	22.6	21.3
5.0	22.6	23.2	24.3	25.0							26.2	27.1	27.0	25.7	23.6	21.4	20.2
2.5	21.4	22.0	23.2	24.0							25.2	26.3	26.2	24.4	22.3	19.9	18.8
0.0	20.0	20.6	21.9	22.9							23.9	25.4	25.3	23.6	20.8	18.1	
-2.5	18.2	18.9	20.4	21.5							22.4	24.2	24.1	22.1	19.0	15.9	

SAE J287 Reaffirmed JUN88

TABLE 13

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.25 < G < +0.74)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)									
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
<u>35.0</u>	13.1	14.5	15.7	16.7	17.3	17.7	17.9	18.0	18.3	18.3	18.1	17.5	16.6	15.4	14.0	12.6	
<u>32.5</u>	15.4	16.7	17.8	18.6	19.1	19.5	19.8	19.8	20.3	20.3	20.0	19.5	18.6	17.6	16.4	15.2	
<u>30.0</u>	17.4	18.6	19.5	20.2	20.7	21.0	21.3	21.4	22.0	22.0	21.7	21.2	20.4	19.6	18.5	17.3	
<u>27.5</u>	19.1	20.2	21.0	21.6	22.0	22.3	22.5	22.7	23.3	23.4	23.2	22.7	22.0	21.2	20.3	19.1	17.6
<u>25.0</u>	20.5	21.5	22.2	22.7	23.0	23.2	23.3	23.7	24.4	24.6	24.4	23.9	23.4	22.6	21.7	20.6	19.0
<u>22.5</u>	21.6	22.5	23.1	23.6	23.9	23.9	23.8	24.4	25.1	25.4	25.3	25.0	24.5	23.8	22.9	21.7	20.1
<u>20.0</u>	22.4	23.2	23.8	24.3	24.5	24.4	23.9	24.8	25.6	26.0	26.0	25.8	25.3	24.7	23.7	22.5	20.9
<u>17.5</u>	22.9	23.6	24.3	24.7	24.8	24.5	23.7	25.0	25.8	26.2	26.5	26.4	26.0	25.3	24.3	23.0	21.4
<u>15.0</u>	23.1	23.8	24.4	24.9	25.0					26.3	26.7	26.8	26.4	25.7	24.5	23.1	21.5
<u>12.5</u>	23.1	23.7	24.4	24.9	24.9					26.0	26.7	26.9	26.6	25.8	24.5	22.9	21.4
<u>10.0</u>	22.7	23.3	24.0	24.6	24.6					25.5	26.4	26.8	26.6	25.7	24.2	22.5	21.0
<u>7.5</u>	22.1	22.6	23.5	24.2	24.1					24.7	25.9	26.6	26.4	25.3	23.6	21.7	20.3
<u>5.0</u>	21.3	21.7	22.7	23.5							25.2	26.1	26.0	24.7	22.7	20.6	19.3
<u>2.5</u>	20.1	20.5	21.6	22.6							24.2	25.4	25.3	23.9	21.5	19.2	18.0
<u>0.0</u>	18.7	19.1	20.4	21.4							23.0	24.5	24.4	22.8	20.1	17.5	
<u>-2.5</u>	17.1	17.5	18.9	20.1							21.6	23.4	23.4	21.5	18.4	15.5	

SAE J287 Reaffirmed JUN88

TABLE 14

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.25 < G < +0.74)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	14.7	16.1	17.3	18.2	18.8	19.2	19.3	19.5	19.8	19.8	19.6	19.0	18.1	16.9	15.6	14.3	
32.5	17.0	18.3	19.3	20.0	20.5	20.9	21.2	21.2	21.7	21.7	21.4	20.9	20.1	19.1	17.9	16.7	
30.0	18.9	20.1	20.9	21.6	22.0	22.4	22.7	22.7	23.3	23.4	23.1	22.5	21.8	20.9	19.9	18.7	
27.5	20.5	21.6	22.4	22.9	23.3	23.6	23.8	23.9	24.6	24.7	24.4	23.9	23.3	22.5	21.6	20.4	18.9
25.0	21.9	22.8	23.5	24.0	24.3	24.5	24.6	24.8	25.6	25.8	25.6	25.2	24.6	23.9	23.0	21.8	20.2
22.5	22.9	23.8	24.4	24.8	25.1	25.1	25.0	25.5	26.3	26.5	26.5	26.1	25.6	24.9	24.1	22.9	21.3
20.0	23.6	24.4	25.0	25.5	25.6	25.5	25.0	25.9	26.7	27.0	27.1	26.9	26.5	25.8	24.8	23.6	22.0
17.5	24.1	24.8	25.4	25.9	26.0	25.6	24.7	26.0	26.8	27.3	27.5	27.4	27.1	26.3	25.3	24.0	22.4
15.0	24.3	24.9	25.6	26.0	26.1	25.9			27.2	27.7	27.8	27.4	26.7	25.5	24.1	22.5	
12.5	24.2	24.8	25.5	26.0	25.9			26.9	27.6	27.9	27.6	27.6	26.7	25.4	23.8	22.3	
10.0	23.8	24.3	25.1	25.7	25.6			26.3	27.3	27.8	27.5	27.5	26.6	25.0	23.3	21.8	
7.5	23.1	23.7	24.5	25.2	25.0			25.5	26.7	27.4	27.2	27.2	26.1	24.4	22.4	21.0	
5.0	22.2	22.7	23.7	24.5						26.0	26.9	26.8	25.5	23.4	21.2	20.0	
2.5	21.0	21.5	22.6	23.5						24.9	26.1	26.0	24.6	22.2	19.8	18.6	
0.0	19.5	20.0	21.3	22.4						23.7	25.2	25.1	23.4	20.7	18.0		
-2.5	17.8	18.3	19.8	21.0						22.3	24.0	24.0	22.1	18.9	15.9		

SAE J287 Reaffirmed JUN88

TABLE 15

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.25 < G < +0.74)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0		0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	15.7	17.1	18.2	19.1	19.7	20.1	20.2		20.4	20.7	20.7	20.4	19.8	19.0	17.9	16.6	15.2	
32.5	17.9	19.2	20.1	20.9	21.4	21.8	22.0		22.1	22.5	22.6	22.3	21.7	20.9	19.9	18.8	17.5	
30.0	19.8	20.9	21.8	22.4	22.9	23.2	23.5		23.5	24.1	24.1	23.8	23.3	22.6	21.7	20.7	19.6	
27.5	21.4	22.4	23.2	23.7	24.1	24.4	24.6		24.7	25.3	25.4	25.2	24.7	24.1	23.3	22.4	21.2	19.7
25.0	22.7	23.6	24.3	24.8	25.1	25.2	25.3		25.6	26.3	26.5	26.3	25.9	25.3	24.6	23.7	22.6	21.0
22.5	23.7	24.5	25.2	25.6	25.8	25.8	25.7		26.2	26.9	27.2	27.1	26.8	26.3	25.6	24.7	23.6	22.0
20.0	24.4	25.2	25.8	26.2	26.3	26.2	25.7		26.5	27.3	27.7	27.7	27.6	27.1	26.4	25.5	24.2	22.6
17.5	24.8	25.5	26.1	26.6	26.6	26.3	25.3		26.6	27.4	27.9	28.1	28.1	27.7	27.0	25.9	24.6	23.0
15.0	25.0	25.6	26.3	26.7	26.7				27.8	28.2	28.4	28.4	28.0	27.3	26.1	24.6	23.1	
12.5	24.8	25.4	26.1	26.6	26.5				27.4	28.1	28.4	28.4	28.2	27.3	25.9	24.3	22.8	
10.0	24.4	25.0	25.8	26.3	26.2				26.8	27.8	28.3	28.3	28.1	27.1	25.5	23.7	22.3	
7.5	23.7	24.3	25.2	25.8	25.6				25.9	27.2	27.9	27.9	27.8	26.6	24.8	22.8	21.5	
5.0	22.7	23.3	24.3	25.0						26.4	27.4	27.2	25.9	23.8	21.6	20.4		
2.5	21.5	22.1	23.2	24.1						25.4	26.6	26.5	25.0	22.6	20.1	19.0		
0.0	20.0	20.6	21.9	22.9						24.1	25.6	25.5	23.8	21.0	18.3			
-2.5	18.3	18.8	20.3	21.5						22.6	24.4	24.4	22.4	19.2	16.1			

SAE J287 Reaffirmed JUN88

TABLE 16

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.75 < G < +1.24)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)										
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	
<u>35.0</u>	13.2	14.7	15.9	16.9	17.5	17.9	18.1	18.3	18.6	18.6	18.4	17.8	16.9	15.7	14.4	13.0		
<u>32.5</u>	15.5	16.9	17.9	18.7	19.3	19.7	20.0	20.1	20.6	20.6	20.3	19.8	18.9	18.0	16.8	15.5		
<u>30.0</u>	17.5	18.7	19.7	20.3	20.8	21.2	21.5	21.7	22.2	22.3	22.0	21.5	20.8	19.9	18.9	17.6		
<u>27.5</u>	19.2	20.3	21.1	21.7	22.1	22.4	22.7	22.9	23.6	23.7	23.5	23.0	22.3	21.5	20.6	19.4	17.9	
<u>25.0</u>	20.6	21.6	22.3	22.8	23.2	23.4	23.5	23.9	24.6	24.8	24.6	24.2	23.7	22.9	22.0	20.9	19.3	
<u>22.5</u>	21.7	22.6	23.3	23.7	24.0	24.1	24.0	24.6	25.3	25.6	25.6	25.3	24.8	24.1	23.2	22.0	20.4	
<u>20.0</u>	22.5	23.3	23.9	24.4	24.6	24.5	24.1	25.0	25.8	26.2	26.2	26.1	25.6	24.9	24.0	22.7	21.1	
<u>17.5</u>	23.0	23.7	24.3	24.8	24.9	24.7	23.9	25.2	25.9	26.4	26.7	26.6	26.3	25.5	24.5	23.2	21.6	
<u>15.0</u>	23.2	23.8	24.5	25.0	25.1					26.4	26.9	27.0	26.7	25.9	24.7	23.3	21.7	
<u>12.5</u>	23.1	23.7	24.4	25.0	25.0					26.1	26.8	27.1	26.9	26.0	24.7	23.1	21.6	
<u>10.0</u>	22.8	23.3	24.1	24.7						25.6	26.5	27.0	26.8	25.9	24.3	22.6	21.1	
<u>7.5</u>	22.2	22.7	23.5	24.2						24.7	26.0	26.7	26.6	25.5	23.7	21.7	20.4	
<u>5.0</u>	21.3	21.7	22.7	23.5							25.3	26.2	26.1	24.9	22.8	20.6	19.4	
<u>2.5</u>	20.2	20.6	21.7	22.6							24.3	25.5	25.5	24.0	21.6	19.2	18.1	
<u>0.0</u>	18.8	19.1	20.4	21.5							23.1	24.6	24.6	22.9	20.2	17.5	16.5	
-2.5	17.1	17.4	18.8	20.1							21.7	23.5	23.5	21.6	18.5	15.5	14.6	

SAE J287 Reaffirmed JUN88

TABLE 17

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.75 < G < +1.24)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	14.9	16.4	17.5	18.4	19.1	19.5	19.6	19.7	20.0	20.1	19.8	19.2	18.4	17.2	15.9	14.5	
32.5	17.1	18.4	19.5	20.2	20.8	21.2	21.4	21.5	22.0	22.0	21.7	21.1	20.3	19.4	18.2	17.0	
30.0	19.1	20.2	21.1	21.8	22.2	22.6	22.9	23.0	23.6	23.6	23.3	22.8	22.1	21.2	20.2	19.0	
27.5	20.7	21.7	22.5	23.1	23.5	23.8	24.0	24.2	24.8	25.0	24.7	24.2	23.6	22.8	21.9	20.7	19.2
25.0	22.0	23.0	23.7	24.2	24.5	24.7	24.8	25.1	25.8	26.0	25.8	25.4	24.9	24.2	23.3	22.1	20.5
22.5	23.0	23.9	24.6	25.0	25.3	25.3	25.2	25.7	26.5	26.8	26.7	26.4	25.9	25.2	24.3	23.1	21.5
20.0	23.8	24.5	25.2	25.6	25.8	25.7	25.2	26.1	26.9	27.3	27.3	27.2	26.7	26.0	25.1	23.8	22.2
17.5	24.2	24.9	25.6	26.0	26.1	25.8	24.9	26.2	26.9	27.5	27.7	27.7	27.3	26.6	25.6	24.2	22.6
15.0	24.4	25.0	25.7	26.2	26.2			27.4	27.9	28.0	27.7	27.7	26.9	25.7	24.3	22.7	
12.5	24.3	24.9	25.6	26.1	26.1			27.1	27.8	28.1	27.8	27.8	27.0	25.6	24.0	22.5	
10.0	23.9	24.4	25.2	25.8				26.5	27.5	28.0	27.8	27.8	26.8	25.2	23.4	22.0	
7.5	23.2	23.7	24.6	25.3				25.6	26.9	27.6	27.5	27.5	26.4	24.5	22.6	21.2	
5.0	22.3	22.8	23.7	24.5						26.1	27.1	27.0	25.7	23.6	21.4	20.1	
2.5	21.1	21.5	22.6	23.6						25.1	26.4	26.3	24.8	22.3	19.9	18.8	
0.0	19.6	20.0	21.3	22.4						23.9	25.4	25.3	23.6	20.8	18.1	17.1	
-2.5	17.9	18.3	19.8	21.0						22.4	24.2	24.2	22.3	19.1	16.0	15.2	

SAE J287 Reaffirmed JUN88

TABLE 18

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.75 < G < +1.24)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(inch)

STATIONS OUTBOARD OF C L/O (inch)

STATIONS INBOARD OF C L/O (inch)

	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	15.9	17.4	18.5	19.4	20.0	20.4	20.5	20.6	20.9	21.0	20.7	20.1	19.2	18.1	16.8	15.5	
32.5	18.1	19.4	20.4	21.1	21.7	22.0	22.3	22.3	22.8	22.8	22.5	22.0	21.2	20.2	19.1	17.8	
30.0	20.0	21.1	22.0	22.6	23.1	23.4	23.8	23.7	24.3	24.4	24.1	23.6	22.9	22.0	21.0	19.8	
27.5	21.5	22.6	23.4	23.9	24.3	24.6	24.8	24.9	25.6	25.7	25.5	25.0	24.3	23.6	22.7	21.5	20.0
25.0	22.8	23.8	24.5	25.0	25.3	25.5	25.6	25.8	26.5	26.7	26.6	26.2	25.6	24.9	24.0	22.8	21.2
22.5	23.8	24.7	25.3	25.8	26.0	26.1	25.9	26.4	27.2	27.5	27.4	27.1	26.6	25.9	25.0	23.8	22.2
20.0	24.5	25.3	25.9	26.4	26.5	26.4	25.9	26.8	27.5	27.9	28.0	27.8	27.4	26.7	25.8	24.5	22.9
17.5	24.9	25.7	26.3	26.7	26.8	26.5	25.6	26.8	27.6	28.1	28.4	28.3	28.0	27.2	26.2	24.8	23.2
15.0	25.1	25.7	26.4	26.8	26.9			28.0	28.5	28.6	28.3	27.5	26.3	24.9	23.3		
12.5	24.9	25.5	26.2	26.7	26.7			27.6	28.4	28.7	28.4	27.5	26.2	24.6	23.1		
10.0	24.5	25.1	25.9	26.4				27.0	28.0	28.5	28.3	27.3	25.7	24.0	22.5		
7.5	23.8	24.3	25.2	25.9				26.1	27.4	28.2	28.0	26.9	25.0	23.0	21.7		
5.0	22.8	23.4	24.4	25.1					26.6	27.6	27.5	26.2	24.0	21.8	20.6		
2.5	21.6	22.1	23.2	24.1					25.6	26.8	26.7	25.2	22.8	20.3	19.2		
0.0	20.1	20.6	21.9	22.9					24.3	25.9	25.8	24.1	21.2	18.5	17.5		
-2.5	18.3	18.8	20.3	21.5					22.8	24.7	24.6	22.6	19.4	16.4	15.5		

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TABLE 19

HAND REACH-RESTRAINED

VEHICLE RANGE: (G GREATER THAN 1.25) POPULATION MIX: 50/50 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.																	
ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C/LO (inch)									
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	13.4	14.9	16.1	17.0	17.7	18.1	18.3	18.6	18.9	19.0	18.7	18.1	17.2	16.1	14.7	13.3	
32.5	15.7	17.0	18.1	18.9	19.5	19.9	20.1	20.4	20.9	20.9	20.6	20.1	19.3	18.3	17.1	15.9	
30.0	17.6	18.9	19.8	20.5	21.0	21.4	21.7	21.9	22.5	22.6	22.3	21.8	21.1	20.2	19.2	18.0	
27.5	19.3	20.4	21.3	21.8	22.3	22.6	22.8	23.1	23.9	24.0	23.8	23.3	22.6	21.9	20.9	19.8	18.2
25.0	20.7	21.7	22.4	23.0	23.3	23.5	23.6	24.1	24.9	25.1	24.9	24.5	24.0	23.2	22.4	21.2	19.6
22.5	21.8	22.7	23.4	23.8	24.1	24.2	24.1	24.8	25.5	25.9	25.8	25.5	25.0	24.4	23.4	22.2	20.6
20.0	22.6	23.4	24.0	24.5	24.7	24.6	24.2	25.2	25.9	26.4	26.5	26.3	25.9	25.2	24.2	23.0	21.4
17.5	23.1	23.8	24.4	24.9	25.1	24.8	24.0	25.3	26.0	26.6	26.9	26.9	26.5	25.8	24.7	23.4	21.8
15.0	23.3	23.9	24.6	25.1	25.2					26.5	27.1	27.2	26.9	26.1	24.9	23.4	21.9
12.5	23.2	23.8	24.5	25.0	25.1					26.2	27.0	27.3	27.1	26.2	24.8	23.2	21.7
10.0	22.9	23.4	24.2	24.8						25.6	26.7	27.2	27.0	26.0	24.5	22.7	21.2
7.5	22.3	22.7	23.6	24.3						24.8	26.1	26.9	26.8	25.6	23.8	21.8	20.5
5.0	21.4	21.8	22.7	23.6							25.4	26.4	26.3	25.0	22.9	20.7	19.4
2.5	20.2	20.6	21.7	22.6							24.4	25.7	25.6	24.1	21.7	19.2	18.1
0.0	18.8	19.1	20.4	21.5							23.2	24.8	24.7	23.0	20.2	17.5	16.5
-2.5	17.2	17.4	18.8	20.1							21.8	23.6	23.7	21.7	18.5	15.5	14.7

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TABLE 20

HAND REACH-RESTRAINED

VEHICLE RANGE: (G GREATER THAN 1.25) POPULATION MIX: 75/25 MALES-TO-FEMALES

(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)										
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	
35.0	15.1	16.6	17.8	18.7	19.3	19.7	19.9	20.0	20.3	20.4	20.1	19.5	18.6	17.5	16.2	14.8		
32.5	17.3	18.6	19.7	20.4	21.0	21.4	21.7	21.7	22.2	22.3	22.0	21.4	20.6	19.7	18.5	17.3		
30.0	19.2	20.4	21.3	22.0	22.4	22.8	23.1	23.2	23.8	23.9	23.6	23.1	22.4	21.5	20.5	19.3		
27.5	20.8	21.9	22.7	23.3	23.7	24.0	24.2	24.4	25.1	25.2	25.0	24.5	23.9	23.1	22.2	21.0	19.5	
25.0	22.1	23.1	23.8	24.3	24.7	24.9	25.1	25.3	26.1	26.3	26.1	25.7	25.2	24.5	23.6	22.4	20.8	
22.5	23.1	24.0	24.7	25.2	25.4	25.5	25.4	25.9	26.7	27.0	27.0	26.7	26.2	25.5	24.6	23.4	21.8	
20.0	23.9	24.7	25.3	25.8	26.0	25.9	25.5	26.3	27.1	27.5	27.6	27.4	27.0	26.3	25.4	24.1	22.5	
17.5	24.3	25.0	25.7	26.1	26.3	26.0	25.2	26.4	27.1	27.7	28.0	28.0	27.6	26.9	25.8	24.4	22.9	
15.0	24.5	25.1	25.8	26.3	26.4				27.6	28.1	28.3	28.0	27.2	26.0	24.5	22.9		
12.5	24.4	25.0	25.7	26.2	26.2				27.2	28.0	28.3	28.1	27.2	25.8	24.2	22.7		
10.0	24.0	24.5	25.3	25.9					26.6	27.7	28.2	28.0	27.0	25.4	23.6	22.2		
7.5	23.3	23.8	24.7	25.3					25.7	27.1	27.9	27.7	26.6	24.7	22.7	21.4		
5.0	22.4	22.8	23.8	24.6						26.3	27.3	27.2	25.9	23.7	21.5	20.3		
2.5	21.2	21.5	22.7	23.6						25.3	26.6	26.5	25.0	22.5	20.0	18.9		
0.0	19.7	20.0	21.3	22.4						24.0	25.6	25.6	23.8	21.0	18.2	17.3		
-2.5	17.9	18.3	19.7	21.0						22.6	24.4	24.4	22.5	19.2	16.2	15.4		

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TABLE 21

HAND REACH-RESTRAINED VEHICLE RANGE: (G GREATER THAN 1.25) POPULATION MIX: 90/10 MALES-TO-FEMALES
(INCH)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (inch)	STATIONS OUTBOARD OF C L/O (inch)							STATIONS INBOARD OF C L/O (inch)									
	15.0	12.5	10.0	7.5	5.0	2.5	0.0	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
35.0	16.2	17.6	18.7	19.6	20.3	20.7	20.8	20.8	21.2	21.2	20.9	20.3	19.5	18.4	17.1	15.7	
32.5	18.3	19.6	20.6	21.4	21.9	22.3	22.6	22.5	23.0	23.1	22.8	22.2	21.4	20.5	19.4	18.1	
30.0	20.1	21.3	22.2	22.9	23.3	23.7	24.0	24.0	24.6	24.7	24.4	23.9	23.2	22.3	21.3	20.1	
27.5	21.7	22.8	23.5	24.1	24.5	24.8	25.1	25.1	25.8	26.0	25.7	25.3	24.6	23.9	23.0	21.8	20.2
25.0	23.0	23.9	24.6	25.1	25.5	25.7	25.8	26.0	26.8	27.0	26.8	26.4	25.9	25.2	24.3	23.1	21.5
22.5	23.9	24.8	25.5	25.9	26.2	26.3	26.2	26.6	27.4	27.7	27.7	27.4	26.9	26.2	25.3	24.1	22.5
20.0	24.6	25.4	26.1	26.5	26.7	26.6	26.2	27.0	27.7	28.1	28.3	28.1	27.7	27.0	26.0	24.8	23.1
17.5	25.1	25.8	26.4	26.9	27.0	26.7	25.9	27.0	27.8	28.3	28.6	28.6	28.2	27.5	26.4	25.1	23.5
15.0	25.2	25.9	26.5	27.0	27.1				28.2	28.7	28.9	28.6	27.8	26.6	25.1	23.5	
12.5	25.1	25.6	26.4	26.9	26.9				27.8	28.6	28.9	28.7	27.8	26.4	24.8	23.3	
10.0	24.6	25.2	26.0	26.5					27.2	28.2	28.8	28.6	27.6	26.0	24.2	22.7	
7.5	23.9	24.4	25.3	26.0					26.3	27.7	28.4	28.3	27.1	25.2	23.2	21.9	
5.0	23.0	23.4	24.4	25.2						26.8	27.9	27.7	26.4	24.2	22.0	20.8	
2.5	21.7	22.1	23.3	24.2						25.3	27.1	27.0	25.5	23.0	20.5	19.4	
0.0	20.2	20.6	21.9	22.9						24.5	26.1	26.0	24.3	21.4	18.7	17.7	
-2.5	18.4	18.8	20.2	21.5						23.1	24.9	24.9	22.9	19.6	16.6	15.8	

SAE J287 Reaffirmed JUN88

TABLE 1m

HAND REACH-RESTRAINED

VEHICLE RANGE: (G LESS THAN -1.25)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	387.	438.	456.	470.	490.	497.	502.	493.	501.	504.	495.	483.	468.	426.	377.		
700.	463.	506.	520.	531.	546.	551.	556.	550.	562.	566.	557.	546.	532.	499.	455.		
600.	519.	555.	567.	576.	586.	586.	584.	590.	605.	611.	604.	595.	584.	555.	514.	449.	
500.	556.	586.	598.	606.	609.	603.	589.	614.	630.	638.	637.	631.	622.	595.	553.	486.	
450.	567.	595.	607.	615.	615.	604.	583.	620.	636.	645.	649.	644.	636.	609.	565.	498.	
400.	574.	600.	612.	621.	618.	601.	571.	621.	637.	648.	656.	654.	646.	619.	572.	506.	
350.	576.	601.	614.	623.	616.	594.	555.	619.	633.	646.	660.	660.	654.	625.	574.	511.	
300.	574.	597.	612.	622.	611.			639.	660.	662.	658.	658.	626.	572.	510.		
250.	567.	590.	605.	617.	602.			628.	657.	662.	658.	658.	624.	564.	506.		
200.	557.	578.	596.	608.	590.			613.	649.	658.	656.	656.	618.	551.	498.		
100.	524.	544.	566.	581.						624.	639.	640.	593.	510.	469.		
0.	474.									584.	607.	610.	551.	449.	423.		
-100.	410.									528.	561.	567.	493.	367.	360.		

TABLE 2m

HAND REACH-RESTRAINED

VEHICLE RANGE: (G LESS THAN -1.25)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	422.	470.	488.	501.	520.	526.	532.	530.	539.	542.	532.	520.	505.	466.	419.		
700.	496.	536.	550.	560.	574.	579.	584.	582.	595.	600.	590.	580.	567.	534.	492.		
600.	550.	584.	596.	604.	612.	612.	609.	619.	634.	640.	634.	626.	615.	586.	545.	480.	
500.	584.	614.	625.	633.	634.	625.	610.	638.	654.	663.	664.	654.	649.	622.	580.	513.	
450.	594.	622.	634.	641.	639.	625.	602.	642.	658.	668.	673.	670.	662.	634.	589.	523.	
400.	600.	626.	639.	647.	640.	620.	587.	642.	657.	668.	679.	678.	671.	642.	594.	529.	
350.	601.	627.	640.	648.	637.	611.	568.	637.	651.	664.	681.	682.	677.	646.	594.	531.	
300.	598.	623.	637.	646.	631.			656.	680.	683.	679.	679.	646.	589.	529.		
250.	591.	615.	630.	641.	621.			643.	675.	681.	678.	678.	642.	578.	523.		
200.	579.	603.	620.	632.	607.			625.	666.	675.	673.	673.	633.	563.	513.		
100.	544.	568.	590.	604.						637.	654.	654.	604.	517.	480.		
0.	492.									593.	618.	621.	558.	451.	430.		
-100.	426.									534.	569.	575.	496.	364.	363.		

SAE J287 Reaffirmed JUN88

TABLE 3m

HAND REACH-RESTRAINED

VEHICLE RANGE: (G LESS THAN - 1.25)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(mm)

	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	443.	490.	507.	519.	538.	544.	550.	551.	561.	564.	554.	542.	527.	489.	443.	
700.	516.	555.	568.	578.	591.	596.	600.	601.	615.	619.	610.	600.	587.	555.	513.	
600.	568.	601.	613.	621.	628.	627.	624.	635.	651.	657.	652.	644.	633.	605.	564.	498.
500.	601.	630.	641.	649.	648.	639.	622.	653.	669.	678.	680.	674.	666.	639.	595.	528.
450.	611.	638.	650.	657.	653.	638.	612.	655.	671.	681.	688.	685.	677.	649.	604.	537.
400.	616.	642.	654.	662.	653.	632.	597.	654.	668.	680.	693.	692.	685.	656.	607.	542.
350.	616.	642.	655.	663.	649.	621.	575.	648.	661.	675.	694.	695.	690.	659.	605.	543.
300.	613.	638.	652.	661.	642.					665.	691.	695.	691.	657.	598.	540.
250.	605.	630.	645.	655.	631.					651.	685.	692.	689.	652.	587.	533.
200.	592.	618.	635.	646.	617.					632.	675.	685.	684.	642.	570.	521.
100.	556.	583.	604.	617.							644.	662.	662.	611.	521.	486.
0.	503.										598.	624.	627.	562.	451.	434.
-100.	436.										537.	573.	579.	497.	361.	365.

TABLE 4m

HAND REACH-RESTRAINED

VEHICLE RANGE: (- 1.24 < G < - 0.75)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(mm)

	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	391.	441.	460.	474.	494.	501.	507.	500.	509.	512.	502.	491.	475.	435.	386.	
700.	466.	509.	523.	535.	550.	555.	560.	556.	569.	573.	564.	553.	540.	507.	464.	
600.	521.	558.	570.	579.	589.	590.	589.	595.	611.	617.	611.	602.	591.	562.	521.	456.
500.	558.	589.	600.	609.	613.	606.	594.	618.	635.	643.	644.	638.	629.	602.	559.	492.
450.	569.	597.	609.	618.	619.	608.	588.	624.	640.	649.	654.	650.	643.	615.	571.	504.
400.	576.	602.	615.	623.	621.	605.	577.	625.	640.	651.	661.	660.	653.	625.	577.	512.
350.	578.	602.	616.	625.	620.	598.	560.	622.	636.	649.	665.	665.	660.	630.	579.	516.
300.	576.	599.	613.	624.	615.					641.	665.	668.	663.	631.	575.	515.
250.	569.	591.	607.	618.	606.					630.	661.	667.	664.	629.	567.	510.
200.	559.	580.	597.	610.	594.					614.	653.	662.	660.	622.	553.	502.
100.	525.	545.	566.	582.							627.	643.	644.	596.	511.	471.
0.	476.										586.	611.	614.	554.	449.	425.
-100.	411.										530.	564.	570.	495.	367.	362.

SAE J287 Reaffirmed JUN88

TABLE 5m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-1.24 < G < -0.75)$

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	427.	475.	493.	506.	525.	532.	538.	536.	546.	549.	539.	527.	512.	474.	426.		
700.	500.	541.	555.	565.	579.	584.	589.	588.	602.	606.	597.	587.	574.	542.	499.		
600.	553.	588.	600.	608.	617.	617.	615.	624.	640.	646.	641.	633.	622.	594.	553.	487.	
500.	587.	617.	628.	636.	638.	631.	616.	644.	660.	669.	670.	665.	657.	629.	586.	519.	
450.	597.	625.	637.	645.	643.	631.	608.	647.	663.	673.	680.	676.	669.	641.	596.	529.	
400.	603.	629.	641.	650.	645.	626.	595.	646.	661.	673.	685.	684.	678.	649.	600.	535.	
350.	604.	629.	642.	651.	642.	617.	576.	641.	655.	668.	687.	688.	683.	652.	599.	537.	
300.	601.	625.	639.	649.	636.					659.	685.	689.	685.	652.	593.	535.	
250.	593.	617.	632.	643.	626.					646.	680.	687.	684.	647.	583.	528.	
200.	582.	605.	622.	634.	612.					628.	671.	681.	679.	639.	567.	518.	
100.	546.	569.	591.	606.							641.	659.	660.	609.	521.	484.	
0.	494.										597.	623.	627.	563.	454.	435.	
-100.	427.										538.	574.	580.	500.	367.	368.	

TABLE 6m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-1.24 < G < -0.75)$

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	448.	496.	513.	526.	544.	551.	557.	557.	567.	570.	560.	549.	534.	496.	450.		
700.	520.	560.	573.	583.	597.	602.	606.	608.	621.	626.	617.	607.	594.	562.	520.		
600.	572.	606.	617.	626.	633.	633.	630.	641.	657.	663.	659.	651.	640.	612.	571.	504.	
500.	605.	634.	645.	653.	654.	645.	630.	658.	674.	683.	686.	681.	673.	646.	602.	535.	
450.	614.	642.	653.	661.	658.	644.	620.	661.	676.	687.	694.	692.	684.	656.	610.	544.	
400.	619.	646.	658.	665.	658.	639.	605.	659.	673.	686.	699.	698.	692.	663.	613.	549.	
350.	620.	645.	658.	666.	655.	629.	585.	653.	666.	680.	700.	702.	697.	665.	611.	550.	
300.	616.	641.	655.	664.	648.					670.	697.	702.	698.	664.	604.	546.	
250.	608.	632.	648.	658.	637.					655.	691.	699.	696.	658.	592.	539.	
200.	595.	620.	637.	648.	623.					636.	681.	692.	690.	648.	575.	527.	
100.	558.	584.	605.	619.							650.	668.	669.	616.	526.	492.	
0.	505.										604.	630.	634.	568.	456.	440.	
-100.	437.										543.	579.	585.	503.	366.	371.	

SAE J287 Reaffirmed JUN88

TABLE 7m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.74 < G < -0.25)$

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE		COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.															
H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
<u>800.</u>	394.	445.	464.	478.	498.	505.	511.	507.	516.	519.	510.	498.	483.	443.	395.		
<u>700.</u>	469.	512.	527.	538.	553.	559.	564.	562.	576.	580.	571.	561.	548.	515.	472.		
<u>600.</u>	524.	560.	573.	583.	593.	594.	593.	601.	617.	623.	618.	610.	599.	570.	529.	463.	
<u>500.</u>	560.	591.	603.	612.	616.	610.	598.	623.	639.	648.	650.	644.	636.	609.	566.	498.	
<u>450.</u>	571.	600.	612.	621.	622.	612.	593.	628.	643.	654.	660.	657.	649.	622.	576.	510.	
<u>400.</u>	578.	604.	617.	626.	624.					655.	667.	666.	659.	631.	582.	517.	
<u>350.</u>	580.	604.	618.	627.	623.					652.	670.	671.	666.	636.	583.	520.	
<u>300.</u>	578.	601.	615.	626.	618.					644.	669.	673.	669.	636.	579.	519.	
<u>250.</u>	571.	593.	608.	620.	609.					632.	665.	672.	669.	633.	569.	514.	
<u>200.</u>	561.	581.	598.	611.	597.					615.	657.	667.	665.	626.	555.	505.	
<u>100.</u>	527.	545.	566.	583.							630.	647.	648.	599.	512.	474.	
<u>0.</u>	478.	494.	521.	542.							588.	614.	618.	556.	450.		
<u>-100.</u>	412.	429.	461.	487.							532.	567.	574.	497.	368.		

TABLE 8m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.74 < G < -0.25)$

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

NOTE: THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.																
ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF CL/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
<u>800.</u>	431.	480.	498.	512.	531.	538.	544.	543.	552.	556.	546.	534.	519.	481.	434.	
<u>700.</u>	504.	545.	559.	570.	584.	590.	594.	595.	608.	613.	604.	594.	581.	549.	507.	
<u>600.</u>	556.	591.	604.	613.	622.	622.	620.	630.	646.	653.	648.	640.	629.	601.	560.	493.
<u>500.</u>	590.	620.	632.	640.	643.	636.	622.	649.	665.	674.	677.	672.	664.	636.	593.	525.
<u>450.</u>	600.	628.	640.	648.	648.	636.	615.	652.	667.	678.	686.	683.	676.	648.	602.	535.
<u>400.</u>	606.	632.	644.	653.	649.					677.	691.	690.	684.	655.	605.	541.
<u>350.</u>	607.	632.	645.	654.	647.					673.	693.	695.	690.	658.	604.	543.
<u>300.</u>	604.	627.	642.	652.	640.					663.	690.	695.	692.	658.	598.	540.
<u>250.</u>	596.	619.	635.	646.	631.					649.	685.	693.	690.	653.	587.	534.
<u>200.</u>	584.	606.	624.	636.	617.					631.	675.	687.	685.	644.	571.	523.
<u>100.</u>	548.	570.	591.	607.							646.	664.	665.	614.	524.	489.
<u>0.</u>	496.	518.	545.	565.							601.	628.	632.	567.	457.	
<u>-100.</u>	428.	451.	484.	509.							543.	579.	585.	505.	371.	

SAE J287 Reaffirmed JUN88

TABLE 9m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.74 < G < -0.25)$

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	434.	501.	519.	532.	551.	557.	563.	564.	574.	577.	567.	556.	541.	503.	457.	
700.	524.	565.	578.	589.	603.	608.	613.	614.	628.	632.	624.	614.	601.	570.	528.	
600.		575.	610.	622.	630.	639.	637.	647.	663.	670.	666.	658.	647.	619.	578.	511.
500.		608.	638.	649.	657.	659.	637.	664.	680.	689.	693.	688.	680.	653.	609.	541.
450.		617.	645.	657.	665.	663.	628.	666.	681.	692.	701.	698.	691.	663.	616.	550.
400.		622.	649.	661.	669.	664.				691.	705.	705.	699.	670.	619.	555.
350.		623.	648.	661.	670.	661.				685.	706.	708.	704.	672.	617.	556.
300.		619.	643.	657.	667.	654.				674.	703.	708.	705.	670.	609.	552.
250.			611.	634.	650.	661.	643.			660.	697.	705.	703.	664.	597.	545.
200.			598.	622.	639.	651.	629.			640.	686.	693.	697.	654.	580.	533.
100.			561.	585.	606.	621.					655.	674.	675.	622.	530.	498.
0.			507.	532.	559.	578.					609.	637.	640.	574.	461.	
-100.			438.	465.	498.	522.					548.	586.	592.	509.	372.	

TABLE 10m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.24 < G < +0.24)$

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	397.	449.	467.	482.	503.	510.	516.	514.	524.	527.	517.	506.	491.	452.	403.	
700.	472.	515.	530.	542.	557.	563.	568.	569.	583.	588.	579.	568.	555.	523.	480.	
600.	526.	563.	576.	586.	596.	597.	596.	606.	623.	629.	625.	617.	606.	578.	536.	470.
500.	562.	593.	605.	614.	619.	614.	603.	627.	644.	653.	656.	651.	643.	616.	572.	505.
450.	573.	602.	614.	623.	625.	616.	597.	632.	647.	658.	666.	663.	656.	628.	582.	516.
400.	580.	606.	619.	628.	628.					654.	672.	672.	666.	637.	587.	523.
350.	582.	606.	620.	630.	626.					654.	675.	677.	672.	641.	587.	525.
300.	580.	602.	617.	627.	621.					646.	673.	678.	675.	641.	582.	524.
250.	573.	594.	610.	622.	613.					633.	669.	677.	674.	637.	572.	518.
200.	563.	582.	599.	613.	601.					616.	660.	671.	670.	629.	557.	509.
100.	529.	546.	567.	584.							632.	651.	652.	602.	513.	477.
0.	479.	494.	520.	542.							590.	617.	621.	558.	450.	
-100.	414.	427.	460.	487.							534.	570.	577.	499.	368.	

SAE J287 Reaffirmed JUN88

TABLE 11m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.24 < G < +0.24)$

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)		STATIONS OUTBOARD OF CL/O (mm)							STATIONS INBOARD OF C L/O (mm)								
		400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
<u>800.</u>		436.	485.	503.	517.	537.	544.	549.	549.	559.	563.	553.	541.	527.	489.	442.	
<u>700.</u>		507.	549.	564.	575.	589.	595.	600.	601.	615.	620.	611.	601.	588.	557.	515.	
<u>600.</u>		559.	595.	608.	617.	626.	627.	626.	636.	652.	659.	655.	647.	637.	609.	567.	500.
<u>500.</u>		593.	624.	635.	644.	647.	641.	629.	654.	670.	679.	683.	679.	671.	643.	599.	532.
<u>450.</u>		603.	631.	643.	652.	652.	642.	622.	657.	672.	683.	692.	690.	683.	655.	607.	542.
<u>400.</u>		608.	635.	647.	656.	654.					682.	697.	697.	691.	662.	611.	547.
<u>350.</u>		610.	634.	648.	657.	651.					677.	698.	701.	696.	665.	609.	548.
<u>300.</u>		606.	630.	644.	654.	645.					667.	696.	701.	698.	663.	603.	546.
<u>250.</u>		599.	621.	637.	648.	635.					653.	690.	698.	696.	658.	591.	539.
<u>200.</u>		587.	608.	625.	638.	622.					634.	680.	692.	691.	649.	575.	528.
<u>100.</u>		551.	571.	592.	608.						650.	669.	671.	618.	527.	494.	
<u>0.</u>		498.	518.	544.	565.						606.	633.	637.	572.	460.		
<u>-100.</u>		430.	449.	483.	508.						547.	584.	591.	509.	374.		

TABLE 12m

HAND REACH-RESTRAINED

VEHICLE RANGE: $(-0.24 < G < +0.24)$

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)		STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
		400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	459.	507.	524.	538.	557.	564.	570.	570.	581.	584.	574.	562.	548.	511.	464.			
700.	528.	569.	584.	594.	609.	614.	619.	620.	634.	639.	631.	621.	608.	577.	535.			
600.	579.	614.	626.	635.	644.	645.	643.	653.	669.	676.	672.	665.	655.	627.	585.	518.		
500.	611.	642.	653.	661.	664.	657.	644.	669.	685.	695.	699.	695.	687.	660.	615.	548.		
450.	621.	649.	661.	669.	669.	657.	636.	671.	686.	698.	707.	705.	698.	670.	623.	557.		
400.	626.	652.	664.	673.	669.					696.	712.	712.	706.	676.	625.	562.		
350.	626.	651.	664.	673.	666.					690.	712.	715.	711.	678.	622.	562.		
300.	622.	646.	660.	670.	659.					679.	709.	715.	712.	676.	615.	559.		
250.	614.	637.	653.	664.	649.					664.	702.	711.	709.	670.	602.	551.		
200.	601.	624.	641.	653.	634.					644.	692.	704.	703.	660.	585.	539.		
100.	564.	585.	607.	623.						661.	680.	682.	628.	535.	504.			
0.	510.	532.	559.	579.						615.	643.	647.	579.	466.				
-100.	439.	463.	496.	521.						554.	592.	598.	515.	378.				

SAE J287 Reaffirmed JUN88

TABLE 13m

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.25 < G < +0.74)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

A POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.																
ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
<u>800.</u>	401.	453.	471.	486.	507.	514.	520.	521.	531.	535.	525.	513.	498.	460.	412.	
<u>700.</u>	474.	518.	534.	545.	561.	567.	572.	575.	590.	595.	586.	576.	563.	531.	489.	
<u>600.</u>	529.	566.	579.	589.	599.	601.	600.	612.	628.	635.	632.	624.	614.	585.	544.	476.
<u>500.</u>	564.	596.	608.	617.	623.	618.	607.	632.	648.	658.	662.	658.	650.	622.	578.	511.
<u>450.</u>	575.	604.	616.	626.	629.	620.	602.	635.	651.	662.	671.	669.	663.	634.	587.	521.
<u>400.</u>	582.	608.	621.	630.	631.					662.	677.	678.	672.	642.	592.	528.
<u>350.</u>	584.	608.	622.	632.	629.					657.	679.	682.	678.	646.	591.	530.
<u>300.</u>	582.	604.	618.	629.	624.					648.	678.	683.	680.	646.	585.	528.
<u>250.</u>	576.	595.	611.	624.	616.					635.	672.	681.	679.	642.	575.	522.
<u>200.</u>	565.	583.	600.	614.	604.					617.	664.	676.	675.	633.	559.	512.
<u>100.</u>	531.	546.	567.	585.							635.	655.	657.	605.	515.	480.
<u>0.</u>	481.	494.	520.	542.							593.	621.	625.	561.	451.	
<u>-100.</u>	415.	426.	458.	486.							536.	573.	581.	501.	369.	

TABLE 14m

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.25 < G < +0.74)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF CL/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
<u>800.</u>	440.	490.	508.	522.	542.	549.	555.	555.	566.	570.	560.	548.	534.	496.	449.		
<u>700.</u>	511.	553.	568.	579.	594.	600.	605.	607.	621.	627.	618.	608.	596.	565.	522.		
<u>600.</u>	562.	599.	611.	621.	631.	632.	631.	641.	657.	665.	662.	654.	644.	616.	574.	507.	
<u>500.</u>	596.	627.	639.	647.	652.	646.	635.	659.	675.	685.	690.	686.	678.	650.	605.	538.	
<u>450.</u>	606.	634.	646.	655.	657.	647.	628.	661.	676.	688.	698.	696.	690.	661.	613.	548.	
<u>400.</u>	611.	638.	650.	659.	658.					686.	703.	703.	698.	668.	616.	553.	
<u>350.</u>	612.	637.	650.	660.	656.					681.	704.	707.	703.	671.	614.	554.	
<u>300.</u>	609.	632.	646.	657.	650.					670.	701.	707.	704.	669.	607.	551.	
<u>250.</u>	602.	623.	639.	650.	640.					656.	695.	704.	702.	664.	595.	544.	
<u>200.</u>	590.	610.	627.	640.	626.					637.	685.	698.	697.	654.	579.	533.	
<u>100.</u>	553.	571.	593.	610.						655.	675.	677.	677.	623.	531.	499.	
<u>0.</u>	500.	517.	544.	565.						610.	638.	643.	643.	576.	464.		
<u>-100.</u>	431.	448.	481.	508.						551.	589.	596.	596.	514.	378.		

SAE J287 Reaffirmed JUN88

TABLE 15m

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.25 < G < +0.74)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	464.	513.	530.	544.	564.	570.	576.	576.	587.	591.	581.	569.	555.	518.	471.		
700.	538.	574.	589.	599.	614.	620.	624.	626.	640.	646.	638.	628.	615.	584.	542.		
600.	583.	618.	631.	640.	649.	650.	649.	659.	675.	682.	679.	672.	662.	634.	592.	525.	
500.	615.	645.	657.	665.	669.	663.	651.	675.	691.	701.	706.	702.	694.	667.	622.	555.	
450.	624.	652.	664.	673.	674.	663.	644.	677.	691.	703.	714.	712.	706.	677.	629.	563.	
400.	629.	655.	668.	677.	674.					701.	718.	719.	713.	683.	631.	568.	
350.	629.	654.	667.	677.	671.			695.	718.	722.	718.	718.	685.	628.	568.		
300.	625.	649.	663.	673.	664.			684.	715.	722.	718.	718.	683.	620.	565.		
250.	617.	639.	655.	666.	654.			668.	708.	718.	716.	716.	677.	608.	557.		
200.	605.	626.	643.	656.	640.			649.	698.	711.	710.	710.	666.	590.	545.		
100.	567.	586.	608.	624.						666.	687.	688.	634.	540.	509.		
0.	512.	531.	558.	579.						620.	649.	653.	585.	471.			
-100.	441.	461.	494.	521.						560.	598.	605.	521.	383.			

TABLE 16m

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.75 < G < +1.24)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
800.	404.	456.	475.	490.	511.	518.	524.	528.	539.	543.	533.	521.	506.	469.	421.		
700.	477.	521.	537.	549.	565.	570.	575.	581.	596.	602.	594.	584.	571.	540.	497.		
600.	531.	569.	582.	592.	603.	605.	604.	617.	634.	641.	639.	631.	621.	593.	551.	483.	
500.	566.	598.	610.	620.	626.	621.	611.	636.	658.	662.	668.	664.	657.	629.	584.	517.	
450.	577.	606.	619.	628.	632.	623.	607.	639.	664.	666.	677.	676.	669.	641.	593.	527.	
400.	584.	610.	623.	633.	634.			665.	682.	683.	678.	678.	648.	596.	533.		
350.	586.	610.	623.	634.	633.			660.	684.	688.	684.	684.	651.	595.	535.		
300.	584.	605.	620.	631.				650.	682.	689.	686.	686.	651.	589.	533.		
250.	578.	597.	613.	625.				636.	676.	686.	685.	685.	646.	577.	526.		
200.	567.	584.	601.	616.				618.	667.	680.	680.	680.	637.	562.	516.		
100.	533.	547.	568.	586.				638.	659.	661.	608.	608.	516.	483.			
0.	483.	493.	519.	542.				595.	624.	629.	563.	563.	452.	435.			
-100.	416.	424.	457.	485.				539.	577.	584.	503.	503.	370.	372.			

SAE J287 Reaffirmed JUN88

TABLE 17m

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.75 < G < +1.24)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED Laterally FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

LEVATION ABOVE H PT (mm)	COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.															
	STATIONS OUTBOARD OF CL/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	445.	495.	513.	528.	548.	555.	561.	562.	573.	577.	567.	556.	541.	504.	457.	
700.	514.	557.	572.	584.	599.	605.	610.	613.	628.	633.	625.	616.	603.	572.	530.	
600.	566.	602.	615.	625.	635.	637.	636.	647.	663.	671.	668.	661.	651.	623.	581.	513.
500.	599.	630.	642.	651.	656.	651.	640.	664.	680.	690.	696.	692.	685.	657.	612.	545.
450.	609.	637.	650.	659.	661.	652.	634.	666.	681.	693.	704.	703.	696.	668.	619.	554.
400.	614.	640.	653.	662.	662.					691.	709.	710.	705.	674.	622.	559.
350.	615.	639.	653.	663.	660.					685.	709.	713.	709.	677.	619.	560.
300.	612.	634.	649.	660.						674.	706.	713.	711.	675.	612.	557.
250.	604.	625.	641.	653.						659.	700.	710.	708.	669.	600.	549.
200.	592.	611.	629.	642.						640.	690.	703.	703.	659.	583.	538.
100.	556.	572.	594.	611.						659.	680.	682.	682.	628.	534.	503.
0.	503.	517.	544.	566.						614.	644.	648.	648.	581.	467.	453.
-100.	433.	446.	479.	507.						556.	594.	602.	602.	519.	382.	387.

TABLE 18m

HAND REACH-RESTRAINED

VEHICLE RANGE: (+0.75 < G < +1.24)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED Laterally FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)									
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.	
<u>800.</u>	469.	518.	536.	550.	570.	577.	583.	582.	594.	597.	587.	576.	561.	525.	479.		
<u>700.</u>	537.	579.	594.	605.	620.	625.	630.	632.	647.	652.	644.	635.	622.	592.	549.		
<u>600.</u>	586.	622.	635.	644.	655.	656.	655.	665.	681.	688.	686.	679.	669.	641.	599.	531.	
<u>500.</u>	618.	649.	661.	670.	674.	669.	658.	680.	696.	706.	713.	709.	702.	674.	628.	561.	
<u>450.</u>	627.	656.	668.	677.	679.	669.	651.	682.	697.	708.	720.	719.	713.	684.	635.	570.	
<u>400.</u>	632.	658.	671.	680.	679.					706.	724.	725.	720.	690.	637.	574.	
<u>350.</u>	632.	657.	670.	680.	676.					699.	724.	728.	724.	691.	634.	575.	
<u>300.</u>	629.	651.	666.	676.						688.	721.	728.	725.	689.	626.	571.	
<u>250.</u>	620.	641.	657.	669.						673.	714.	724.	723.	683.	613.	563.	
<u>200.</u>	608.	627.	645.	658.						653.	703.	717.	717.	672.	595.	551.	
<u>100.</u>	570.	587.	609.	626.							672.	693.	695.	640.	545.	515.	
<u>0.</u>	515.	531.	558.	580.							626.	655.	660.	591.	476.	464.	
<u>-100.</u>	443.	458.	492.	520.							566.	605.	612.	528.	389.	397.	

SAE J287 Reaffirmed JUN88

TABLE 19m

HAND REACH-RESTRAINED VEHICLE RANGE: (G GREATER THAN +1.25) POPULATION MIX: 50/50 MALES-TO-FEMALES
(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
<u>800.</u>	408.	460.	479.	494.	515.	522.	528.	534.	547.	551.	541.	529.	514.	477.	430.	
<u>700.</u>	480.	525.	540.	552.	568.	574.	579.	587.	603.	609.	601.	591.	579.	548.	505.	
<u>600.</u>	533.	571.	585.	595.	606.	608.	608.	622.	639.	647.	645.	638.	629.	601.	558.	490.
<u>500.</u>	568.	600.	613.	622.	629.	625.	615.	640.	656.	667.	674.	671.	664.	636.	590.	523.
<u>450.</u>	579.	608.	621.	630.	635.	627.	611.	643.	658.	670.	683.	682.	676.	647.	598.	533.
<u>400.</u>	586.	612.	625.	635.	637.			668.	687.	689.	684.	684.	684.	654.	601.	538.
<u>350.</u>	588.	612.	625.	636.	636.			662.	689.	693.	690.	690.	690.	657.	599.	540.
<u>300.</u>	586.	607.	622.	633.				652.	686.	694.	691.	691.	691.	655.	592.	537.
<u>250.</u>	580.	598.	614.	627.				638.	680.	691.	690.	690.	690.	650.	580.	530.
<u>200.</u>	569.	585.	603.	617.				619.	671.	685.	685.	685.	685.	641.	564.	520.
<u>100.</u>	535.	547.	568.	587.				641.	663.	665.	665.	665.	665.	611.	517.	486.
<u>0.</u>	485.	493.	519.	542.				598.	628.	633.	633.	633.	633.	566.	453.	438.
<u>-100.</u>	418.	423.	455.	484.				541.	580.	588.	588.	588.	588.	506.	371.	374.

TABLE 20m

HAND REACH-RESTRAINED VEHICLE RANGE: (G GREATER THAN +1.25) POPULATION MIX: 75/25 MALES-TO-FEMALES
(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

FIGURE 1. DEVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.																
ELEVATION ABOVE H PT (mm)	STATIONS OUTBOARD OF CL/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	449.	500.	518.	533.	553.	561.	566.	568.	580.	584.	574.	563.	548.	512.	465.	
700.	518.	562.	577.	588.	604.	610.	615.	619.	634.	640.	633.	623.	611.	580.	538.	
600.	569.	606.	619.	629.	640.	642.	641.	652.	669.	677.	675.	668.	658.	631.	588.	520.
500.	602.	633.	645.	654.	661.	656.	646.	669.	684.	695.	702.	699.	692.	664.	618.	551.
450.	611.	640.	653.	662.	665.	657.	641.	671.	685.	697.	710.	709.	703.	674.	625.	560.
400.	617.	643.	656.	666.	667.			695.	714.	716.	716.	711.	680.	627.	565.	
350.	618.	642.	655.	666.	664.			689.	715.	719.	716.	682.	624.	566.		
300.	615.	636.	651.	662.				678.	712.	719.	717.	680.	616.	562.		
250.	607.	627.	643.	655.				662.	705.	716.	715.	674.	604.	555.		
200.	595.	613.	630.	644.				643.	695.	709.	709.	664.	586.	543.		
100.	559.	573.	594.	612.				664.	685.	688.	633.	538.	508.			
0.	505.	517.	543.	566.				619.	649.	654.	586.	471.	458.			
-100.	435.	444.	477.	506.				560.	600.	607.	524.	386.	392.			

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TABLE 21m

HAND REACH-RESTRAINED

VEHICLE RANGE: (G GREATER THAN +1.25)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 2a RESTRAINT.

ELEVATION
ABOVE
H PT
(mm)

	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	474.	524.	542.	556.	576.	583.	589.	588.	600.	604.	594.	583.	568.	532.	486.	
700.	541.	584.	598.	610.	625.	631.	636.	638.	653.	659.	651.	642.	630.	599.	557.	
600.	590.	627.	639.	649.	660.	668.	661.	670.	687.	695.	693.	686.	676.	649.	606.	538.
500.	621.	653.	665.	674.	679.	675.	665.	686.	701.	712.	719.	716.	709.	681.	635.	568.
450.	630.	659.	671.	681.	684.	675.	658.	687.	708.	714.	727.	726.	720.	691.	641.	576.
400.	635.	662.	674.	684.	684.					711.	730.	732.	727.	696.	643.	581.
350.	636.	660.	673.	683.	681.					704.	731.	735.	731.	698.	639.	581.
300.	632.	654.	668.	679.						693.	727.	735.	732.	695.	631.	577.
250.	624.	644.	660.	678.						677.	720.	731.	729.	689.	618.	569.
200.	611.	629.	647.	661.						657.	709.	723.	723.	678.	600.	557.
100.	573.	588.	610.	628.						677.	699.	701.	646.	550.	521.	
0.	517.	531.	558.	580.						631.	662.	667.	597.	482.	470.	
-100.	445.	456.	490.	519.						572.	611.	619.	534.	395.	403.	

TABLE 22mm

HAND REACH-UNRESTRAINED

VEHICLE RANGE: (G < -1.25)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 1 LAP BELT RESTRAINT.

ELEVATION
ABOVE
H PT
(mm)

	STATIONS OUTBOARD OF C L/O (mm)							STATIONS INBOARD OF C L/O (mm)								
	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	532.	563.	573.	580.	579.	570.	556.	568.	575.	580.	581.	575.	566.	532.	477.	398.
700.	605.	628.	635.	638.	633.	622.	606.	619.	629.	637.	642.	640.	633.	605.	556.	482.
600.	662.	679.	684.	686.	677.	665.	648.	659.	672.	681.	691.	690.	685.	662.	617.	548.
500.	703.	717.	720.	721.	710.	698.	681.	689.	703.	713.	726.	727.	723.	703.	661.	595.
450.	717.	730.	733.	733.	723.	711.	695.	700.	714.	725.	738.	739.	737.	717.	677.	612.
400.	727.	739.	742.	743.	733.	722.	706.	708.	722.	733.	747.	749.	746.	727.	688.	624.
350.	732.	745.	748.	749.	740.					739.	753.	754.	752.	734.	694.	631.
300.	734.	746.	750.	751.	744.					741.	755.	756.	754.	736.	697.	633.
250.	730.	744.	748.	750.	744.					740.	753.	755.	752.	734.	694.	631.
200.	722.	737.	742.	745.							748.	749.	747.	727.	688.	624.
100.	692.	711.	718.	724.							727.	727.	724.	702.	660.	595.
0.	642.	667.	678.	687.							692.	690.	685.	660.	615.	546.
-100.	573.	605.	620.	634.							642.	638.	630.	601.	551.	478.

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TABLE 23mm

HAND REACH-UNRESTRAINED

VEHICLE RANGE: (G < 1.25)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 1 LAP BELT RESTRAINT.

ELEVATION

ABOVE

H PT

(mm)

STATIONS OUTBOARD OF C L/O (mm)

STATIONS INBOARD OF C L/O (mm)

	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	573.	602.	612.	617.	616.	609.	598.	599.	607.	613.	615.	611.	602.	571.	520.	447.
700.	642.	665.	671.	674.	668.	659.	645.	645.	656.	664.	671.	668.	662.	637.	591.	524.
600.	695.	714.	718.	719.	709.	698.	684.	681.	694.	704.	714.	713.	709.	688.	646.	584.
500.	732.	748.	751.	750.	739.	728.	713.	708.	722.	732.	745.	746.	743.	724.	686.	626.
450.	745.	760.	762.	761.	750.	739.	724.	718.	731.	742.	755.	757.	754.	736.	699.	640.
400.	753.	767.	770.	769.	757.	746.	732.	725.	739.	750.	763.	764.	762.	745.	708.	651.
350.	757.	771.	774.	773.	762.					754.	767.	769.	766.	749.	713.	656.
300.	757.	772.	774.	774.	764.					755.	768.	770.	767.	750.	714.	657.
250.	753.	768.	771.	771.	762.					754.	766.	767.	764.	747.	711.	654.
200.	744.	760.	764.	765.							760.	761.	758.	740.	703.	646.
100.	712.	732.	738.	741.							739.	738.	734.	713.	675.	615.
0.	663.	687.	695.	701.							703.	701.	695.	670.	628.	566.
100.	594.	625.	637.	646.							654.	649.	640.	611.	564.	498.

TABLE 24mm

HAND REACH-UNRESTRAINED

VEHICLE RANGE: (G < 1.25)

POPULATION MIX: 90/10 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 90% MALE AND 10% FEMALE DRIVERS WEARING A TYPE 1 LAP BELT RESTRAINT.

ELEVATION

ABOVE

H PT

(mm)

STATIONS OUTBOARD OF C L/O (mm)

STATIONS INBOARD OF C L/O (mm)

	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	614.	639.	646.	650.	647.	640.	628.	629.	636.	641.	643.	640.	632.	605.	560.	495.
700.	677.	698.	703.	705.	697.	688.	674.	671.	681.	688.	694.	693.	687.	665.	624.	563.
600.	725.	743.	747.	747.	736.	725.	710.	705.	716.	725.	734.	734.	730.	711.	673.	616.
500.	758.	774.	777.	776.	763.	751.	735.	729.	741.	750.	761.	762.	759.	742.	707.	652.
450.	769.	784.	786.	785.	772.	760.	744.	737.	749.	759.	771.	772.	769.	753.	719.	664.
400.	776.	790.	792.	791.	778.	766.	749.	743.	755.	765.	777.	778.	776.	760.	726.	672.
350.	778.	793.	795.	794.	781.					768.	780.	781.	779.	763.	729.	676.
300.	777.	792.	794.	793.	780.					768.	780.	781.	779.	763.	729.	675.
250.	771.	787.	789.	789.	777.					765.	776.	777.	775.	758.	724.	670.
200.	761.	778.	781.	781.						770.	771.	768.	750.	716.	661.	
100.	729.	748.	753.	754.						747.	747.	743.	723.	686.	630.	
0.	680.	703.	709.	713.						711.	709.	703.	680.	640.	581.	
100.	612.	641.	650.	656.						662.	657.	649.	622.	577.	514.	

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TABLE 25mm

HAND REACH-UNRESTRAINED

VEHICLE RANGE: (-1.25 < G < 0.75)

POPULATION MIX: 50/50 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 50% MALE AND 50% FEMALE DRIVERS WEARING A TYPE 1 LAP BELT RESTRAINT.

ELEVATION
ABOVE

H P T
(mm)

STATIONS OUTBOARD OF C L/O (mm)

STATIONS INBOARD OF C L/O (mm)

	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	545.	583.	594.	601.	601.	595.	586.	589.	602.	611.	615.	609.	596.	552.	479.	374.
700.	619.	651.	658.	662.	654.	645.	631.	633.	649.	662.	672.	670.	663.	629.	567.	475.
600.	676.	703.	708.	709.	696.	683.	666.	666.	684.	698.	715.	716.	711.	686.	634.	552.
500.	717.	740.	744.	742.	725.	710.	690.	689.	708.	723.	743.	746.	744.	724.	680.	607.
450.	731.	753.	756.	754.	735.	719.	699.	697.	716.	731.	752.	756.	755.	737.	696.	626.
400.	741.	762.	765.	762.	742.	726.	705.	703.	721.	737.	758.	762.	762.	746.	707.	641.
350.	747.	768.	770.	767.	747.					740.	761.	765.	765.	751.	713.	650.
300.	748.	770.	772.	769.	748.					741.	761.	765.	765.	751.	716.	654.
250.	746.	768.	770.	767.	747.					739.	758.	762.	762.	749.	714.	654.
200.	740.	763.	765.	763.							753.	756.	756.	742.	707.	649.
100.	715.	741.	745.	744.							735.	737.	735.	719.	683.	625.
0.	675.	705.	711.	712.							708.	707.	702.	682.	644.	585.
-100.	618.	655.	664.	668.							674.	668.	660.	634.	591.	528.

TABLE 26mm

HAND REACH-UNRESTRAINED

VEHICLE RANGE: (-1.25 < G < 0.75)

POPULATION MIX: 75/25 MALES-TO-FEMALES

(mm)

HORIZONTAL REACH FORWARD OF THE HR REFERENCE PLANE AT STATIONS LOCATED LATERALLY FROM THE CENTERLINE OF OPERATOR (C L/O) AND AT ELEVATIONS ABOVE THE REARMOST H POINT. THE ENVELOPE DESCRIBES A 95% LEVEL OF PERFORMANCE OF A DRIVER POPULATION COMPOSED OF 75% MALE AND 25% FEMALE DRIVERS WEARING A TYPE 1 LAP BELT RESTRAINT.

ELEVATION
ABOVE

H P T
(mm)

STATIONS OUTBOARD OF C L/O (mm)

STATIONS INBOARD OF C L/O (mm)

	400.	300.	250.	200.	100.	50.	0.	0.	50.	100.	200.	250.	300.	400.	500.	600.
800.	587.	621.	631.	636.	636.	630.	622.	620.	633.	642.	646.	640.	630.	591.	528.	438.
700.	657.	684.	691.	693.	686.	677.	665.	661.	676.	688.	698.	696.	689.	659.	605.	525.
600.	710.	733.	737.	737.	724.	713.	698.	691.	708.	722.	736.	737.	733.	710.	664.	593.
500.	747.	767.	769.	767.	751.	737.	720.	711.	729.	744.	762.	765.	763.	744.	704.	640.
450.	759.	778.	780.	778.	760.	746.	728.	718.	736.	751.	770.	774.	772.	756.	718.	657.
400.	768.	786.	788.	785.	766.	751.	733.	723.	741.	756.	775.	779.	779.	763.	728.	669.
350.	772.	791.	792.	789.	770.					759.	778.	782.	781.	767.	733.	676.
300.	773.	791.	793.	790.	770.					759.	777.	781.	781.	767.	734.	679.
250.	770.	789.	790.	787.	768.					756.	774.	778.	778.	764.	732.	678.
200.	762.	782.	784.	782.							769.	772.	771.	757.	725.	672.
100.	737.	759.	763.	762.							750.	751.	749.	734.	700.	648.
0.	696.	723.	729.	729.							721.	720.	716.	697.	661.	607.
-100.	640.	673.	682.	685.							684.	680.	673.	648.	608.	551.