



Driver Hand Control Reach

KES M – B602

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1. Scope of Application

This shall regulate hand reach of driver population ratios of passenger cars, multi purpose passenger vehicles, light & medium car and truck.

However, heavy vehicles shall be excluded from these.

2. Application Condition

2.1 This should be examined with H point or rear most H point at the initial design phase of vehicle.

Consider tolerance of vehicle, when applying this for comparing this with seating buck.

2.2 This shall be applicable to L.H.D vehicle of sliding possible.

However, left and right symmetry should be assumed in case of RHD vehicle.

2.3 This shall be applicable to designing reach (Three finger grasping reach) to control knob positioned at front and moving front and rear of 25mm diameter in figure 1.

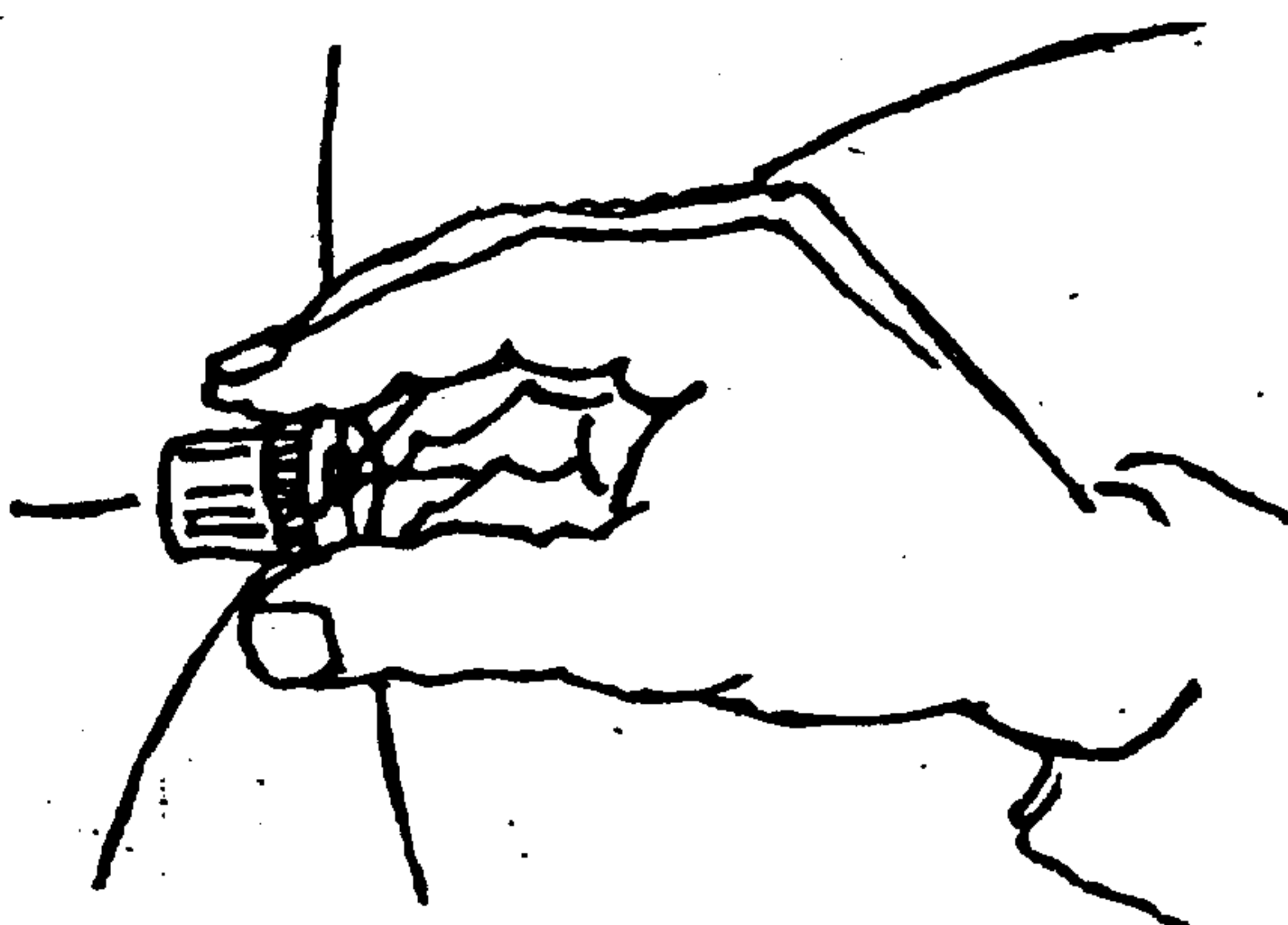


Figure 1

For other cases, adjusting rate should be applied as follows.

2.3.1 Extended Finger operated adjustment

For this cases, add 50mm to center of finger pad from reach table data for driver to control.

2.3.2 Full Hand grasped adjustment

For this cases, subtract 50mm from center of finger pad from reach table data for driver to control.

3. Terminology

3.1 Restrained Reach

Reach with shoulder belt and lap belt on (With torso restrained)

3.2 Unrestrained reach

Reach with lap belt on

3.3 Driver hand reach capability

Maximum reach of driver with one hand on steering wheel and right foot on acc. pedal.

3.4 Hand reach envelopes (Refer to figure 3)

Geometrical expression of hand reach limit with torso restraint.

3.5 Hand reach envelope plane (HR plane)

This shall be used for positioning hand reach envelopes properly by seating configuration (Figure 2).

Horizontal distance from Acc. heel point to HR plane shall be expressed as function of general package factor (G).

$$HR = 786 - (99) G, \text{mm}$$

3.6 General package factor (G)

Workspace shall be expressed as the following equations

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

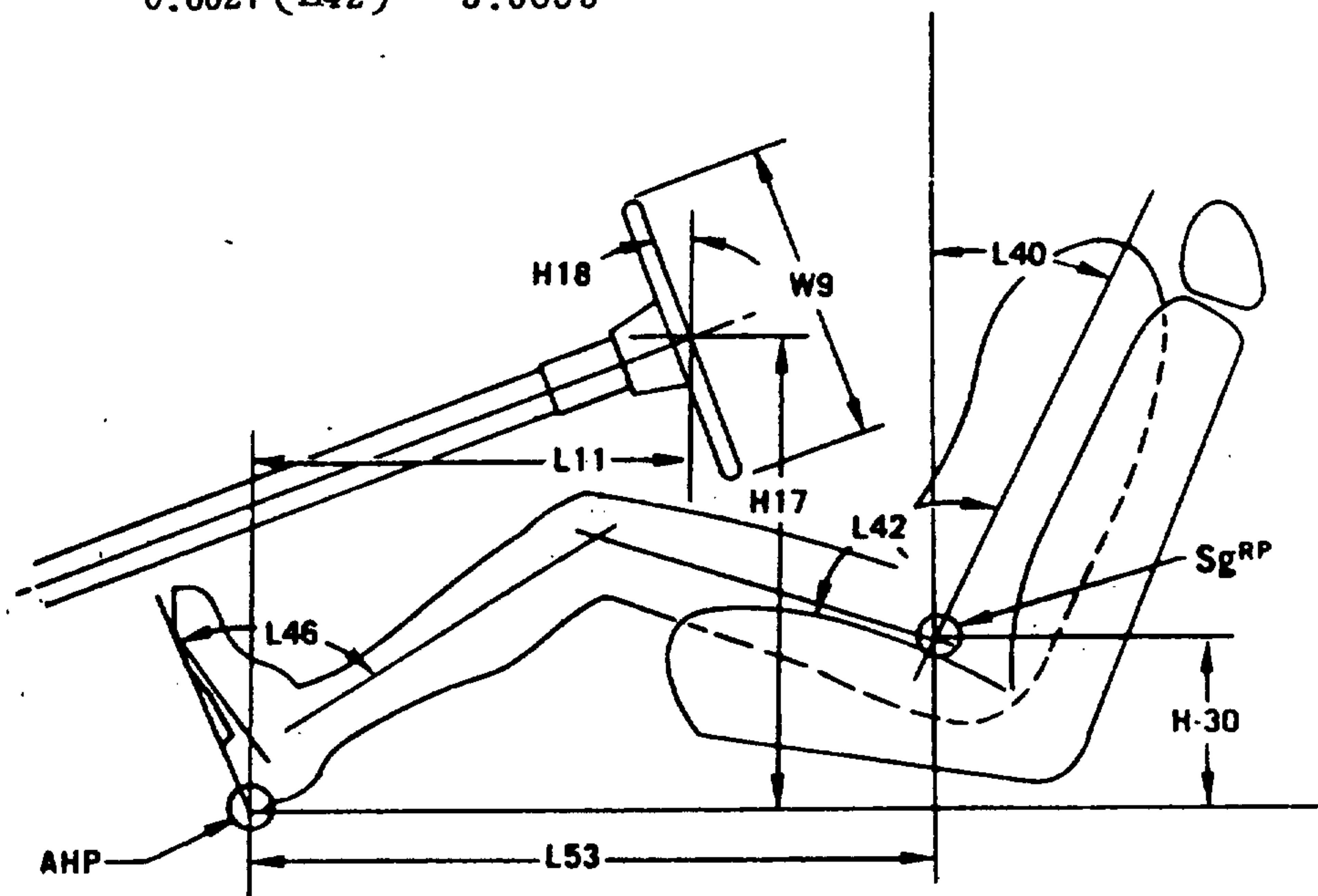


Figure 2 -Vehicle seating configuration

In addition, applicable package specification shall be as follows.

○ L 40	BACK ANGLE-FRONT	9.0 ~ 33.0°
○ H 30	Vertical SgRP to heel pt.	130 ~ 520 mm
○ L 43	Horizontal H.pt travel, SgRP	130 mm
○ W 9	Steering Wheel Diameter	330 ~ 600 mm
○ H 18	Steering Wheel Angle	10° ~ 70°
○ L 11	Horizontal Steering Wheel ctr.	152 ~ 660 mm
○ H 17	Vertical Steering Wheel ctr.	530 ~ 838 mm

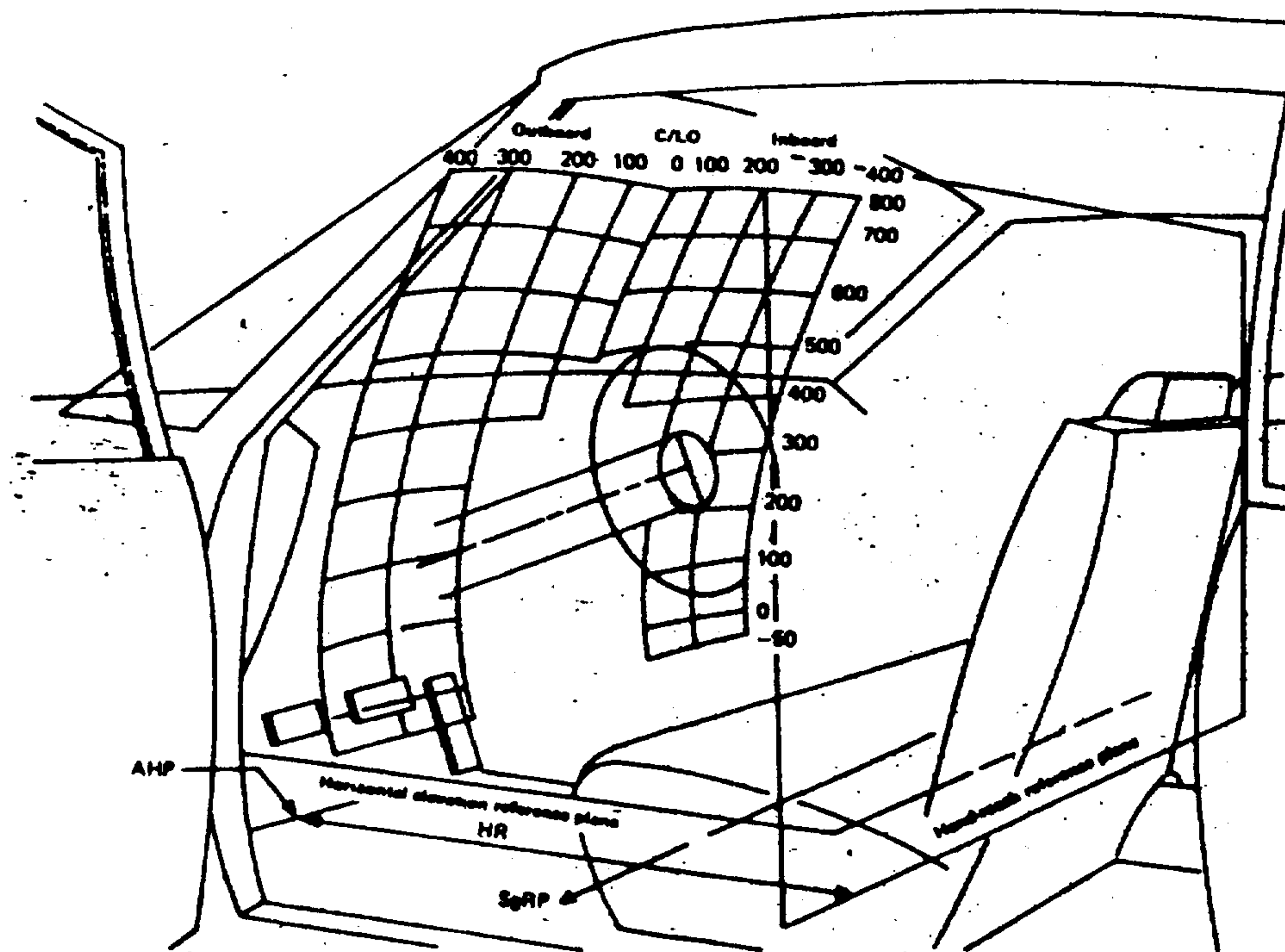


Figure 3 – Hand reach envelopes in vehicle position

4. Drawing Reading Method

4.1 Appendix drawing shall be classified by two according to restraint condition of torso.

4.1.1 Hand reach – Restrained (Refer to 3.1)

4.1.2 Hand reach – Unrestrained (Refer to 3.2)

4.2 This shall be classified by 7 through general package factor (G) of 3.6 according to torso restraint.

- (1) $G \leq -1.25$
- (2) $-1.24 \leq G \leq -0.75$
- (3) $-0.74 \leq G \leq -0.25$
- (4) $-0.24 \leq G \leq +0.24$
- (5) $+0.25 \leq G \leq +0.74$
- (6) $+0.75 \leq G \leq +1.24$
- (7) $+1.25 \leq G$

4.3 This shall be classified as 3 by required body size according to each general package factor (G).

(1) 50% male & 50% female (50/50 male to female)

(2) 75% male & 25% female (75/25 male to female)

(3) 90% male & 10% female (90/10 male to female)

4.4 Envelope shall be expanded 400mm outward and 600 mm inward from driver center and upward 800mm and 100mm downward from H-point by 100mm or 50mm space.
(Refer to figure 3.)

5. Drawing Procedure

5.1 Decide G by 3.6.

5.2 Decide HR by 3.5

5.3 Compare HR with L53 (SgRP to A.H.P.)

(1) For $(Hr-L53) < 0$, reference plane of hand reach shall be HR plane.

(2) For $(Hr-L53) \geq 0$, reference plane of hand reach shall be plane passing through HR.

5.4 Decide Torso restraint condition by 3.1. and 3.2 according to operator position.

5.5 Decide driver population according to 4.3

5.6 Find proper data from additional table by 5.1, 5.4 and 5.5.

5.7 Draw hand reach envelopes by data from 5.6 to reference plane decided in 5.3.

5.8 Make sure that intended operator position be within hand reach envelopes.

6. Translation Standard

SAE J287 FEB80 (Driver hand control reach)

Additional Rule

This shall be enacted establishment and revision date.

TABLE 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 LA- ALLY 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 25 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	25.0	27.5	30.0	
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	14.2	12.7	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	16.2	15.1	13.8					
30.0	16.9	18.1	18.9	19.6	20.0	20.4	20.7	20.3	20.6	20.8	20.5	20.0	19.0	17.8	16.7	15.6					
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	16.6				
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	23.2	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	23.0	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	22.6	20.9				
12.5	22.8	23.4	24.1	24.6	24.4	23.4	21.3	24.8	24.9	25.5	26.0	26.1	25.7	25.0	23.8	22.4	20.9				
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	24.4	24.7	23.4	21.3	19.0	17.4				
0.0	18.6	19.2									22.7	23.4	23.8	22.4	19.9	17.4	15.8				
-2.5	17.0	17.6									21.4	22.2	22.8	21.1	18.3	15.4	14.4				

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 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	13.8	15.2	16.4	17.2	17.5	18.1	18.2	18.5	19.7	19.7	19.5	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	20.8	20.3	19.4	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	17.4
25.0	21.3	22.2	22.9	23.3	23.6	23.7	23.7	23.0	24.4	24.7	24.5	24.0	23.4	22.7	21.9	20.7	19.1
22.5	22.4	23.2	23.8	24.2	24.4	24.4	24.1	24.4	25.4	25.4	25.4	25.0	24.5	23.4	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	26.4	26.7	26.4	25.7	24.6	23.2	21.4
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	26.4	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					24.0	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

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	19.4	19.7	19.4	19.2	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	18.4	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	20.4	19.4	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	23.8	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	27.0	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	19.4
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	22.2	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

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	17.9	18.4	18.7	18.8	19.0	19.3	19.3
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	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	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	23.4	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	23.4	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	21.5	20.9
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	22.4	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	25.1	23.8	22.1	20.4	
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	26.4	26.3	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	17.4		
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		

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	14.9	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	23.9	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	24.9	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				25.8	26.7	27.1	26.8	26.3	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	26.5	26.3	25.5	23.8	22.0	20.5
5.0	21.9	22.6	23.6	24.2					25.4	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	18.4		
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							21.9	23.4	23.4	21.5	18.4	15.5	14.6		

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	19.1	19.8	19.3	19.6	19.9	19.9	19.7	19.1	14.2	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	21.4	21.5	20.9	20.1	19.1	19.0	14.7		
30.0	19.2	20.3	21.1	21.7	22.1	22.5	22.4	22.4	23.3	23.3	23.0	22.5	21.4	20.9	19.9	14.7		
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	14.9	
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	24.4	23.9	22.7	21.2	
20.0	24.0	24.7	25.3	25.7	25.4	25.5	24.8	25.9	26.6	27.0	27.0	26.7	26.3	25.4	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	26.4	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	26.4	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	24.9	22.3	20.9		
5.0	22.5	23.1	24.2	24.4						25.4	26.4	26.5	25.2	23.2	21.1	19.4		
2.5	21.3	22.0	23.2	23.9							24.7	25.9	25.7	24.3	21.9	19.5	14.4	
0.0	19.9	20.6									23.5	24.9	24.4	23.1	20.4	17.7	14.7	
-2.5	14.2	19.0									22.0	23.7	23.6	21.7	14.5	15.5	14.7	

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	17.0	14.4	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	20.4	19.4	14.9	17.4	16.4		
27.5	18.9	20.0	20.7	21.3	21.7	22.0	22.2	22.2	22.4	22.9	22.6	22.1	21.4	20.4	14.0	14.5	17.0	
25.0	20.3	21.3	22.0	22.5	22.8	23.0	23.0	23.2	23.9	24.0	23.4	23.4	22.7	22.0	21.1	20.0	14.4	
22.5	21.4	22.3	22.9	23.4	23.6	23.6	23.5	24.0	24.7	24.9	24.4	24.4	23.9	23.2	22.3	21.2	19.4	
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	24.4	24.4	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	24.4	23.4	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	22.4	22.4	21.2	
12.5	22.9	23.5	24.2	24.7	24.7				25.4	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	25.4	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	23.4	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	14.3	15.4		

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	20.4	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	18.7				
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	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	27.1	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	27.0	26.1	24.6	22.9	21.5				
7.5	24.9	23.5	24.4	25.0	24.7					25.2	26.4	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	24.4	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					

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)								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	25.0	27.5	30.0		
35.0	18.8	19.6	17.7	18.5	19.1	19.5	19.6	19.9	20.1	20.2	19.9	19.4	18.5	17.3	16.0	14.7						
32.5	17.5	18.7	19.7	20.4	20.9	21.2	21.5	21.6	22.0	22.0	21.7	21.2	20.4	19.4	18.2	17.0						
30.0	19.4	20.8	21.3	21.9	22.4	22.7	23.0	23.0	23.6	23.6	23.3	22.8	22.0	21.2	20.2	19.0	17.6					
27.5	21.0	22.0	22.8	23.3	23.6	23.9	24.1	24.2	24.8	24.9	24.6	24.1	23.5	22.7	21.8	20.6	19.1					
25.0	22.4	23.3	23.9	24.4	24.7	24.8	24.8	25.1	25.8	25.9	25.7	25.3	24.7	24.0	23.1	22.0	20.4					
22.5	23.4	24.2	24.8	25.2	25.4	25.4	25.2	25.7	26.5	26.7	26.6	26.3	25.7	25.1	24.2	23.0	21.4					
20.0	24.1	24.9	25.5	25.9	26.0	25.7	25.1	26.1	26.9	27.2	27.2	27.0	26.5	25.9	24.9	23.7	22.1					
17.5	24.5	25.2	25.9	26.2	26.3	25.8	24.7	26.2	26.9	27.4	27.6	27.5	27.1	26.4	25.4	24.1	22.5					
15.0	24.7	25.4	26.0	26.4	26.3					27.4	27.8	27.8	27.5	26.7	25.6	24.2	22.6					
12.5	24.6	25.2	25.9	26.4	26.2					27.0	27.7	27.9	27.6	26.8	25.5	23.9	22.4					
10.0	24.2	24.8	25.6	26.1	25.8					26.5	27.4	27.8	27.5	26.6	25.1	23.3	21.9					
7.5	23.5	24.1	25.0	25.6	25.2					25.6	26.8	27.4	27.2	26.1	24.4	22.4	21.1					
5.0	22.6	23.2	24.2	24.9							26.0	26.9	26.7	25.5	23.4	21.2	20.0					
2.5	21.4	22.0	23.2	23.9							25.0	26.1	26.0	24.5	22.1	19.7	18.6					
0.0	19.9	20.6	21.9	22.4							23.7	25.1	25.0	23.3	20.6	17.9						
-2.5	18.2	18.9	20.5	21.5							22.2	23.9	23.8	21.9	18.7	15.7						