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Japan Test Programme Backset Measurement with R-point versus H-point method

April ‘07

JAPAN MLIT

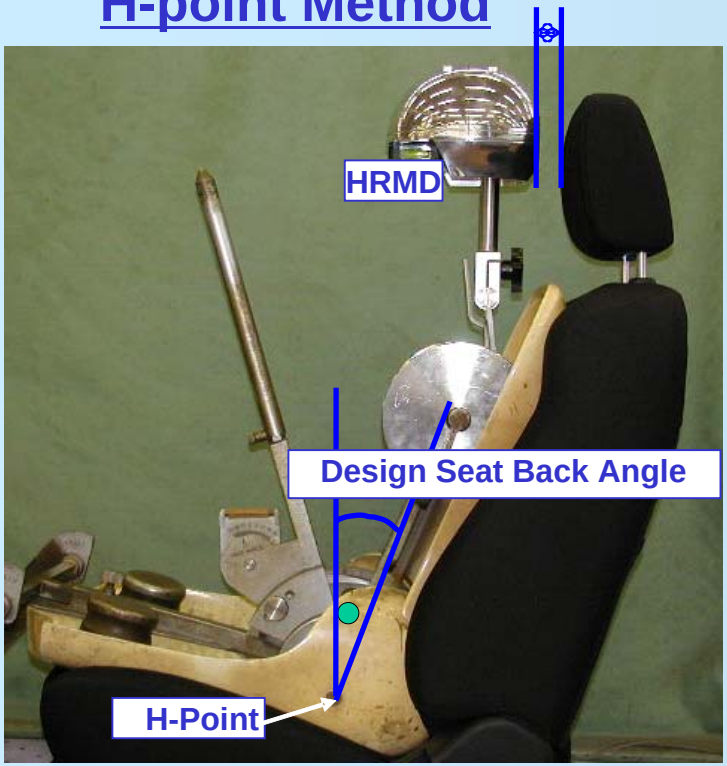
Contents

1. Purpose

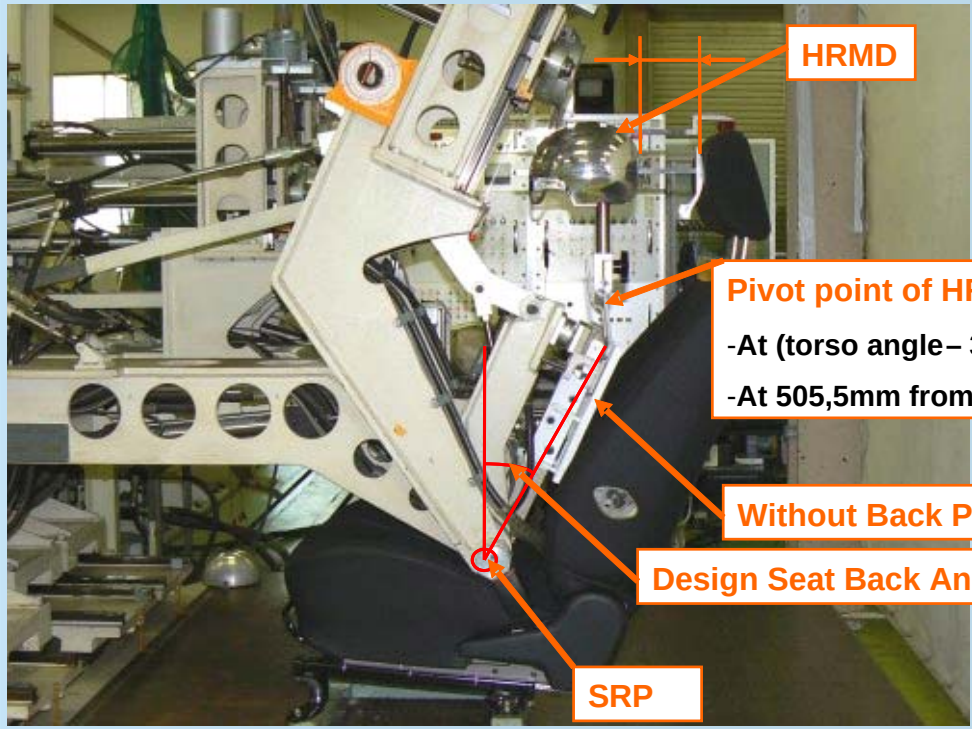
To summarize the advantages and disadvantages of the following two proposed backset measurement methods, and determine suitable evaluation standards.

- **H-point Method: Backset is measured using a 3D manikin and a head restraint measuring device (HRMD), with the seat back set at the manufacturer's design angle.**
- **R-point Method: Backset is measured with an HRMD or equivalent device initially aligned to the seating reference point (SRP), with the seat back set at the manufacturer's design angle. (Note: The R-point is within ±25 mm of the H-point.)**

H-point Method



R-point Method



2. Evaluation Conditions

Case	Seat		No. of measurers	No. of measure-ments	No. of measurering device	Reclining angle
	Type	No.				
H-point Backset with Design SBA (Seat Back Angle)	Mi(a)*	3	3	9	1	Design angle
	Mi(b)*	1	3	3	1	
	Mi(c)	3	3	9	1	
	N	3	3	9	1	
	Ma	3	3	9	1	
	S	3	3	9	1	
	D	3	3	9	1	
R-point Backset	Mi(a)*	3	2	9	3	Design angle
	Mi(b)*	1	2	3	3	
	Mi(c)	3	3	9	1	
	N	3	3	9	1	
	Ma	3	3	9	1	
	S	3	3	9	1	
	D	3	3	9	1	

＊：Cited from 7th GTR Meeting, HR-7-10

2. Test Seat Specifications

Cited from presentation material for7th GTR Meeting HR-7-10

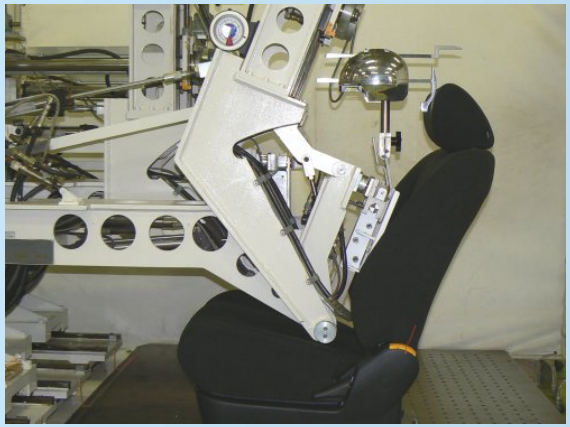
Type Mi (a)

Type Mi (b)

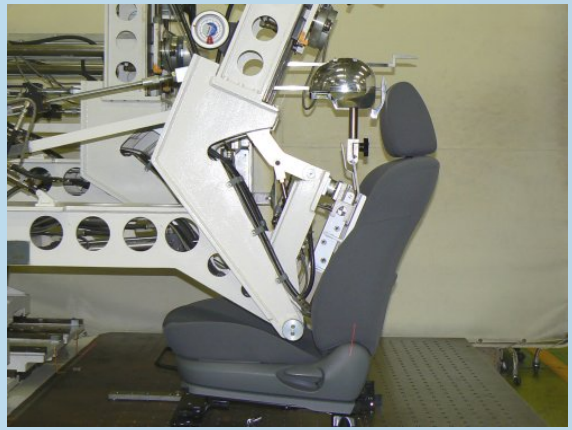
2. Test Seat Specifications

Type Mi (c)

Type N



Type Ma



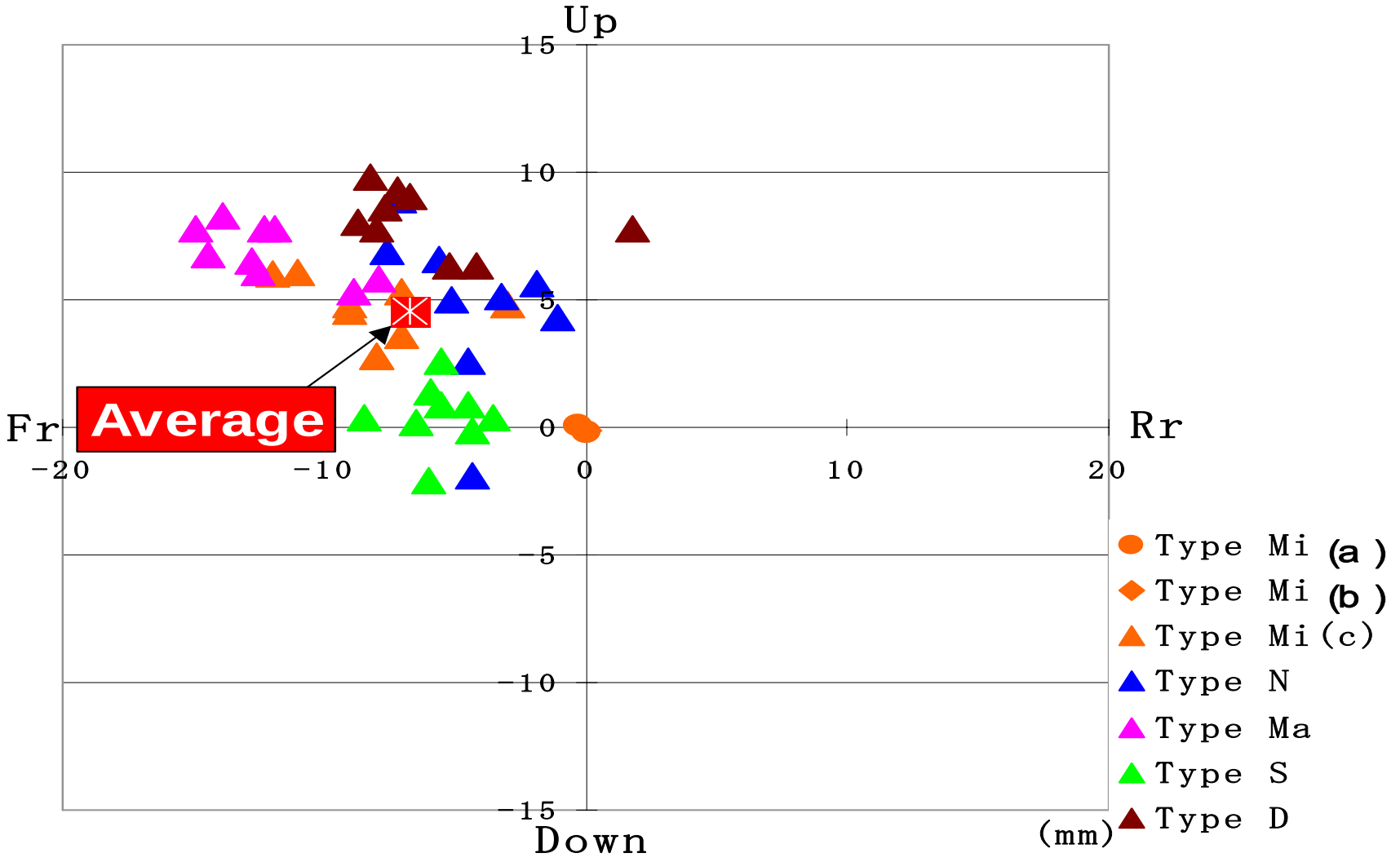
Reactive head restraints

Type D

Type S

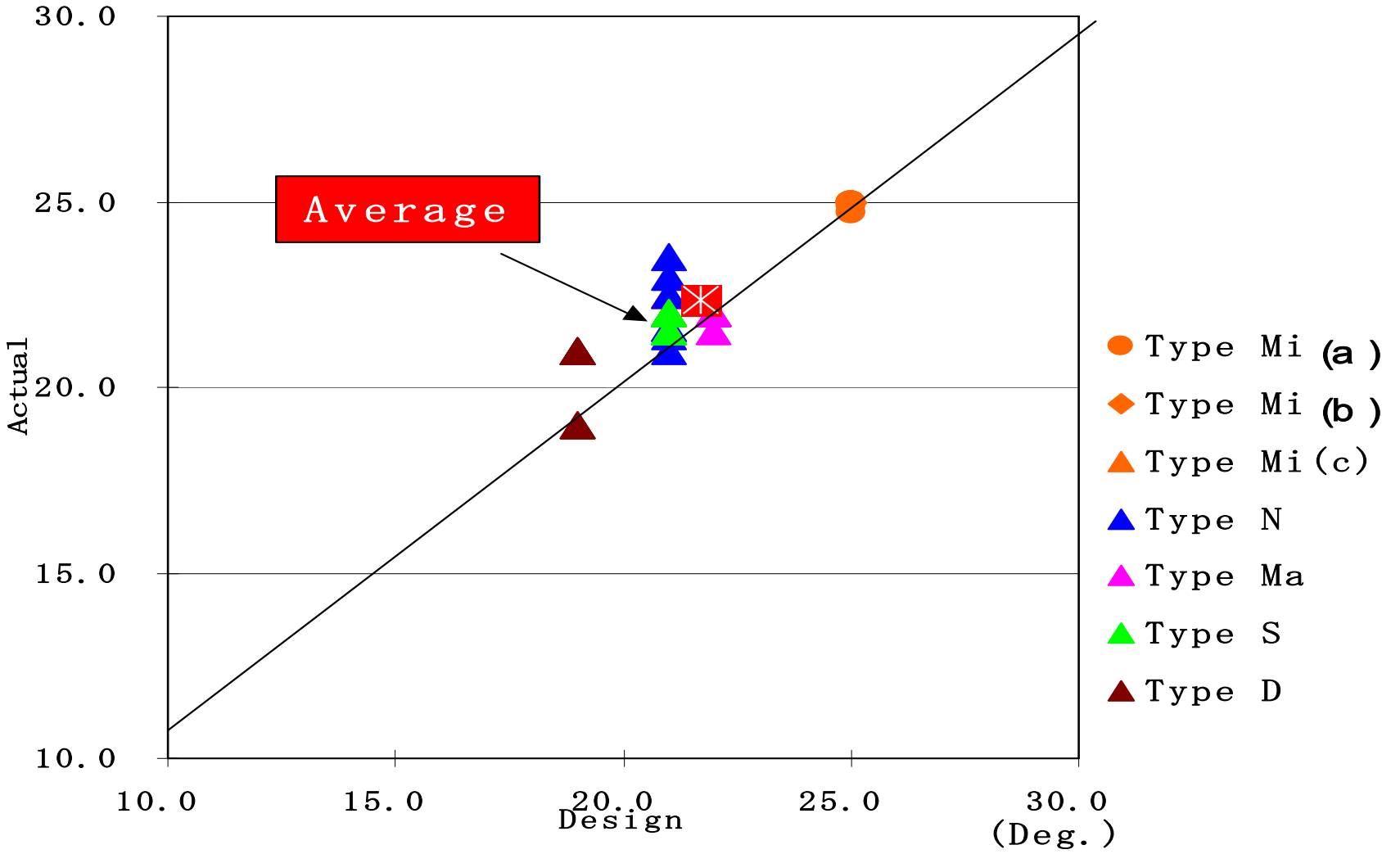
2. H-point Variability of Test Seats

The H-points of the test seats were distributed in the forward and upward directions, within the specified tolerance (±25 mm).



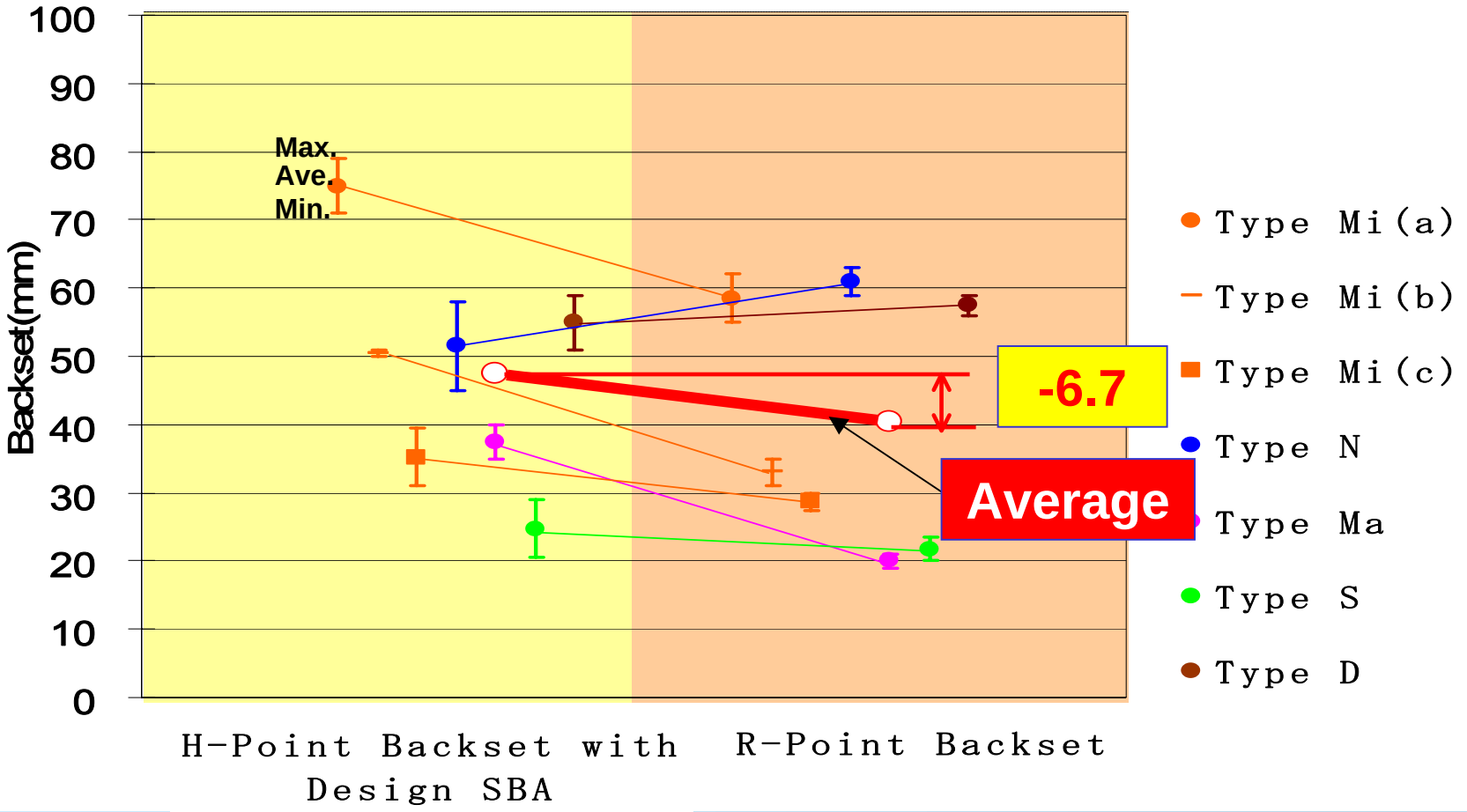
2. Torso Angle Variability of Test Seats

Torso angle measurements were also within the specified tolerance (±3°).



3. Comparative Results of Backset Measurements

While values obtained with the R-point method were somewhat higher or lower for various seats, the R-point measurements were on average 6.7 mm lower.



3. Comparative Summary of Variability and Repeatability

The R-point method yielded better coefficients of variation (CV) for variability and repeatability of measurements.

Type	Measurement Repeatability					
	H-Point Backset with Design SBA		R-Point Backset		H-Point Backset with 25dgree SBA (Reference)	
	Max. Variation (mm)	C.V.	Max. Variation (mm)	C.V.	Max. Variation (mm)	C.V.
Mi(c)	±1.75	5.41	±0.00	1.54	±6.50	13.45
N	±3.00	6.84	±0.50	1.06	±8.00	12.38
Ma	±1.25	2.97	±0.00	2.07	±6.50	13.95
S	±1.75	6.23	±0.50	2.06	±7.50	19.79
D	±3.00	4.93	±0.50	0.54	±6.00	8.04
Ave.	±2.15	5.28	±0.30	1.46	±6.90	13.53

$$C.V = \frac{S_d}{\overline{X}} \; 100\ (\%)$$

$\overline{X}$ = *Mean value of each seat*

S_d = *Standard deviation of each seat*

3. Patterns of Backset Values

Three of the six non-active seats were compatible with the US-proposed H-point backset limit of 55 mm, with allowance for 3σ variability.

Type	H-Point Backset with Design SBA (HA)			R-Point Backset (RA)			RA -HA	Compatibility with H-point≤55
	Actual		3σ	Actual		3σ	Actual	
	Min.	Max.	Max.	Min.	Max.	Max.	Ave.	
Mi(a)	71.0	79.0	82.2	55.0	62.0	65.8	-15.0	FAIL
Mi(b)*1	51.0	50.0	71.0	31.0	35.0	50.5	-17.7	FAIL
Mi(c)	31.0	39.5	42.4	27.5	30.0	31.8	-6.1	PASS
N	45.0	58.0	62.5	59.0	63.0	65.5	11.0	PASS*2
Ma	35.0	40.0	42.5	19.0	21.0	22.6	-17.7	PASS
S	20.5	29.0	32.8	20.0	23.5	25.3	-3.6	PASS
D	51.0	59.0	63.3	56.0	59.0	60.6	1.9	FAIL
Ave.	47.1		56.7	40.1		46.0	-6.7	

***1: Estimated from Mi(a) variability, due to insufficient number of measurements.**

***2 : Determined as ≤80 for a reactive seat.**

4. Conclusions

1. Measurement Method

   The R-point method has higher repeatability.

2. Difference between H-point and R-point measurements

   While theoretically there should be no difference between the average measurements, actual **R-point measurements were about 7 mm lower** because of seat variability patterns.

3. Feasibility of Desired Backset Value

   The feasibility of the US-proposed "H-point backset limit of 55 mm" is verified, based on the design seat back angle, with allowances for production and measurement variations.

   Equivalent R-point backset will be about 48 mm or less.