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J834a

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PASSENGER CAR REAR VISION —SAE J834a

SAE Recommended Practice

Report of Body Engineering Committee approved June 1962 and last revised January 1967.

1. Scope—This SAE Recommended Practice defines basic requirements and related test procedures for evaluating inside and outside rear view mirrors on passenger cars and station wagons.

NOTE: This recommended practice is not intended to cover requirements for backing operations.

2. Definitions

2.1 Binocular—Vision with two eyes.

2.2 Driver Weight—The curb weight, as defined in the SAE Aerospace-Automotive Drawing Standards, Section E1.02, plus 150 lb driver.

2.3 Ellipse—The 95th percentile tangential cutoff of the driver's eye range ellipse described in SAE J941.

2.4 H Point—The pivot center of the manikin thigh and torso, as described in the SAE J826.

2.5 Manufacturer's Design Weight—The curb weight plus passenger load (150 lb each) as reported by the vehicle manufacturer in the AMA specifications report.

2.6 Projected Eye Point—A point on a horizontal plane forward of the mirror at a distance equal to the true distance from the eye to the mirror.

3. Requirements

3.1 Vehicle Loadings—The requirements and related test procedures described in this recommended practice shall be based upon the driver weight or manufacturer's design weight, whichever is the more restrictive.

3.2 Image—The image in inside and outside rear view mirrors shall be clear, undistorted, and of unit magnification. This is not meant specifically to exclude additional devices such as curved mirrors, when they are needed for special purposes, but it should be recognized that their use may require special experience, judgment, and adaptation.

3.3 Reflectivity—Rear view mirrors shall be tested in accordance with the procedures in the SAE J964.

3.4 Mirror Mounting—The mounting of any rear view mirror shall be sufficiently stable to provide a readily distinguishable image to the driver under normal conditions.

3.5 Inside Mirror

3.5.1 LOCATION—Using the drafting room procedures described in paragraph 4, an inside rear view mirror shall, wherever possible, be

located above a horizontal plane tangent to the upper edge of the 95th percentile eye ellipse or below a plane tangent to the lower edge of the 95th percentile eye ellipse and the front end of the sheet metal.

3.5.2 VERTICAL ANGLE OF REAR VISION—The vertical angle of rear vision for an inside rear view mirror shall include at least the horizon and the road 200 ft rear of the driver's H point (Fig. 1).

3.5.3 HORIZONTAL ANGLE OF BINOCULAR REAR VISION—The horizontal angle of binocular rear vision for an inside rear view mirror shall include a field of vision of at least 20 deg (Fig. 1).

3.6 Left-Hand Outside Mirror

3.6.1 LOCATION—Using the drafting room procedures described in paragraph 4, an outside rear view mirror shall be located:

(a) Wherever possible above a horizontal plane tangent to the upper edge of the 95th percentile eye ellipse or below a horizontal plane tangent to the lower edge of this eye ellipse.

(b) So that the combined head and eye movement does not exceed 60 deg.

(c) Avoiding visual obscuration by the unwiped portion of the windshield or by the upper "A" pillar.

NOTE: It is desirable that outside rear view mirrors or controls for adjusting them be within the driver's reach.

3.6.2 VERTICAL ANGLE OF REAR VISION—The vertical angle of rear vision for the left hand outside rear view mirror shall include at least the horizon and the road surface 35 ft rear of the driver's H point (Fig. 1).

3.6.3 HORIZONTAL ANGLE OF BINOCULAR REAR VISION—The horizontal angle of binocular rear vision for an outside left-hand rear view mirror shall include a field of vision of at least 10 deg (Fig. 1).

3.7 Mirror Adjustment—The mirror assembly shall be capable of adjustment which will afford all of the above visual requirements at any point within the 95th percentile eye ellipse.

3.8 Auxiliary Rear Vision Devices—Any rear vision device used in addition to the required rear view mirror systems shall not interfere with the visual requirements of this recommended practice.

3.9 General—Within the visual requirements stated above, rear view mirrors shall be designed, constructed, located, and mounted to minimize the likelihood of injury upon contact.

4. Drafting Procedure

4.1 Inside Rear View Mirror (Fig. 2)

4.1.1 Draw the eye ellipse in two views.

4.1.2 Draw the mirror in the side and plan view in design position. Adjust the mirror inclination angle to accommodate an approximation of point B' (paragraph 4.1.5).

4.1.3 Draw a horizontal line in the side view through the upper point on the mirror reflective surface (point A) forward through the windshield and rearward through the backlight. Lower this line if required to accomplish an unobstructed 20 deg horizontal angle of rear vision. Point A in the plan view is at the mirror's reflective surface mid-point.

4.1.4 Establish point B at the rearmost point on the left-hand eye ellipse in both views.

4.1.5 Construct a true length of line AB in the plan and side view from point A. This new line is AB'.

4.1.6 Construct the projected eye point (point C) in the side view on the horizontal line drawn in paragraph 4.1.3 and in the plan view on a line parallel to the vehicle centerline passing through point A, equal to the length of line AB', from point A.

4.1.7 Construct the mirror rotation angle by bisecting angle CAB' in both views. Adjustment may be necessary at this point to point A if

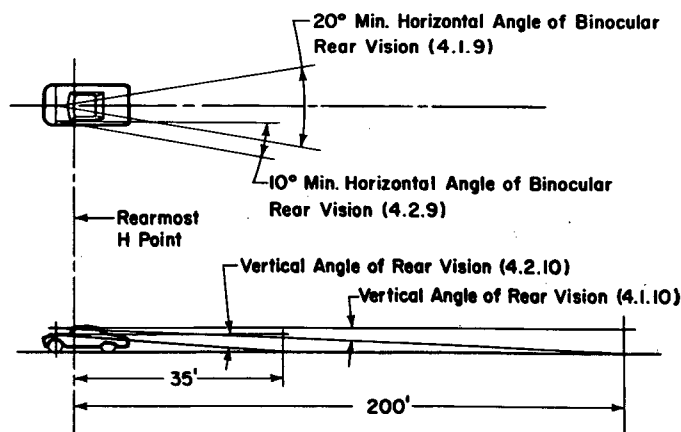


FIG. 1

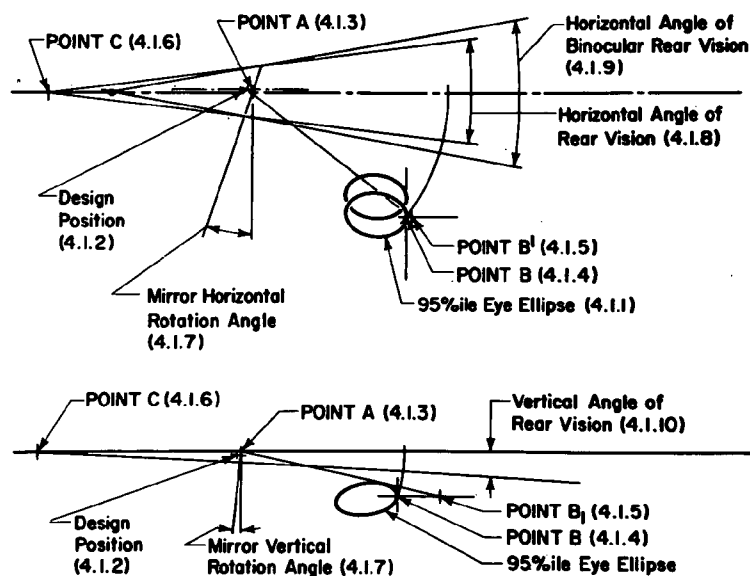


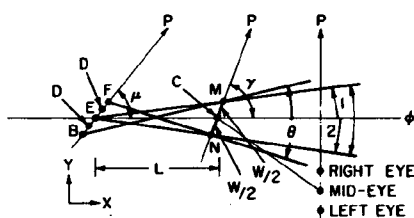
FIG. 2

TABLE 1—INSIDE REAR VIEW MIRROR HORIZONTAL ANGLE OF REAR VISION

The following data is required to use this table.
 1. The width of the mirror reflective surface.
 2. The length of line AB'.
 3. The mirror rotation angle.

NOTE: The monocular rear vision angle may be used in place of the mirror rotation angle when using the in-car checking service.
 See Fig. 3 for graphic illustration.

Length of Line AB'	Width of Mirror Ref. Surface	Rotational Angle, deg									
		14		18		22		26		30	
		Monocular	Binocular	Monocular	Binocular	Monocular	Binocular	Monocular	Binocular	Monocular	Binocular
20	8	22.01	28.14	21.62	27.32	21.12	26.29	20.53	25.06	19.84	23.63
20	9	24.70	30.78	24.27	29.94	23.72	28.88	23.08	27.62	22.32	26.15
20	10	27.36	33.40	26.90	32.54	26.31	31.46	25.61	30.17	24.79	28.66
21	8	20.98	26.84	20.60	26.04	20.13	25.05	19.56	23.86	18.90	22.49
21	9	23.55	29.37	23.13	28.55	22.61	27.52	21.99	26.30	21.26	24.89
21	10	26.10	31.87	25.65	31.03	25.08	29.99	24.40	28.74	23.61	27.28
22	8	20.05	25.65	19.68	24.88	19.22	23.92	18.68	22.77	18.04	21.46
22	9	22.50	28.07	22.10	27.28	21.60	26.29	20.99	25.11	20.29	23.74
22	10	24.94	30.47	24.51	29.66	23.96	28.65	23.31	27.43	22.54	26.02
23	8	19.19	24.56	18.84	23.81	18.39	22.88	17.87	21.78	17.26	20.51
23	9	21.54	26.89	21.15	26.11	20.67	25.16	20.09	24.01	19.41	22.69
23	10	23.88	29.19	23.46	28.40	22.93	27.42	22.30	26.24	21.56	24.87
24	8	18.40	23.56	18.06	22.84	17.64	21.94	17.13	20.87	16.54	19.65
24	9	20.66	25.79	20.29	25.05	19.82	24.12	19.26	23.01	18.60	21.74
24	10	22.91	28.01	22.50	27.24	21.99	26.29	21.38	25.15	20.67	23.83
25	8	17.67	22.64	17.35	21.93	16.94	21.07	16.45	20.04	15.88	18.85
25	9	19.85	24.79	19.49	24.06	19.03	23.16	18.49	22.09	17.86	20.86
25	10	22.01	26.92	21.62	26.18	21.12	25.25	20.53	24.14	19.84	22.86
26	8	17.00	21.78	16.68	21.10	16.29	20.26	15.82	19.26	15.27	18.12
26	9	19.10	23.85	18.75	23.15	18.31	22.28	17.78	21.24	17.17	20.05
26	10	21.18	25.92	20.80	25.19	20.32	24.29	19.75	23.21	19.08	21.97
27	8	16.38	20.99	16.07	20.33	15.69	19.51	15.23	18.55	14.70	17.44
27	9	18.40	22.99	18.06	22.30	17.64	21.46	17.13	20.45	16.54	19.30
27	10	20.41	24.98	20.04	24.27	19.58	23.40	19.02	22.35	18.37	21.15
28	8	15.80	20.25	15.50	19.61	15.13	18.82	14.69	17.88	14.18	16.81
28	9	17.75	22.18	17.42	21.52	17.01	20.70	16.52	19.72	15.95	18.60
28	10	19.69	24.11	19.33	23.42	18.88	22.57	18.34	21.55	17.72	20.39
29	8	15.26	19.56	14.97	18.94	14.61	18.17	14.18	17.27	13.69	16.23
29	9	17.15	21.43	16.83	20.79	16.43	19.99	15.95	19.04	15.40	17.95
29	10	19.03	23.29	18.68	22.62	18.24	21.80	17.71	20.81	17.11	19.68
30	8	14.76	18.92	14.48	18.31	14.13	17.57	13.71	16.69	13.23	15.68
30	9	16.58	20.73	16.27	20.10	15.88	19.32	15.42	18.40	14.88	17.35
30	10	18.40	22.53	18.06	21.88	17.64	21.07	17.13	20.12	16.54	19.02



DERIVATION OF INSIDE MIRROR TABLES:

- C = Projected center of reflective surface
 M, N = End points of projected reflective surface
 L = True distance—eye mid-point to reference point, M
 γ = Mirror angle to vehicle centerline
 D = Half of inter-ocular distance
 φ = Monocular angle of rear vision
 θ = Binocular angle of rear vision

MONOCULAR ANGLE — φ:

$$\begin{aligned}
 X_B &= X_C - L \\
 Y_B &= Y_C \\
 X_M &= X_C + W/2 \cos \gamma \\
 Y_M &= Y_C + W/2 \sin \gamma \\
 X_N &= X_C - W/2 \cos \gamma \\
 Y_N &= Y_C - W/2 \sin \gamma \\
 \phi_1 &= \tan^{-1} \left(\frac{Y_M - Y_C}{X_M - X_B} \right) \\
 \phi_2 &= \tan^{-1} \left(\frac{Y_N - Y_C}{X_N - X_B} \right) \\
 \phi &= \phi_1 + \phi_2
 \end{aligned}$$

BINOCULAR ANGLE — θ:

$$\begin{aligned}
 \mu &= 2\gamma - \pi/2 \\
 X_F &= X_B + D \cos \mu \\
 Y_F &= Y_B + D \sin \mu \\
 X_B &= X_E - D \cos \mu \\
 Y_B &= Y_E - D \sin \mu \\
 S &= \frac{X_N X_F}{X_M X_B} \\
 \theta &= \tan^{-1} \left(\frac{S - T}{S + T} \right)
 \end{aligned}$$