MOTOR VEHICLE SEAT BELT ASSEMBLIES - SAE J4a

SAE Standard

Report of Motor Vehicle Seat Belt Committee approved November 1955 and last revised April 1963.

SAE Standards and Recommended Practices are subject to frequent change to keep pace with experience and technical advances. Hence, the inclusion of the requirements specified in this SAE Standard in State or Federal laws where flexibility of revision is lacking, is discouraged.

1. SCOPE

1.1 This SAE Standard applies to single occupancy, lap type seat belt assemblies intended for installation in motor vehicles. It specifies performance requirements and laboratory test procedures for such assemblies.*

2. WEBBING

2.1 Requirements

2.1.1 Elongation - Elongation of the webbing should not exceed 20% under 2500 lb tensile test load.

2.1.2 Width - Portions of the belt webbing which may come in contact with the occupant should be not less than 1-7/8 in. wide under no load and not less than 1-13/16 in. wide when subjected to a load of 2500 lb.

2.1.3 Mininum Tensile Strength - The rated minimum tensile strength of the webbing should be not less than 5000 lb when tested in accordance with Item 2.2.3.

2.1.4 Resistance to Abrasion - After the webbing is subjected to the abrasion test specified in Item 2.2.4, the webbing shall retain a minimum tensile strength of 3600 lb.

2.1.5 Color and Light Fastness - The following requirements are listed in order to give reasonable assurance that the dye in the webbing will not harm clothing or that the color of the webbing will not substantially change.

(a) Color Fastness - For crock, both wet and dry, equal to or better than class 3 in the AATCC Chart for Measuring Transference of Color. (This requires the use of Method 5650 of Federal Standard CCC-T-191B.)

(b) Light Fastness - Webbing should have a light fastness rating to Fair to 40 hr when tested in accordance with Method 5660 of Federal Standard CCC-T-191B.

2.2 Test Procedures

2.2.1 Elongation Test - When webbing samples are being prepared for the webbing tensile test (Item 2.2.3) they should be marked for elongation testing in the following manner: while subjected to a dead weight of 5 lb the samples shall be inscribed with calibration marks 8 in. apart and equidistant from each end.

When 2500 lb are reached during the webbing tensile test, the distance between calibration marks shall be measured to the nearest 1/25 in. and recorded. (Each 1/25 in. in excess of 8 in. represents 1/2% elongation.)

NOTE: Separation of jaws should not be stopped while this measurement is being made.

2.2.2 Width - At the time sample is being prepared for the elongation test the width should be measured and recorded. The width shall be remeasured and recorded at the time elongation is recorded.

2.2.3 Tensile Test - Three samples of the webbing should be tested to determine compliance with the width, minimum strength, and elongation requirements given in the preceding sections. The tensile tests should be made on samples which are at equilibrium with an atmosphere having a relative humidity of not more than 67% and a temperature of not more than 80 F. The samples should be tested in a suitable testing machine, using grips conforming to USAF Air Materiel Command Drawings MIL-330, 330-1, 330-3, and 330-4.* The samples should be mounted in the machine when the grips are 10 to 12 in. apart. The machine heads should separate at a maximum rate of 4 in./minute under no load. Each test sample of the webbing should withstand a load at least equal to its rated minimum tensile strength, for at least 3 sec without failure. Each sample shall comply with the width and elongation requirements forming part of the standard.

2.2.4 Abrasion Test - The webbing shall be tested for abrasion resistance on the device shown schematically in Fig. 1. The webbing A shall have one end attached to weight B. The webbing shall pass over the hexagonal bar C (so positioned that two edges of the bar are used in the abrasion) and shall be attached to the oscillating drum D. The drum shall oscillate so that the webbing is given a 13 in. traverse over the bar at the rate of 60 ± 2 strokes per minute. Each stroke represents a 13 in. traverse in a single direction. Suitable guides shall be used to prevent lateral webbing movement parallel to the hexagonal bar axis. After 5000 strokes the webbing shall be removed and the minimum tensile strength shall be determined as specified in Item 2.2.3. New abrading edges of hexagonal bar C shall be used for each specimen tested. Weight B shall be 5.2 lb ± 2 oz.

3. BUCKLE

3.1 Requirements

3.1.1 Maximum Buckle Release Force - The belt buc should release when a releasing force of not more than 30 lb is applied, when tested in accordance with Item 3.2.1.

*Compliance with the requirements of this SAE Standard does not provide assurance that when the seat belt assembly is installed, the floor pan washers or other car structure reinforcing plates supplied with the seat belt will be adequately strong to sustain the test load specified in Paragraph 4.1.1 for the belt assembly. Generally, a test of an installation in a car is necessary to determine the adequacy of the reinforcing plates. For recent models, data on tested anchorage installations can be obtained from the vehicle manufacturer. See also SAE Recommended Practice, Motor Vehicle Seat Belt Anchorage - SAE J787.

*Copies of these drawings may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York 17, N. Y.

3.1.2 Release and Latching Mechanism under No Load - When tested as specified in Item 3.2.2 the movement, by hand, of the buckle release and latching parts through their maximum travel shall not produce any galling or wearing of buckle or cause any failure.

3.1.3 General - Any metal to metal buckle should be checked to determine that there is no danger of latching in a manner resulting in reduced strength or holding ability; it shall not be possible to obtain partial engagement by means of any technique representative of actual use. The buckle and mating metal plate, when in partial engagement, must separate under a tensile load of 5 lb or less, or meet minimum strength requirements specified in Item 4.1.1.

3.1.4 Belt Adjustment Force - The initial belt adjustment force, when tested in accordance with Item 3.2.3, shall not exceed 40 lb.

3.2 Test Procedures

3.2.1 Maximum Buckle Release Force Test - Three belt assemblies should be tested to determine compliance with the maximum buckle release force requirement. The belt assemblies used in the Rated Minimum Strength Test may be used for this test. The load applied as recommended in Item 4.2.1 should now be reduced to a loop load of 150 lb, and while maintaining this reduced load, the buckle release force should be measured. The buckle release force should be applied in a manner and direction typical of that which would be employed by the seat belt occupant. For lever release buckles, the force may be applied on the centerline of the buckle lever or finger tab, 1/8 in. from its edge and in such direction as to produce maximum releasing effect. A 3/32 in. dia hole may be drilled through the buckle tab on lever at this application point, and a small loop of soft wire may be used as the connection link between the buckle tab or lever and the force measuring scale. The release force, so measured, should be in conformity with the recommendations in Item 3.1.1.

3.2.2 Release and Latching Mechanism under No Load - Prior to performing the following test procedure the buckle shall be run in by precycling at least 10 times through the complete travel of the latch.

The two sections of the belt shall be connected together as in the normal use of the belt. The buckle shall be clamped or firmly held against a flat surface so as to permit normal movement of buckle parts. With the metal mating plate (metal-to-metal buckles) or webbing end (metal-to-webbing buckles) withdrawn from the buckle, the release mechanism shall be moved through the maximum possible travel against its stop with a force of 30 lb, 200 times, at a rate not to exceed 30 cycles per minute. This may be done by hand. The buckle shall be examined to determine compliance with the performance requirements of Section 3.1.2.

3.2.3 Belt Adjustment Force Test - The seat belt assembly is suspended vertically by one anchor end so that the ends of the adjustable webbing sections hang down. A 3 lb weight is attached to the lower (anchor) end of the suspended belt. The belt adjustment force is the maximum amount of downward force required on the adjustable webbing end to raise the weight.

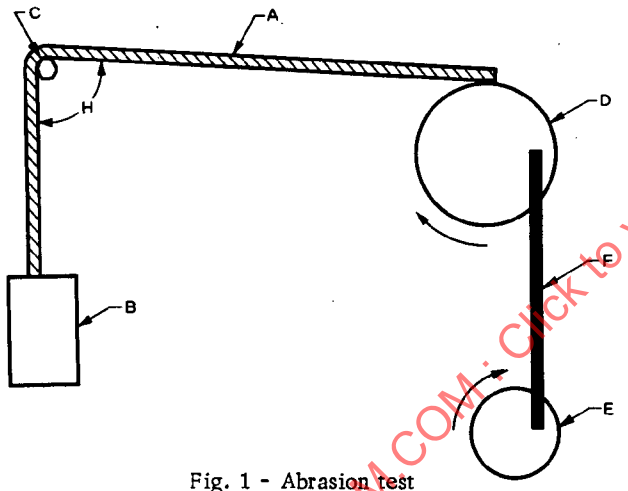

Fig. 1 - Abrasion test

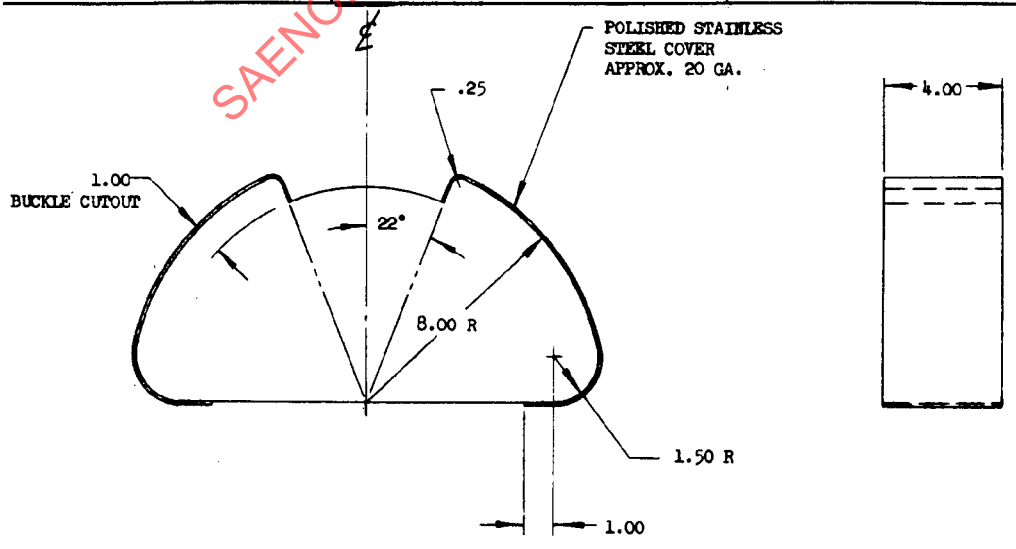

Fig. 2 - Body block

test report should describe the test mounting of the belt assembly giving pertinent angles and dimensions. At least 2 in. of the free end of the webbing should extend beyond the adjusting means located at or near the buckle. Where the belt manufacturer has made provision in the belt assembly, and has so indicated in the instruction sheet, that the belt is normally worn with the buckle in the center of the body, the test shall be conducted with the buckle in the center of the body block. Where no provision of this kind is made and indicated, the belt shall be adjusted so that the buckle is at the side of the body block during the test, as shown in Fig. 3.

In preparation for the test, care should be taken to lock the cam type buckle with only the static force of the spring. It must not be jammed down or allowed to snap down.

Before the load is applied, the webbing should be marked at the unloaded side of each piece of hardware in the belt assembly. After loading belt assembly and releasing load as described in Item 3.2.1, total slippage measurement should be determined from markings and should not exceed amount specified in Item 4.1.2. Load should be applied so as to cause the body block to move at a maximum rate of 4 in./minute under no load. Each sample tested should develop no less than the rated minimum strength specified in Item 4.1.1. At this point, the test may continue for buckle release force as outlined in Item 3.2.2.

5. METAL PARTS

5.1 Burrs and Sharp Edges - All metal parts should be free from burrs and sharp edges.

5.2 Corrosion Test - Mounting hardware exposed to the weather (floor bolts, washers, and so forth) should be subjected to a salt spray (fog) test in accordance with ASTM B 117-61, Method of Salt Spray (Fog) Testing, for a period of 50 hr, consisting of two periods of 24 hr, exposure and 1 hr drying time each. There should be no evidence of excessive corrosion immediately after the above test has been completed, such as would affect the proper functioning of the device.

6. RETRACTION DEVICES - If the seat belt is equipped with a webbing retraction or stowing device, this device is to be considered as part of the belt assembly. A device shall not be considered acceptable if its design or use can result in less occupant restraint against movement than is provided by a seat belt without such a device. With a nonlocking device the webbing must extend fully to its positive anchorage position when the belt is tightened normally with the buckle fastened.

APPENDIX

This Appendix is intended as a guide to aid in establishing the angles to be used in the testing of seat belts so that the laboratory test will simulate as nearly as practical actual loading in the vehicle. The lateral spacing of attachment fittings and the angles a, b, and c (See Fig. 3) are to be obtained from the seat belt instruction sheet or from the seat belt supplier.

Angle a, indicated in Fig. 3 as 90 deg, is the angle the webbing twists between the body block and the attachment fittings. Angles b and c are the angles between the centerline of the webbing and a convenient reference line of each of the attachment fittings, taken in two views normal to each other. Angles a, b, and c represent angles which would result from vehicle installation. For example, angle a can vary from 0 to 90 deg depending on how the attachment fittings are installed in the vehicle. Angle b is obtained in the vehicle by viewing from the rear, normal to the webbing centerline; angle c is obtained by viewing from the side, normal to the webbing centerline and 90 deg opposed to angle b. For belts intended for use with adjustable vehicle seats, these angles should be obtained with the seat in its full forward and full down positions. For fitting attachment to structure other than the floor, similar spacing and angle instructions should be used.

For any seat belt assembly, angles a, b, and c should be obtained to the nearest 5 deg increment, and when less than 5 deg, these angles may be neglected, if desired.

For any seat belt assembly where more than one spacing is required for installation in different model vehicles, it may be necessary to check the different spacings with their corresponding angles a, b, and c, to determine the most adverse condition.

After the attachment fittings are aligned with the webbing using angles a, b, and c, the fittings should then be attached to the testing machine, with suitable fixtures, to maintain this alignment under the no-load condition. During loading this alignment may change due to the stressing or distortion of the fittings.

For the laboratory test setup a 19-1/2 to 20-1/2 in. dimension from the top of the body block to the transverse fitting attachment line, Fig. 3, is to be used when seat belt attachments are mounted directly to the vehicle structure (namely: floor pan, wheelhouse, doors, and so forth).

If the seat belt is intended for attachment to the seat structure and if that structure were originally designed or reinforced to withstand the seat belt loads, a 13-1/2 to 14-1/2 in. dimension should then be used from the top of the body block to the transverse fitting attachment line.

NOTE: SAE Information Report, Motor Vehicle Seat Belt Installations-- SAE J800 may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.

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