

DYNAMIC TEST PROCEDURE - TYPE 1 AND TYPE 2 SEAT BELT ASSEMBLIES—SAE J117

SAE Recommended Practice

Report of Motor Vehicle Seat Belt Committee approved January 1970.

1. SCOPE

This SAE Recommended Practice establishes a dynamic test procedure for evaluating Type 1 lap belt assemblies for pelvic restraints and Type 2 assemblies for combination pelvic and upper torso restraints, as defined in SAE J4c. Uniform test requirements, test procedures, a seat belt assembly loading device, and data recording requirements are specified.

The intent of the recommended practice is to provide an acceptance procedure employing a dynamic test method for determining the ability of seat belt assemblies to meet minimal requirements for restraining a seat belt assembly loading device. A simple dynamic test is described which will yield repeatable and comparable results while simulating the loading condition a seat belt assembly is subjected to in a frontal accident. The impact conditions generate belt loads representative of those obtained in a motor vehicle striking a rigid barrier head on at 30 mph as stated in SAE J850.

2. GENERAL TEST REQUIREMENTS

The dynamic test facility for acceptance testing of Type 1 and Type 2 seat belt assemblies shall provide a reliable, accurate, and repeatable testing device readily adaptable for mounting various attachment hardware and special accessories supplied by seat belt manufacturers. The facility shall consist of the following basic components and design features.

2.1 A structurally rigid acceleration platform shall be provided for securing the seat belt attachment hardware and mounting a support for a seat belt loading device.

2.2 A track or guide path shall be provided to permit only the longitudinal movement of the acceleration platform during the test, thus preventing the platform from pitching, yawing, or rolling.

2.3 A support for the seat belt loading device shall be rigidly attached to the acceleration platform. If the support is a seat, that seat and seat back shall be rigid. A recommended seat configuration including dimensions is given in Fig. 1.

2.4 A seat belt assembly loading device shall be used to represent a restrained occupant, as outlined in paragraph 5.

2.5 The longitudinal acceleration of the platform shall be defined by the following parameters:

2.5.1 Maximum peak acceleration, 30 g — Transient accelerations above 30 g shall not have a duration of more than 3 ms as measured at the 30 g level and shall not exceed 50 g.

2.5.2 The maximum rate of acceleration shall be 2000 g/sec. Rates of acceleration greater than 2000 g/sec are allowable if they persist for less than 5 ms.

2.5.3 Acceleration pulse lengths shall not be less than 50 ms nor greater than 150 ms.

2.6 Adjust test parameters within the limits specified to produce the following seat belt loads:

(a) Lap belt only — 5000 lb minimum, total load.

(b) Combined restraint — 6000 lb minimum, total load (load divided 50% in upper torso and 50% in lap belt portion, $\pm 10\%$).

(c) Lap belt of combined restraint — If the lap belt of the combined restraint can be worn alone it shall also meet the requirements of paragraph 2.6 (a).

The above loads shall be measured as close as practical to the anchorages. The total loads consist of the arithmetic sum of the peak anchorage loads.

2.7 If the seat belt assembly under test includes a force limiting device(s) or webbing having elongation greater than 20% or less than 14%, the assembly shall be tested with the test parameters defined in paragraphs 2.5 and 2.6 and determined by the use of a calibrating seat belt assembly.

2.7.1 The calibrating seat belt assembly shall be fabricated to duplicate the seat belt assembly under test, except

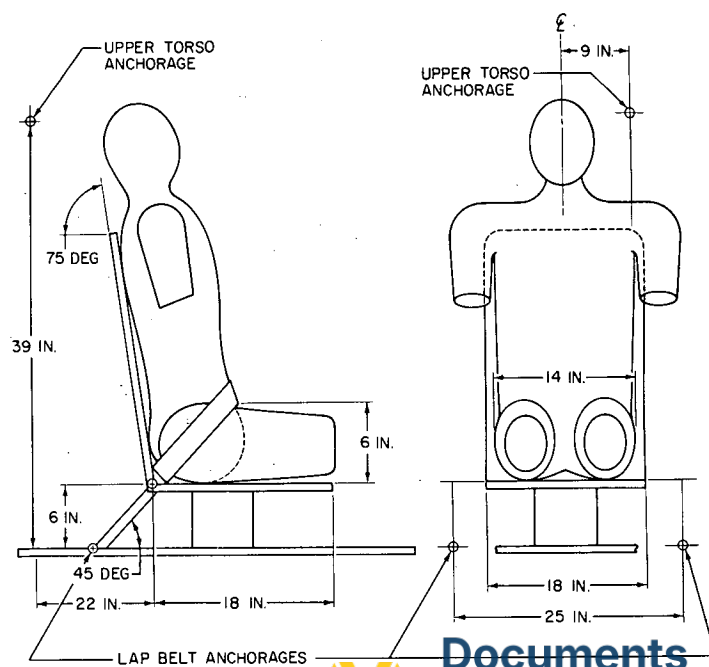


Fig. 1 - A recommended seat belt loading device and seat configuration

it shall utilize webbing of $17 \pm 3\%$ elongation (as determined by paragraph 7.3 of SAE J4c).

3. TEST PROCEDURE

3.1 A minimum of three seat belt assemblies, including webbing, straps, buckles, adjustment and attachment hardware, shall be dynamically tested in accordance with paragraphs 3.2-3.4. All devices considered part of the seat belt assembly and which can affect the performance of the assembly (for example, retractors, energy absorbers) shall be installed in accordance with the manufacturer's instructions and included in the test.

3.2 The seat belt assembly shall be tested in the geometry shown in Fig. 1 or, where appropriate, using the geometry specified for a designated vehicle installation.

3.3 The seat belt assembly loading device shall be installed so as to maintain the pretest belt loading and slack up to the point of application of the test load.

3.4 The seat belt assembly shall be fitted to the loading device in accordance with the supplier's instructions and adjusted to the following specification.

3.4.1 The adjustment for Type 1 seat belt assembly shall be standardized by preloading the lap loop to 10 ± 1 lb (5 lb at each attachment) if no emergency locking or automatic locking mechanism is provided. If an emergency locking or automatic locking mechanism is provided, the belt assembly shall be adjusted for minimum slack or minimum preloading.

3.4.2 The adjustment for Type 2 and Type 2a pelvic section of the seat belt assembly shall be standardized by preloading the lap loop to 10 lb (5 ± 1 lb at each attachment), if no emergency locking or automatic locking mechanism is provided. If an emergency locking or automatic locking mechanism is provided, the lap loop shall be adjusted for minimum slack or minimum preloading.

The adjustment for Type 2 and Type 2a upper torso section of the seat belt assembly shall be standardized by placing one (or more, where appropriate, for each strap) 3 in. cube ($3 \times 3 \times 3$ in.) spacer block between the upper torso belt(s) and the loading device at the approximate height of the sternum, before adjusting the upper torso belt, if no emergency locking or automatic locking mechanism is provided. The adjustment for the upper torso restraint shall be standardized by preloading the torso section to 5 ± 1 lb. If more than one attachment is used, the 5 lb preload shall be equally divided between the attachments. Before testing, the spacer shall be removed without changing the belt adjustment. If an emergency locking or automatic locking mechanism is provided, the shoulder section shall be adjusted for minimum slack or minimum preloading.

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3.5 The seat belt assembly shall be subjected to the acceleration time defined in paragraph 2.5. The direction of the impulse shall be parallel to the longitudinal axis of the acceleration platform.

4. ACCEPTANCE RECORDS

4.1 The time history of the acceleration applied to the longitudinal axis of the acceleration platform shall be recorded during each test by appropriate and properly calibrated instrumentation.

4.2 The time history of the restraint loads specified in paragraph 2.6 shall be recorded during each test by appropriate and properly calibrated instrumentation.

4.3 The frequency response of the instrumentation shall be flat from d-c to 150 Hz. Higher frequencies may be attenuated.

4.4 The maximum forward position of the test device or seat belt assembly relative to the acceleration platform shall be recorded during each test. All seat belt assembly displacement measurements shall be measured parallel to the direction of the impulse and recorded with an accuracy of ± 0.5 in. or less, according to the following procedure.

4.4.1 For the Type 1 seat belt assembly only, the maximum forward longitudinal displacement shall be recorded.

4.4.2 For the Type 2 seat belt assembly, the maximum forward displacement of two points shall be recorded.

(Displacement transducers are acceptable in lieu of high speed motion pictures.)

5. SEAT BELT ASSEMBLY LOADING DEVICE

5.1 The loading device for a Type 1 lap belt assembly may be a block without moving parts which engages the lap belt in a manner simulating the belt being worn over the hips in accordance with paragraph 3.4. The engagement shall be on a curved surface having a minimum width of 14 in. as shown in Fig. 1.

5.2 The loading device for the Type 2 lap belt and upper torso restraint shall generally simulate the torso of an adult human being. The area of engagement of the lap belt portion of the restraint shall be as shown in Fig. 1. The loading device shall allow for differential forward motion of the lap and upper torso. This may be accomplished by allowing a rigid form to rotate in a forward direction or by providing articulation at the hip locations.

5.3 All areas of the loading device which contact the seat belt assembly may have padding of a compliant material which will prevent metallic parts from engaging a rigid surface on the loading device and permit some adjustment of the webbing of the restraint.

5.4 Weight of loading device shall be 125–175 lb.

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