Transport Canada
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Road Safety

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Standards and Regulations Division

TEST METHOD SECTION 209

Seat Belt Assemblies

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Motor Vehicle Standards and Research Branch
Road Safety and Motor Vehicle Regulation Directorate
TRANSPORT CANADA
Ottawa, Ontario
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TEST METHOD SECTION 209 — SEAT BELT ASSEMBLIES

1. INTRODUCTION

Subsection 2 of this section makes up the test methods referred to in Section 209 of Schedule D to the Motor Vehicle Safety Regulations, which I approve for demonstrating compliance with the requirements of that section.

(Original signed by)

Gordon D. Campbell
for Minister of Transport,
Ottawa

2. TEST PROCEDURES

2.1 WEBBING

2.1.1 Width

The width of webbing from three seat belt assemblies shall be measured after conditioning for at least 24 hours in an atmosphere having a relative humidity between 48 and 67 percent and temperature of 23°C ± 2°C (73.4°F ± 3.6°F). The tension during measurement of width shall be not more than 22 N (5 pounds) on webbing from a Type 1 seat belt assembly, and 9.8 kN ± 0.4 kN (2 200 ± 100 pounds) on webbing from a Type 2 seat belt assembly. The width of webbing from a Type 2 seat belt assembly may be measured during the breaking strength test described in paragraph 2.1.2.

2.1.2 Breaking Strength

Webbing from three seat belt assemblies shall be conditioned in accordance with paragraph 2.1.1 and tested for breaking strength in a testing machine of suitable capacity verified to have an error of not more than 1 percent in the range of the breaking strength of the webbing in accordance with "Standard Methods of Load Verification of Testing Machines", American Society for Testing and Materials (ASTM) Designation: E4–79.

The machine shall be equipped with split drum grips illustrated in Figure 1, having a diameter between 50 mm and 100 mm (2 and 4 inches). The rate of grip separation shall be between 50 mm

and 100 mm (2 and 4 inches) per minute. The distance between the centres of the grips at the start of the test shall be between 100 mm and 250 mm (4 and 10 inches). After placing the specimen in the grips, the webbing shall be stretched continuously at a uniform rate to failure. The median value shall be used for determining the retention of breaking strength in paragraphs 2.1.4, 2.1.5 and 2.1.6.

2.1.3 Elongation

Elongation shall be measured during the breaking strength test described in paragraph 2.1.2 by the following procedure: A preload between 196 N and 245 N (44 and 55 pounds) shall be placed on the webbing mounted in the grips of the testing machine and the needle points of an extensometer, in which the points remain parallel during test, are inserted in the centre of the specimen. Initially the points shall be set at a known distance apart between 100 mm and 200 mm (4 and 8 inches). When the force on the webbing reaches the value specified in paragraph 209(7)(f) of Schedule D to the Motor Vehicle Safety Regulations the increase in separation of the points of the extensometer shall be measured and the percent elongation shall be calculated to the nearest 0.5 percent.

2.1.4 Resistance to Abrasion

The webbing from three seat belt assemblies shall be tested for resistance to abrasion by rubbing over the hexagon bar prescribed in Figure 2 in the following manner: The webbing shall be mounted in the apparatus shown schematically in Figure 2. One end of the webbing (A) shall be attached to a weight (B) which has a mass of 2.35 kg ± 0.05 kg (5.2 ± 0.1 pounds). The webbing shall be passed over the two new abrading edges of the hexagon bar (C) and the other end attached to an oscillating drum (D) which has a stroke of 330 mm (13 inches). Suitable guides shall be used to prevent movement of the webbing along the axis of hexagonal bar C. Drum D shall be oscillated for 5 000 strokes or 2 500 cycles at a rate of 60 ± 2 strokes per minute or 30 ± 1 cycles per minute. The abraded webbing shall be conditioned as prescribed in paragraph 2.1.1 and tested for breaking strength by the procedure described in paragraph 2.1.2. The median values for the breaking strengths determined on abraded and unabraded specimens shall be used to calculate the percentage of breaking strength retained.

2.1.5 Resistance to Light

Webbing at least 500 mm (20 inches) in length from three seat belt assemblies shall be suspended vertically on the inside of the specimen rack in a Type E carbon-arc light-exposure apparatus described in Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials, ASTM Designation G23–81, published by the American Society for Testing and Materials, except that the filter used for 100 percent polyester yarns shall be chemically strengthened soda-lime glass with a transmittance of less than 5 percent for wave lengths equal to or less than 305 nanometers and 90 percent or greater transmittance for wave lengths of 375 to 800 nanometers. The apparatus shall be operated without water spray at an air temperature of 60° ± 2°C (140°F ± 3.6°F) measured at a point 25 mm ± 5 mm (1 ± 0.2 inch) outside the specimen rack and midway in height. The temperature sensing element shall be shielded from radiation. The specimens shall be exposed to the light from the carbon arc for 100 hours and then conditioned as prescribed in paragraph 2.1.1. The colour-fastness of the exposed and conditioned specimens shall be determined on the Geometric Gray Scale issued by the American Association of Textile Chemists and Colorists (AATCC). The breaking strength of the specimens shall be determined by the procedure prescribed in paragraph

2.1.2. The median values for the breaking strengths determined on exposed and unexposed specimens shall be used to calculate the percentage of breaking strength retained.

2.1.6 Resistance to Micro-Organisms

Webbing at least 500 mm (20 inches) in length from three seat belt assemblies shall first be preconditioned in accordance with Appendix A(1) and (2) of AATCC Test Method 30–81, "Fungicides Evaluation of Textiles: Mildew and Rot Resistance of Textiles", and then subjected to Test I, "Soil Burial Test" of that test method. The breaking strengths of the specimens shall be determined by the procedure prescribed in paragraph 2.1.2. The median values for the breaking strengths determined on exposed and unexposed specimens shall be used to calculate the percentage of breaking strength retained.

Note: This test shall not be required on webbing made from material which is inherently resistant to micro-organisms.

2.1.7 Colourfastness to Crocking

Webbing from three seat belt assemblies shall be tested by the procedure specified in AATCC Standard Test Method 8–1981, "Colourfastness to Crocking: AATCC Crockmeter Method".

2.1.8 Colourfastness to Staining

Webbing from three seat belt assemblies shall be tested by the procedure specified in AATCC Standard Test Method 107–1981, "Colourfastness to Water", except that the testing shall use the following: (1) distilled water, (2) the AATCC perspiration tester, (3) a drying time of four hours, specified in section 7.4 of the AATCC procedure, and (4) section 9 of the AATCC test procedures to determine the colourfastness to staining on the AATCC Chromatic Transference Scale.

2.2 HARDWARE

2.2.1 Corrosion Resistance

Three seat belt assemblies shall be tested by "Standard Method of Salt Spray (Fog) Testing", ASTM Designation: B117–73. Any surface coating or material not intended for permanent retention on the metal parts during service life shall be removed prior to preparation of the test specimens for testing. The period of test shall be 50 hours for all attachment hardware at or near the floor, consisting of 2 periods of 24 hours exposure to salt spray followed by 1 hour drying and 25 hours for all other hardware, consisting of 1 period of 24 hours exposure to salt spray followed by 1 hour drying. In the salt spray test chamber, the parts from the three assemblies shall be oriented differently selecting those orientations most likely to develop corrosion on the larger areas. At the end of test, the seat belt assembly shall be washed thoroughly with water to remove the salt. After drying for at least 24 hours under standard laboratory conditions specified in paragraph 2.1.1 attachment hardware shall be examined for ferrous corrosion on all surfaces that can be contacted by a sphere 19 mm (0.75 inch) in diameter, and other hardware shall be examined for ferrous and nonferrous corrosion which may be transferred, either directly or by means of the webbing, to a person or his clothing during use of a seat assembly incorporating the hardware.

Note: When attachment and other hardware are permanently fastened, by sewing or other means, to the same piece of webbing, separate assemblies shall be used to test the two types of hardware. The test for corrosion resistance shall not be required for attachment hardware made from corrosion-resistant steel containing at least 11.5 percent chromium or for attachment hardware protected with an electrodeposited coating of nickel, or copper and nickel, as prescribed in paragraph 209(12)(b) of Schedule D to the Motor Vehicle Safety Regulations. The assembly that has been used to test the corrosion resistance of the buckle shall be used to measure adjustment force, tilt-lock adjustment, and buckle latch in paragraph 2.2.5, 2.2.6, and 2.2.7, respectively, assembly performance in paragraphs 2.3.1, 2.3.2, and 2.3.3 and buckle release force in paragraph 2.2.4.

2.2.2 Temperature Resistance

Three seat belt assemblies having plastic or nonmetallic hardware or having retractors shall be subjected to the conditions prescribed in Procedure D of ASTM "Standard Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions", ASTM D 756–78. The dimension and weight measurement shall be omitted. Buckles shall be unlatched and retractors shall be fully retracted during conditioning. The hardware parts after conditioning shall be used for all applicable tests.

2.2.3 Attachment Hardware

a) Attachment bolts used to secure the pelvic restraint of a seat belt assembly to a motor vehicle shall be tested in a manner similar to that shown in Figure 3. The load shall be applied at an angle of 45° to the axis of the bolt through attachment hardware from the seatbelt assembly, or through a special fixture which simulates the loading applied by the attachment hardware. The attachment hardware or simulated fixture shall be fastened by the bolt to the anchorage shown in Figure 3, which has a standard 7/16–20 UNF–2B or ½–13 UNC–2B threaded hole in a hardened steel plate at least 10 mm (0.4 inch) in thickness. The bolt shall be installed with two full threads exposed from the fully seated position. The appropriate force required by paragraph 209(13)(a) of Schedule IV to the Motor Vehicle Safety Regulations shall be applied. A bolt from each of three seat assemblies shall be tested.

b) Attachment hardware, other than bolts, designed to receive the ends of two seat belt assemblies shall be subjected to a tensile force of 26.7 kN (6 000 pounds) in a manner simulating use. The hardware shall be examined for fracture after the force is released. Attachment hardware from three seat belt assemblies shall be tested.

c) Single attachment hook for connecting webbing to any eye bolt shall be tested in the following manner: the hook shall be held rigidly so that the retainer latch or keeper, with cotter pin or other locking device in place, is in a horizontal position as shown in Figure 4. A force of 666 N ± 9 N (150 ± 2 pounds) shall be applied vertically as near as possible to the free end of the retainer latch, and the movement of the latch by this force at the point of application shall be measured. The vertical force shall be released, and a force of 666 N ± 9 N (150 ± 2 pounds) shall be applied horizontally as near as possible to the free end of the retainer latch. The movement of the latch by this force at the point of load application shall be measured. Alternatively, the hook may be held in other positions, provided the forces are applied and the movements of the latch are

measured at the points indicated in Figure 4. A single attachment hook from each of three seat belt assemblies shall be tested.

2.2.4 Buckle release

a) Three seat belt assemblies shall be tested to determine compliance with the maximum buckle release force requirements, following the assembly test in subsection 2.3. After subjection to the force applicable for the assembly being tested, the force shall be reduced and maintained at 666 N (150 pounds) on the assembly loop of a Type 1 seat belt assembly, or 333 N (75 pounds) on the components of a Type 2 seat belt assembly. The buckle release force shall be measured by applying a force on the buckle in a manner and direction typical of those which would be employed by a seat belt user. For pushbutton-release buckles, the force shall be applied at least 3.18 mm (0.125 inch) from the edge of the pushbutton access opening of the buckle in a direction that produces maximum releasing effect. For lever-release buckles, the force shall be applied on the centerline of the buckle lever or finger tab in a direction that produces maximum releasing effect.

b) The area for application of release force on a pushbutton actuated buckle shall be determined to the nearest 32 mm^2 (0.05 square inch). The cylinder specified in subparagraph 209(20)(c) (ii) of Schedule D to the Motor Vehicle Safety Regulations shall be inserted in the actuation portion of a lever released buckle for determination of compliance with the requirement. A buckle with other release actuation shall be examined for access of release by fingers.

c) The buckle of a Type 1 or Type 2 seat belt assembly shall be subjected to a compressive force of 1780 N (400 pounds) applied anywhere on a test line that is coincident with the centerline of the belt extended through the buckle or on any line that extends over the center of the release mechanism and intersects the extended centerline of the belt at an angle of 60°. The load shall be applied by using a curved cylindrical bar having a cross section diameter of 19 mm (0.75 inch) and a radius of curvature of 150 mm (6 inches), placed with its longitudinal centerline along the test line and its center directly above the point on the buckle to which the load will be applied. The buckle shall be latched, and a tensile force of 333 N (75 pounds) shall be applied to the connected webbing during the application of the compressive force. Buckles from three seat belt assemblies shall be tested to determine compliance with subparagraph 209(20)(b) of Schedule D to the Motor Vehicle Safety Regulations.

2.2.5 Adjustment force

Three seat belt assemblies shall be tested for adjustment force on the webbing at the buckle, or other manual adjusting device normally used to adjust the size of the assembly. With no load on the anchor end, the webbing shall be drawn through the adjusting device at a rate of 500 mm/min ± 50 mm/min (20 ± 2 inches per minute) and the maximum force shall be measured to the nearest 1.1 N (0.25 pound) after the first 25 mm (1 inch) of webbing movement. The webbing shall be precycled 10 times prior to measurement.

2.2.6 Tilt-lock adjustment

This test shall be made on buckles or other manual adjusting devices having tilt-lock adjustment normally used to adjust the size of the assembly. Three buckles or devices shall be tested. The base of the adjustment mechanism and the anchor end of the webbing shall be oriented in planes normal to each other. The webbing shall be drawn through the adjustment mechanism in a direction to increase belt length at a rate of 500 mm/min ± 50 mm/min (20 ± 2 inches per minute) while the plane of the base is slowly rotated in a direction to lock the webbing. Rotation shall be stopped when the webbing locks, but the pull on the webbing shall be continued until there is a resistance of at least 89 N (20 pounds). The locking angle between the anchor end of the webbing and the base of the adjustment mechanism shall be measured to the nearest degree. The webbing shall be pre-cycled 10 times prior to measurement.

2.2.7 Buckle latch

The buckles from three seat belt assemblies shall be opened fully and closed at least 10 times. Then the buckles shall be clamped or firmly held against a flat surface so to permit normal movement of buckle parts, but 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 200 times through the maximum possible travel against its stop with a force of 133 N ± 13 N (30 ± 3 pounds) at a rate not to exceed 30 cycles per minute. The buckle shall be examined to determine compliance with the performance requirements of subsection 209(22) of Schedule D to the Motor Vehicle Safety Regulations.

A metal-to-metal buckle shall be examined to determine whether partial engagement is possible by means of any technique representative of actual use. If partial engagement is possible, the maximum force of separation when in such partial engagement shall be determined.

2.2.8 Non-locking retractor

After the retractor is cycled 10 times by full extension and retraction of the webbing, the retractor and webbing shall be suspended vertically and a force of 17.8 N (4 pounds) shall be applied to extend the webbing from the retractor. The force shall be reduced to 13.3 N (3 pounds) when attached to a pelvic restraint, or to 4.9 N (1.1 pounds) per strap or webbing that contacts the shoulder of an occupant when retractor is attached to an upper torso restraint. The residual extension of the webbing shall be measured by manual rotation of the retractor drum or by disengaging the retraction mechanism.

Measurements shall be made on three retractors. The location of the retractor attached to upper torso restraint shall be examined for visibility of the reel during use of the seat belt assembly in a vehicle.

Note: This test is not required on a non-locking retractor attached to the free-end of webbing which is not subjected to any tension during restraint of an occupant by the assembly.

2.2.9 Automatic-locking retractor

Three retractors shall be tested in a manner to permit the retraction force to be determined exclusive of the gravitational forces on hardware or webbing being retracted. The webbing shall be fully extended from the retractor. While the webbing is being retracted, the average force of retraction within plus or minus 50 mm (2 inches) of 75 percent extension (25 percent retraction)

shall be determined and the webbing movement between adjacent locking segments shall be measured in the same region of extension. A seat belt assembly with automatic locking retractor in upper torso restraint shall be tested in a vehicle in a manner prescribed by the installation and usage instructions. The retraction force on the occupant of the seat belt assembly shall be determined before and after traveling for 10 minutes at a speed of 24 km/h (15 miles per hour) or more over a rough road (e.g., Belgian block road) where the occupant is subjected to displacement with respect to the vehicle in both horizontal and vertical directions. Measurements shall be made with the vehicle stopped and the occupant in the normal seated position.

2.2.10 Emergency-locking retractor

A retractor shall be tested in a manner that permits the retraction force to be determined exclusive of the gravitational forces on hardware or webbing being retracted. The webbing shall be fully extended from the retractor, passing over or through any hardware or other material specified in the installation instructions. While the webbing is being retracted, the lowest force of retraction within plus or minus 50 mm (2 inches) of 75 percent extension shall be determined. A retractor that is sensitive to webbing withdrawal shall be subjected to an acceleration of 0.3 times the acceleration due to gravity within a period of 50 milliseconds while the webbing is at 75 percent extension, to determine compliance with subparagraph 209(25)(b)(i) of Schedule D to the Motor Vehicle Safety Regulations. The retractor shall be subjected to an acceleration of 0.7 times the acceleration due to gravity within a period of 50 milliseconds, while the webbing is at 75 percent extension, and the webbing movement before locking shall be measured under the following conditions: for a retractor sensitive to webbing withdrawal, the retractor shall be accelerated in the direction of webbing retraction while the retractor drums' central axis is oriented horizontally and at angles of 45°, 90°, 135° and 180° to the horizontal plane. For a retractor sensitive to vehicle acceleration, the retractor shall be:

a) Accelerated in the horizontal plane in two directions normal to each other, while the retractor drum's central axis is oriented at the angle at which it is installed in the vehicle, and

b) Accelerated in three directions normal to each other while the retractor drum's central axis is oriented at angles of 45°, 90°, 135° and 180° from the angle at which it is installed in the vehicle, unless the retractor locks by gravitational force when tilted in any direction to any angle greater than 45° from the angle at which it is installed in the vehicle.

2.2.11 Performance of retractor

After completion of the corrosion-resistance test described in paragraph 2.2.1 the webbing shall be fully extended and allowed to dry for at least 24 hours under standard laboratory conditions specified in subsection 2.1.1. The retractor shall be examined for ferrous and nonferrous corrosion which may be transferred, either directly or by means of the webbing, to a person or his clothing during use of a seat belt assembly incorporating the retractor, and for ferrous corrosion on significant surfaces if the retractor is part of the attachment hardware. The webbing shall be withdrawn manually and allowed to retract for 25 cycles. The retractor shall be mounted in an apparatus capable of extending the webbing fully, applying a force of 89 N (20 pounds) at full extension, and allowing the webbing to retract freely and completely. The webbing shall be withdrawn from the retractor and allowed to retract repeatedly in this apparatus until 2 500 cycles are completed. The retractor and webbing shall then be subjected to the temperature resistance test prescribed in paragraph 2.2.2. The retractor shall be subjected to 2 500 additional cycles of webbing withdrawal and retraction. Then, the retractor and webbing shall be subjected to dust in a

chamber similar to one illustrated in Figure 6 containing about 0.9 kg (2 pounds) of coarse grade dust conforming to the specification given in SAE Recommended Practice J726 "Air Cleaner Test Code" (May 1981). The dust shall be agitated every 20 minutes for 5 seconds by compressed air, free of oil and moisture, at a gage pressure of 570 kPa ± 57 kPa (80 ± 8 pounds per square inch) entering through an orifice 1.5 mm ± 0.1 mm (0.060 ± 0.004 inch) in diameter. The webbing shall be extended to the top of the chamber and kept extended at all times except that the webbing shall be subjected to 10 cycles of complete retraction and extension within 1 to 2 minutes after each agitation of the dust. At the end of 5 hours, the assembly shall be removed from the chamber. The webbing shall be fully withdrawn from the retractor manually and allowed to retract completely for 25 cycles. An automatic-locking retractor or a non-locking retractor attached to pelvic restraint shall be subjected to 5 000 additional cycles of webbing withdrawal and retraction. An emergency-locking retractor or a non-locking retractor attached to upper torso restraint shall be subjected to 45 000 additional cycles of webbing withdrawal and retraction between 50 and 100 percent extension. The locking mechanism of an emergency locking retractor shall be actuated at least 10 000 times within 50 to 100 percent extension of webbing during the 50 000 cycles. At the end of test, compliance of the retractors with the applicable requirements in subsections 209(23), (24) and (25) of Schedule IV to the Motor Vehicle Safety Regulations shall be determined. Three retractors shall be tested for performance.

2.3 ASSEMBLY PERFORMANCE

2.3.1 Type 1 seat belt assembly

Three complete seat belt assemblies, including webbing, straps, buckles, adjustment and attachment hardware, and retractors, arranged in the form of a loop as shown in Figure 5, shall be tested in the following manner:

a) The testing machine shall conform to the requirements specified in paragraph 2.1.2. A double-roller block shall be attached to one head of the testing machine. This block shall consist of two rollers 100 mm (4 inches) in diameter and sufficiently long so that no part of the seat belt assembly touches parts of the block other than the rollers during the test. The rollers shall be mounted on antifriction bearings and spaced 300 mm (12 inches) between centers, and shall have sufficient capacity so that there is not brinelling, bending or other distortion of parts which may affect the results. An anchorage bar shall be fastened to the other head of the testing machine.

b) The attachment hardware furnished with the seat belt assembly shall be attached to the anchorage bar. The anchor points shall be spaced so that the webbing is parallel in the two sides of the loop. The attaching bolts shall be parallel to, or at an angle of 45° or 90° to the webbing, whichever results in an angle nearest to 90° between webbing and attachment hardware except that eye bolts shall be vertical, and attaching bolts or nonthreaded anchorages of a seat belt assembly designed for use in specific models of motor vehicles shall be installed to produce the maximum angle in use indicated by the installation in the motor vehicle. Rigid adapters between anchorage bar and attachment hardware shall be used if necessary to locate and orient the adjustment hardware. The adapters shall have a flat support face perpendicular to the threaded hole for the attaching bolt and adequate in area to provide full support for the base of the attachment hardware connected to the webbing. If necessary, a washer shall be used under a swivel plate or other attachment hardware to prevent the webbing from being damaged as the attaching bolt is tightened.

c) The length of the assembly loop from attaching bolt to attaching bolt shall be adjusted to about 1.3 m (51 inches), or as near thereto as possible. A force of 245 N (55 pounds) shall be applied to the loop to remove any slack in webbing at the hardware. The force shall be removed and the heads of the testing machine shall be adjusted for an assembly loop between 1.22 m and 1.27 m (48 and 50 inches) in length. The length of the assembly loop shall then be adjusted by applying a force between 89 N and 98 N (20 and 22 pounds) to the free end of the webbing at the buckle, or by the retraction force of an automatic-locking or emergency locking retractor. A seat belt assembly that cannot be adjusted to this length shall be adjusted as closely as possible. An automatic locking or emergency-locking retractor when included in a seat belt assembly shall be locked at the start of the test with a tension on the webbing slightly in excess of the retractive force in order to keep the retractor locked. The buckle shall be in a location so that it does not touch the rollers during test, but to facilitate making the buckle release test in paragraph 2.2.4 the buckle should be between the rollers or near a roller in one leg.

d) The heads of the testing machine shall be separated at a rate between 50 and 100 mm/min (2 and 4 inches per minute) until a force of 22.2 kN ± 0.2 kN (5 000 ± 50 pounds) is applied to the assembly loop. The extension of the loop shall be determined from measurements of head separation before and after the force is applied. The force shall be decreased to 666 N ± 45 N (150 ± 10 pounds) and the buckle release force measured as prescribed in paragraph 2.2.4.

e) After the buckle is released, the webbing shall be examined for cutting by the hardware. If the yarns are partially or completely severed in a line for a distance of 10 percent or more of the webbing width, the cut webbing shall be tested for breaking strength as specified in paragraph 2.1.2 locating the cut in the free length between grips. If there is insufficient webbing on either side of the cut to make such a test for breaking strength, another seat belt assembly shall be used with the webbing repositioned in the hardware. A tensile force of 11.1 kN ± 0.1 kN (2 500 ± 25 pounds) shall be applied to the components or a force of 22.2 kN ± 0.2 kN (5 000 ± 50 pounds) shall be applied to an assembly loop. After the force is removed, the breaking strength of the cut webbing shall be determined as prescribed above.

f) If a Type 1 seat belt assembly includes an automatic-locking retractor or an emergency locking retractor, the webbing and retractor shall be subjected to a tensile force of 11.1 kN ± 0.1 kN (2 500 ± 25 pounds) with the webbing fully extended from the retractor.

g) If a seat belt assembly has a buckle in which the tongue is capable of inverted insertion, one of the three assemblies shall be tested with the tongue inverted.

2.3.2 Type 2 seat belt assembly

Components of three seat belt assemblies shall be tested in the following manner:

a) The pelvic restraint between anchorages shall be adjusted to a length between 1.22 m and 1.27 m (48 and 50 inches) or as near this length as possible if the design of the pelvic restraint does not permit its adjustment to this length An automatic-locking or emergency-locking retractor when included in a seat belt

assembly shall be locked at the start of the test with a tension on the webbing slightly in excess of the retractive force in order to keep the retractor locked. The attachment hardware shall be oriented to the webbing as specified in subparagraph 2.3.1(b) and illustrated in Figure 5. A tensile force of 11.1 kN ± 0.1 kN (2 500 ± 25 pounds) shall be applied on the components in any convenient manner and the extension between anchorages under this force shall be measured. The force shall be reduced to 333 ± 22 N (75 ± 5 pounds) and the buckle release force measured as prescribed in paragraph 2.2.4.

b) The components of the upper torso restraint shall be subjected to a tensile force of 6 670 N ± 67 N (1 500 ± 15 pounds) following the procedure prescribed above for testing pelvic restraint and the extension between anchorages under this force shall be measured. If the testing apparatus permits, the pelvic and upper torso restraints may be tested simultaneously. The force shall be reduced to 333 N ± 22 N (75 ± 5 pounds) and the buckle release force measured as prescribed in paragraph 2.2.4.

c) Any component of the seat belt assembly common to both pelvic and upper torso restraint shall be subjected to a tensile force of 13.3 kN ± 0.1 kN (3 000 ± 30 pounds).

d) After the buckle is released in tests of pelvic and upper torso restraints, the webbing shall be examined for cutting by the hardware. If the yarns are partially or completely severed in a line for a distance of 10 percent or more of the webbing width, the cut webbing shall be tested for breaking strength as specified in paragraph 2.1.2 locating the cut in the free length between grips. If there is insufficient webbing on either side of the cut to make such a test for breaking strength, another seat belt assembly shall be used with the webbing repositioned in the hardware. The force applied shall be 11.1 kN ± 0.1 kN (2 500 ± 25 pounds) for components of pelvic restraint, and 6 670 N ± 67 N (1 500 ± 15 pounds) for components of upper torso restraint. After the force is removed, the breaking strength of the cut webbing shall be determined as prescribed above.

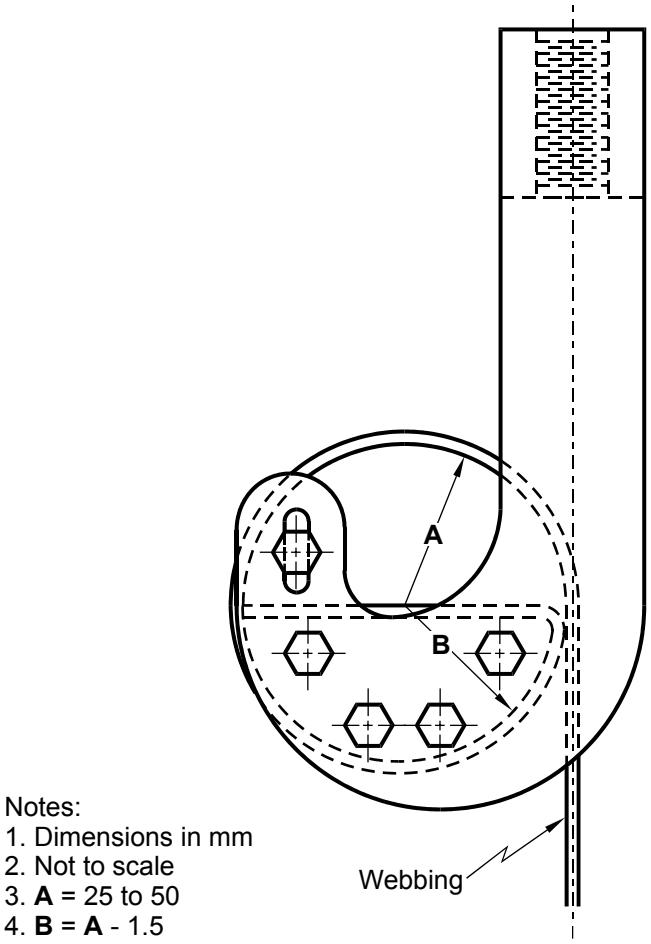
e) If a Type 2 seat belt assembly includes an automatic-locking retractor or an emergency locking retractor, the webbing and retractor shall be subjected to a tensile force of 11.1 kN ± 0.1 kN (2 500 ± 25 pounds) with the webbing fully extended from the retractor, or to a tensile force of 6 670 N ± 67 N (1 500 ± 15 pounds) with the webbing fully extended from the retractor if the design of the assembly permits only upper torso restraint forces on the retractor.

f) If a seat belt assembly has a buckle in which the tongue is capable of inverted insertion, one of the three assemblies shall be tested with the tongue inverted.

2.3.3 Resistance to buckle abrasion

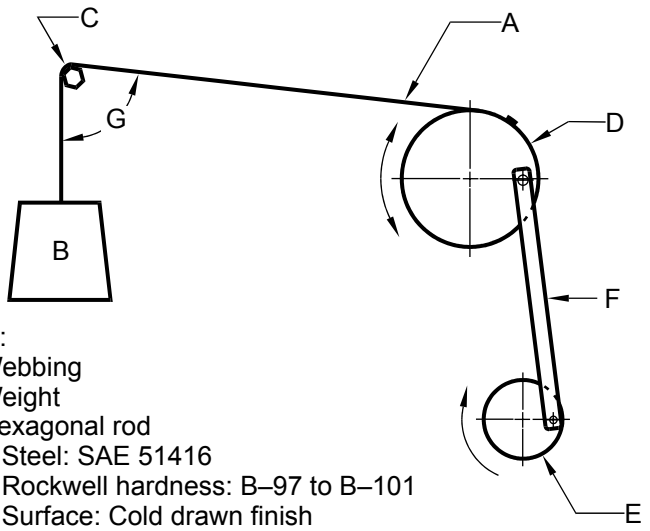
Seat belt assemblies shall be tested for resistance to abrasion by each buckle or manual adjusting device normally used to adjust the size of the assembly. The webbing of the assembly to be used in this test shall be exposed for 4 hours to an atmosphere having relative humidity of 65 percent and temperature of 21°C (70°F). The webbing shall be pulled back and forth through the buckle or manual adjusting device as shown schematically in Figure 7. The anchor end of the webbing (A) shall be attached to a weight (B) of 13 N (3 pounds). The webbing shall pass through the buckle (C) and the other end (D) shall be attached to a reciprocating device so that the webbing

forms an angle of 8° with the hinge stop (E). The reciprocating device shall be operated for 2 500 cycles at a rate of 18 cycles per minute with a stroke length of 200 mm (8 inches). The abraded webbing shall be tested for breaking strength by the procedure described in paragraph 2.1.2.



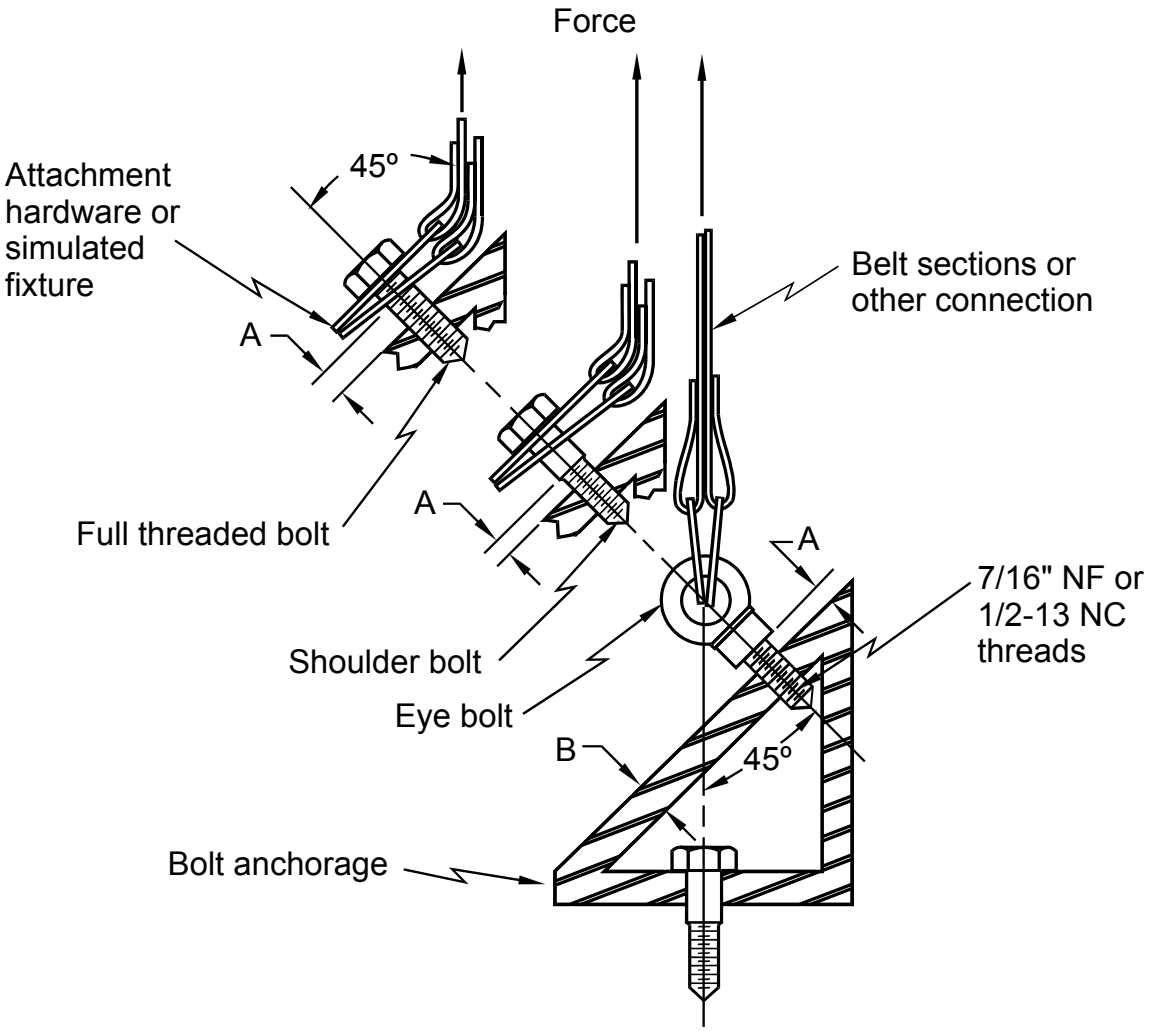
Notes:
1. Dimensions in mm
2. Not to scale
3. **A** = 25 to 50
4. **B** = **A** - 1.5

Figure 1 (rev Feb 27, 1984)



Notes:
A Webbing
B Weight
C Hexagonal rod
Steel: SAE 51416
Rockwell hardness: B–97 to B–101
Surface: Cold drawn finish
Size: 6.35 ± 0.03
Radius on edges: 0.5 ± 0.1
D Drum diameter: 400
E Crank
F Crank arm
G Angle between webbing: 85° ± 2°
Dimensions in mm
Not to scale

Figure 2 (rev Feb 27, 1984)



Notes:
1. Dimensions in mm unless specified otherwise.
2. Not to scale
3. **A** - 2 full threads from fully seated position
4. **B** - 10 mm

Figure 3 (rev Feb 27, 1984)

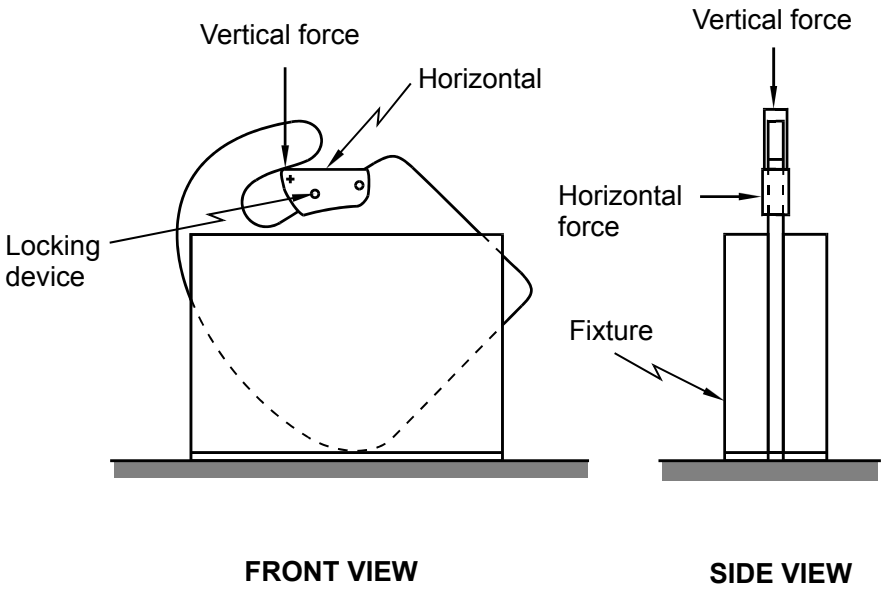
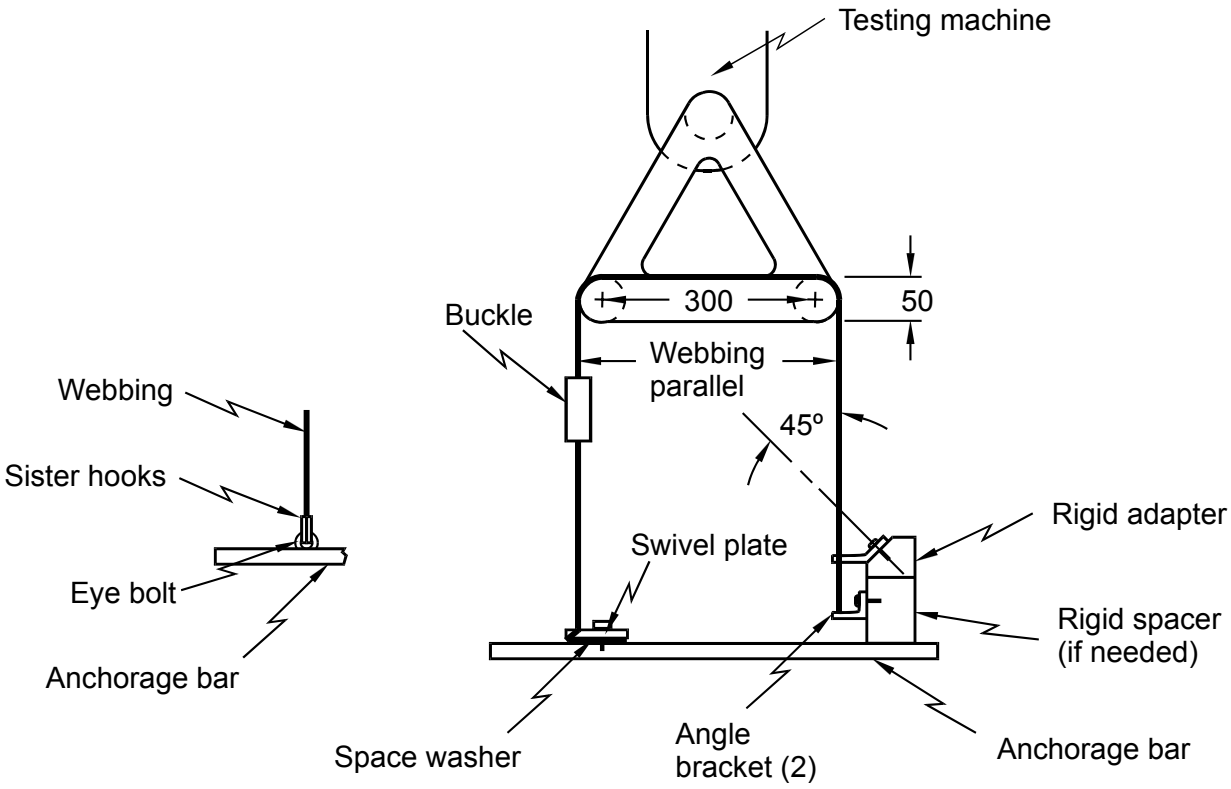


Figure 4 (rev Feb 27, 1984)



Notes:
1. Dimensions in mm
2. Not to scale

Figure 5 (rev Feb 27, 1984)

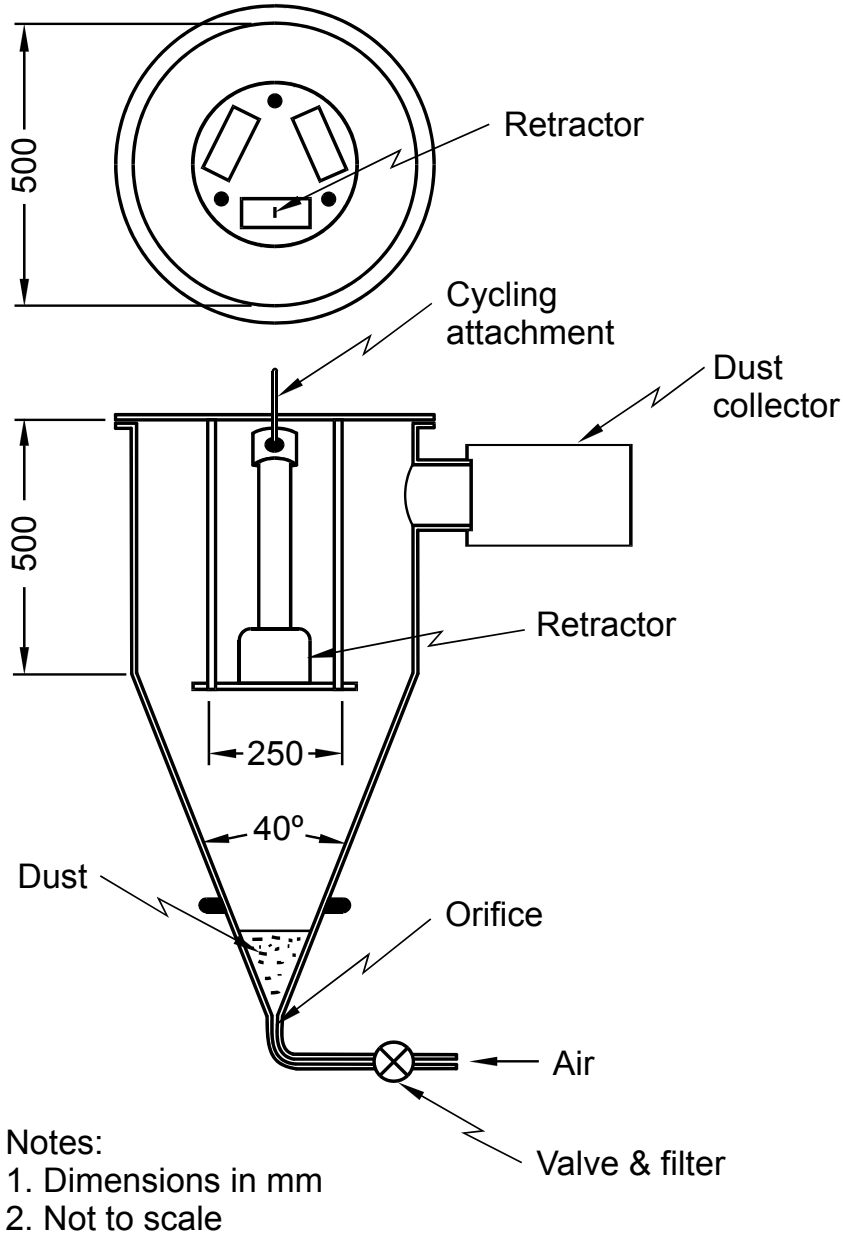


Figure 6 (rev Feb 27, 1984)

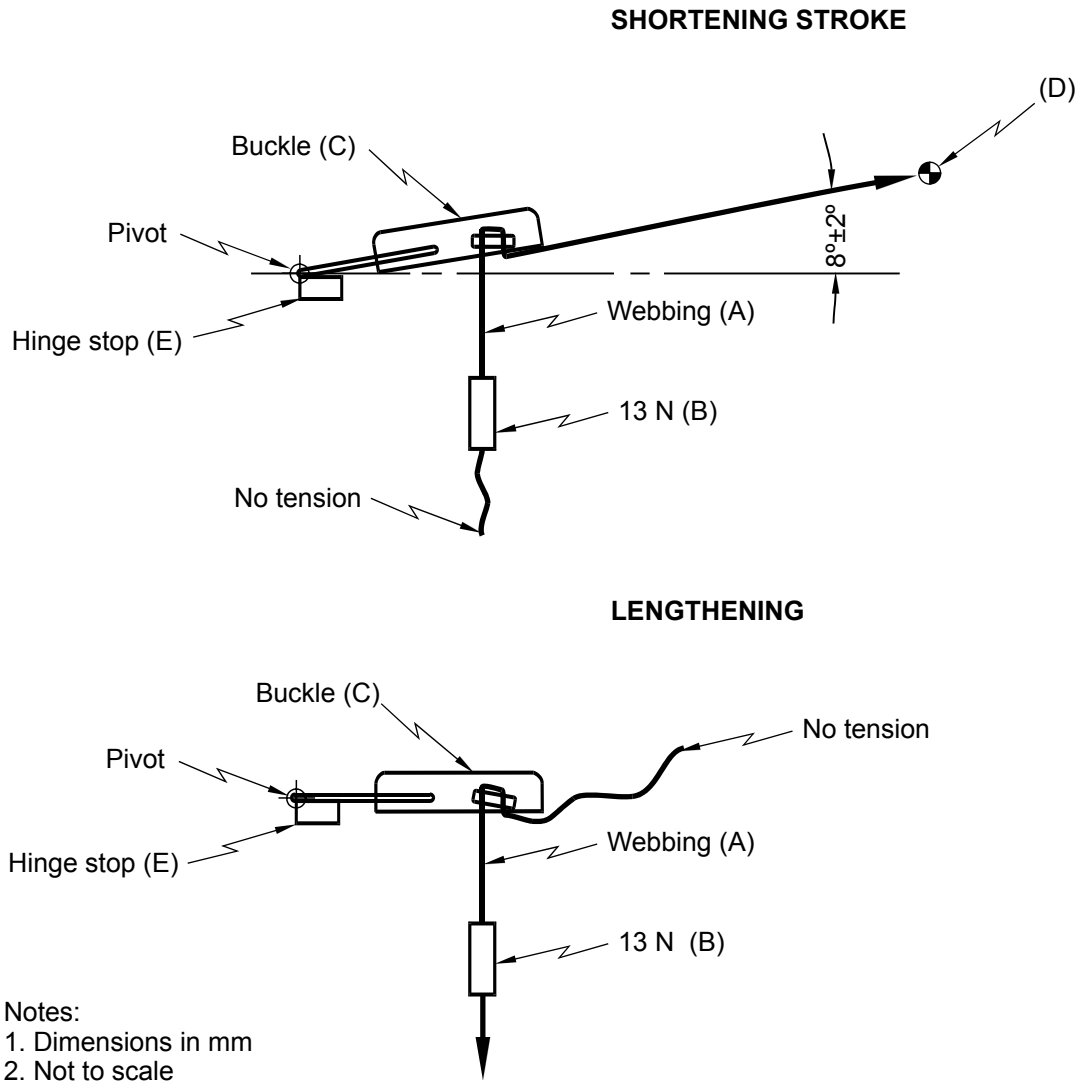


Figure 7 (rev Feb 27, 1984)