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SAE J1454 JAN86

Dynamic Durability Testing of Seat Cushions for Off-Road Work Machines

SAE Recommended Practice
Issued January 1986

Submitted for Recognition as an American National Standard

RATIONALE:

Several documents exist relating to this subject, including SAE standards and Recommended practices, ASTM standards, plus various test methods developed by automotive manufacturers. All of these address independent testing of the materials used in the construction such as foam cushioning material, vinyl and cloth covering materials, and sewing thread.

The purpose of this Recommended Practice is to provide a uniform method of dynamically testing the durability of complete seat cushions on a comparative basis. A method such as this is necessary for the following reasons:

1. The exact same materials can be applied in different shapes and sizes of cushions and have varying durability characteristics under field or simulated field conditions.

2. Varying support structures of the cushion can affect durability, such as a contoured versus a flat support surface, regardless of the fact that the cushions are constructed of the same materials and of similar shape on the seating surface.

3. Simulating a severe application, which includes constant turning, squirming, entry and egress of the operator in the seat, is necessary for an accurate lab comparison of cushions regarding durability.

4. A means to lab test the attachment method which fastens the various cushion materials to the seat structure is necessary.

In an effort to maintain uniformity with other SAE recommended practices, the simulated human buttocks and load applied duplicates the device and load specified in SAE J1163 JAN80 - Determining Operator Seat Location On Off-Road Work Machines.

Cotton duck (#10) was selected to cover the buttocks because it simulates the most abrasive and aggressive type of fabric that could be encountered in clothing. It is also durable and readily available.

The motion of the simulated buttocks relative to the cushion is intended to simulate entry, egress, and the turning motion of a seated operator.

Because the wear of a seat cushion is usually more severe than a backrest cushion, this Recommended Practice only addresses testing of this portion of the seat.

The temperature at which the test is to be performed, 72° ± 10°F (22° ± 5.6°C), allows testing at room temperature without the use of a precisely controlled chamber. If severe temperature conditions need to be simulated, the test can be run in an oven or refrigerated chamber.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

SAE J1051, Deflection of Seat Cushions for Off-Road Work Machines

SAE J1163, Determining Operator Seat Location on Off-Road Work Machines

APPLICATION:

The purpose of this Recommended Practice is to provide a uniform method of dynamically testing the durability of seat cushions on a comparative basis.

The Recommended Practice describes a laboratory test procedure for comparatively evaluating the durability and fatigue life qualities of a complete seat cushion. This is accomplished by submitting the seating surface of the cushion to repetitive compressive and rotational loading with a simulated human buttocks.

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OFF-HIGHWAY MACHINERY PRACTICE

Submitted for recognition as an American National Standard

SAE J1454

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DYNAMIC DURABILITY TESTING OF SEAT CUSHIONS FOR OFF-ROAD WORK MACHINES

1. PURPOSE: The purpose of this Recommended Practice is to provide a uniform method of dynamically testing the durability of seat cushions on a comparative basis.

2. SCOPE: The Recommended Practice describes a laboratory test procedure for comparatively evaluating the durability and fatigue life qualities of a complete seat cushion. This is accomplished by submitting the seating surface of the cushion to repetitive compressive and rotational loading with a simulated human buttocks.

3. DEFINITIONS:

3.1 Test Specimen: A finished upholstered seat cushion assembly, including support structure, in an unused condition (with packaging or protective bag removed). Raw materials such as foam or elastic components used in the manufacture of the product should be aged for a minimum of 96 h at a temperature of 72 ± 10°F (22 ± 5.6°C) before the test is conducted.

4. TEST APPARATUS REQUIRED:

4.1 A simulated human buttocks (Fig. 1) covered with new No. 10 cotton duck material-untreated, that meets Military Standard CCC-C-419 Type 1, securely attached with a drawstring or similar means (Fig. 2).

4.2 An apparatus capable of securing and providing motion and force to the simulated human buttocks or the seat cushion to achieve the relative movements and applied forces as outlined under procedures in paragraphs 5.2 and 5.3.

5. PROCEDURE:

5.1 Condition the test specimen, undeflected and undistorted, at a temperature 72 + 10°F (22 + 5.6°C) for a minimum of 12 h. All subsequent tests should be conducted at this temperature condition unless simulation of extreme conditions is necessary for certain applications.

5.2 Mount the test specimen to the supporting platform in the same position horizontally that it is installed in the seat assembly or machine (Fig. 3). In the case of cushions which have angle adjustments, this position should correspond to the center adjustment position. When no center position is available, the position corresponding to the nearest adjustment which increases the angle of rearward slope to the seat cushion should be used. The specimen should be mounted so that the swivel joint on the simulated buttocks through which the force is applied is centered laterally and 40 mm ahead of the seat index point (SIP), as determined by the procedure given in SAE J1163. In the case where a SIP cannot be determined, such as a seat cushion without an accompanying backrest, the simulated buttocks should be centered front to rear on the test specimen. Also, the test specimen should be positioned so that the front to rear centerline coincides with the front to rear centerline of the simulated buttocks when it is in the center position of its rotational travel (Fig. 3) as outlined in paragraph 5.3.

5.3 The test apparatus should be adjusted so that there is a total force equal to 638 N including the mass of the simulated buttocks and any of the mechanism that would affect this force on the cushion. This force should remain constant during the entire cushion compression portion of the test. With this force applied, the buttocks should be rotated clockwise 60 deg and counterclockwise 60 deg centered about the lateral centerline of the cushion. The simulated buttocks should then be raised until it no longer contacts the cushion. This is considered one complete cycle and should be repeated at 10-12 cpm for the desired number of cycles. The duty cycle shall be 70% on the cushion and 30% off the cushion. Some types of cushion covering materials may wear the cotton duck cover rapidly and replacement may be necessary during the test if any of the threads break and a hole appears. Each new test should use a new piece of No. 10 cotton duck cover.

6. DATA REQUIRED:

6.1 Description of test specimen (manufacturer's name, part number, covering material, and foam specification).

6.2 Deviations or special test conditions.

6.3 Location of simulated buttocks on test specimen.

6.4 Force deflection data per SAE J1051 before and after test.

6.5 Description and photos of general condition of cushion assembly and covering material after the desired number of cycles have been completed.

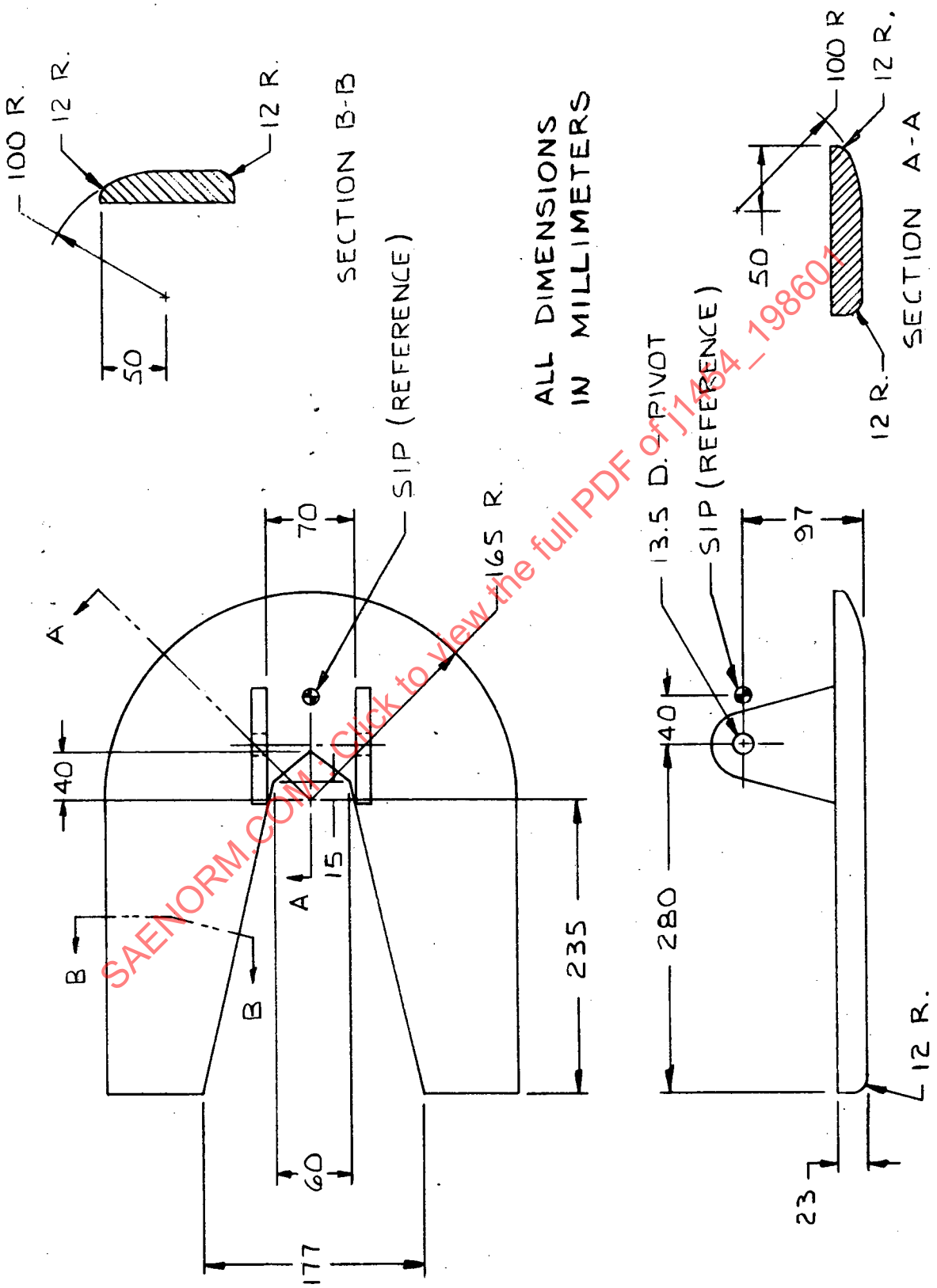

Fig. 1

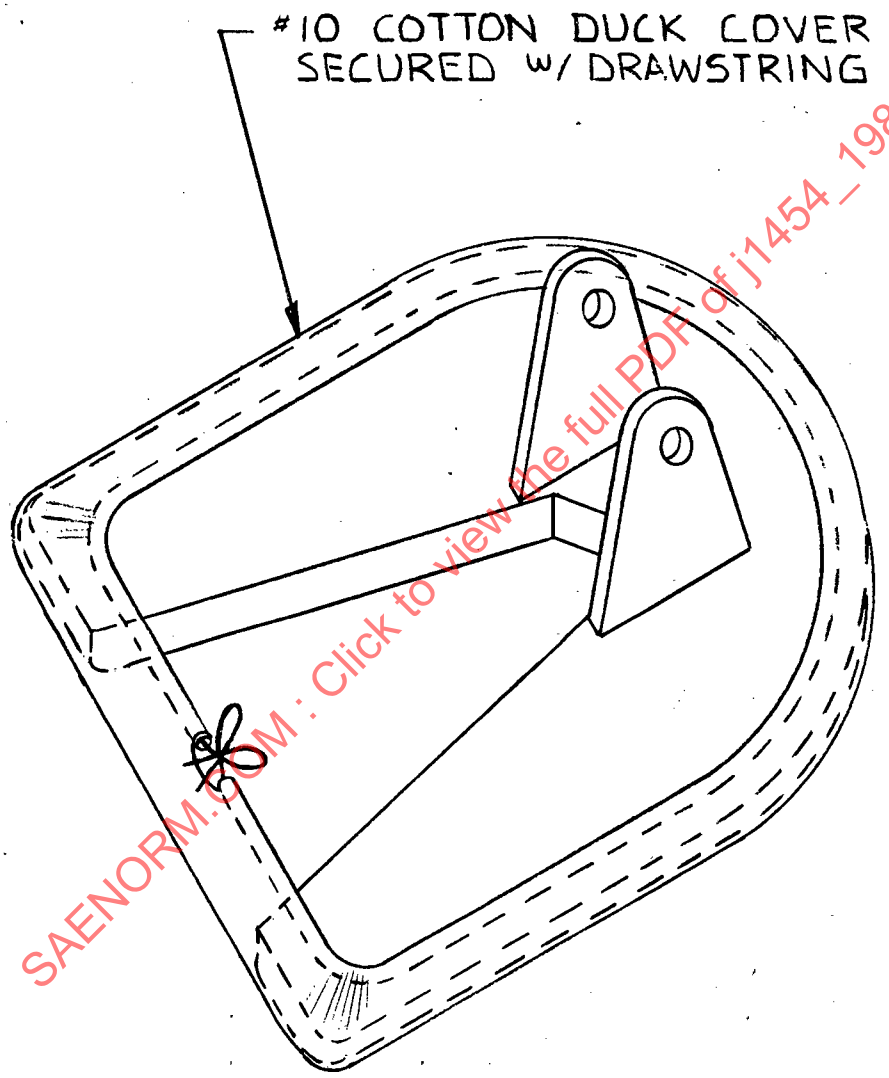

Fig. 2