

Steering Control Systems - Laboratory Test Procedure Heavy Trucks

RATIONALE

This procedure was revised to provide clarification to select setup parameters and several test situations that may arise, as well as commonize instrumentation and test conditions to ECE R-12 Occupant Protection - Steering Column Displacement.

1. SCOPE

This SAE Recommended Practice describes a laboratory test procedure for evaluating the characteristics of heavy truck steering control systems under simulated driver impact conditions. The test procedure employs a torso-shaped body block that is impacted against the steering wheel.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J211-1 Instrumentation for Impact Test - Part 1: Electronic Instrumentation

SAE J211-2 Instrumentation for Impact Test - Part 2: Photographic Instrumentation

SAE CRP-13 Heavy Truck Crashworthiness (Phase III-Testing and Analysis for Recommended Practice Development Results), April 1997

ECE R-12 Occupant Protection – Steering Column Displacement

3. ITEMS TO BE DETERMINED

3.1 Impact velocity of the body block.

3.2 Resultant force during the impact.

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4. TEST EQUIPMENT FOR INSTRUMENTATION

4.1 Body Block

The complete body block shall have the following characteristics:

4.1.1 Spring Rate

107-143 kg/cm (600-800 lb/in), when the chest is loaded by a 10.0 cm wide by 38.0 cm long (4 in by 15 in) beam, 90 deg to the longitudinal axis of the body block, and parallel to the backing plate (Figure 1). The center of the beam is placed 45.7 ± 0.63 cm (18.0 ± 0.25 in) from the top of the head, centered laterally, and preloaded to 2.26 kg (5 lb) including the weight of the beam, to establish baseline penetration. Test speed is 25.0 ± 5 cm/minute (10 ± 2 in/minute). The load is measured when the beam has moved 12.7 cm (0.50 in) into the body block from the baseline and the spring rate is obtained by doubling this load.

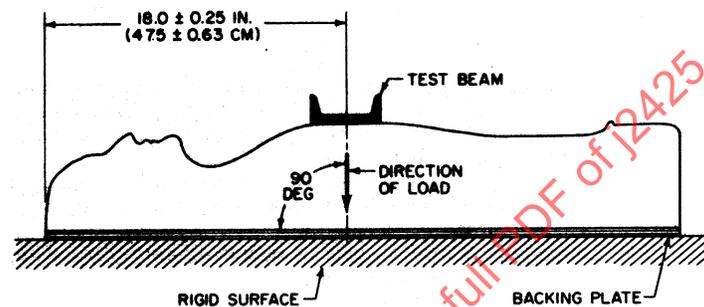


FIGURE 1 - TEST BEAM LOCATION

4.1.2 Weight

The body block shall weight $33.97 +2.26 -0$ kg ($75 +5 -0$ lb).

4.1.3 Body block center of gravity

The center of gravity of the complete body block shall be 55.12 ± 0.63 cm (21.7 ± 0.25 in) from the top of the head.

4.1.4 Moment of inertia

The moment of inertia around the lateral axis through the center of gravity of the complete body block shall be 23 ± 2.3 cm \cdot kg sec 2 (20 ± 2 in \cdot lb sec 2).

4.1.5 Configuration of the body block is shown in Figures 2-4.

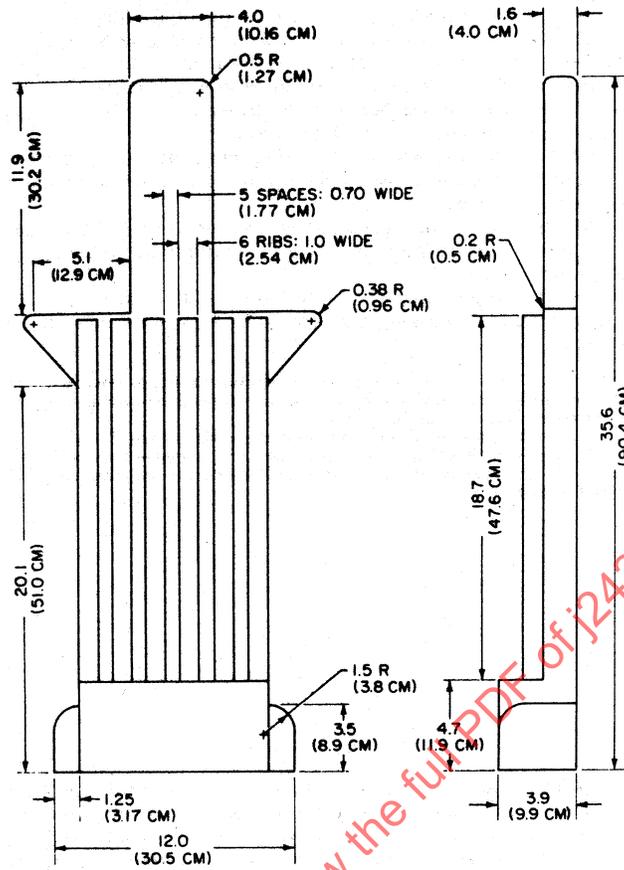


FIGURE 2 - MOLD INSERT

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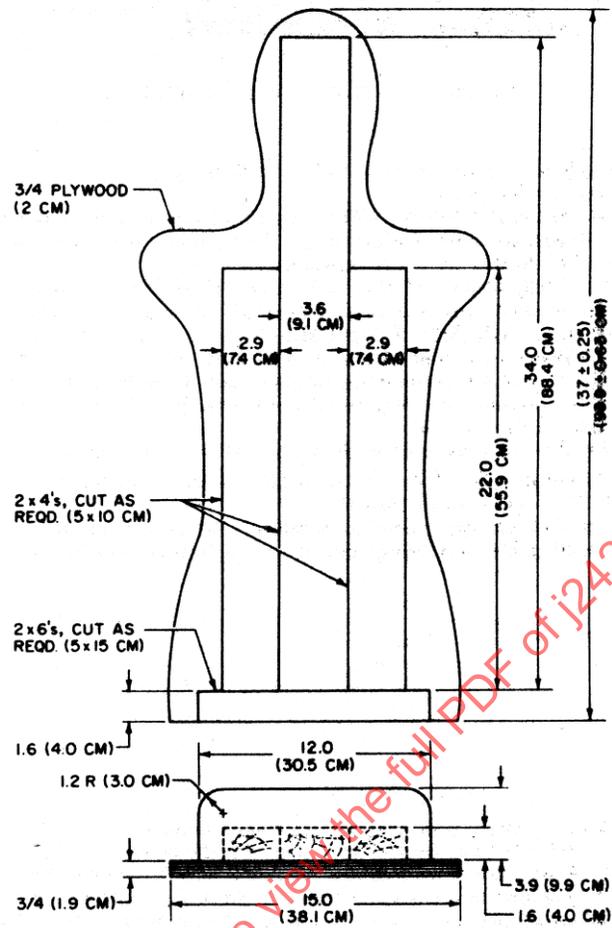


FIGURE 3 - BACKBOARD AND BASE

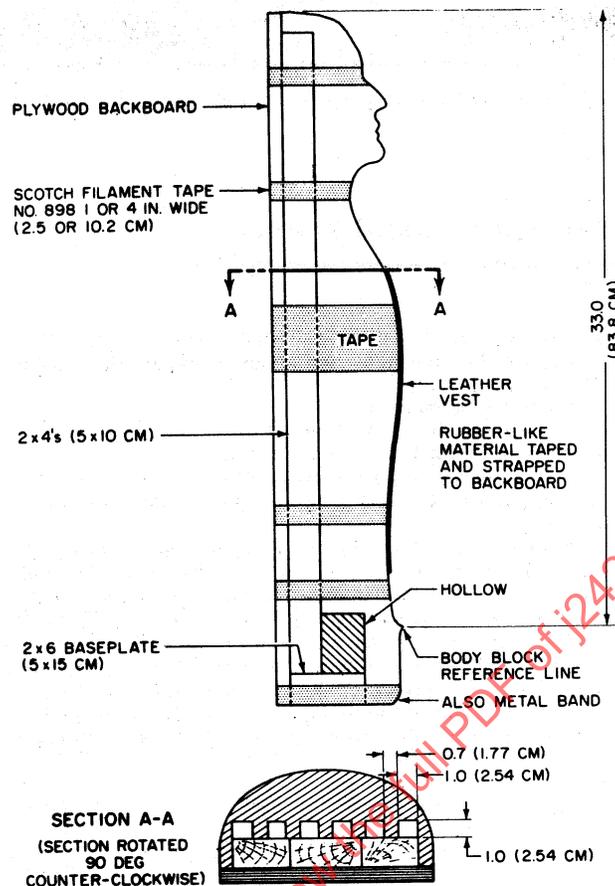


FIGURE 4 - BODY BLOCK PROFILE

4.2 Instrumentation

Two unidirectional accelerometers shall be placed symmetrically in the transverse plane of the center of gravity of the body block. Other methods with regard to the number and positioning of the measuring accelerometers shall be allowed, such as by dividing the test apparatus into separate parts at the center of gravity of which accelerometers are placed to measure the acceleration horizontally and parallel to the longitudinal axis of the vehicle. The peak resultant force may be measured by mounting a 3-axis load cell between the steering wheel and column or may be calculated from unidirectional accelerometers mounted on the body block. All measurements should be recorded and filtered according to the most recent version of SAE J211.

4.3 Any test equipment is satisfactory which can produce the minimum body block-to-steering wheel impact velocity of 24 km/h (15 mph) and which insures the body block is moving parallel to the vehicle horizontal reference, with translational (not rotational) motion, in side view at impact. (See Figure 5.) The direction of impact velocity, in the plan view, is parallel to the longitudinal vehicle axis.