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Roll-Over Protective Structures (ROPS) for Compact Utility Tractors



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Roll-Over Protective Structures (ROPS) for Compact Utility Tractors

Approved March 1996; reaffirmed March 2005 as an American National Standard Developed cooperatively by the ASAE Turf and Landscape Equipment Systems Committee and the Equipment Manufacturers Institute Agricultural ROPS Subcommittee; approved by the Power and Machinery Division Standards Committee; adopted by ASAE September 1995; approved as an American National Standard March 1996; reaffirmed by ASAE December 1999; reaffirmed by ANSI June 2000; reaffirmed by ASAE February 2005; reaffirmed by ANSI March 2005; periodic review extension approved by ANSI to March 2013 in August 2011 and ASABE to June 2012 in November 2011; revised February 2012; revision approved by ANSI February 2012.

Keywords: Roll-over, ROPS, Safety, Seat belts, Test procedure, Tractors

1 Purpose and Scope

- 1.1 The purpose of this Standard is to establish the test and performance requirements of a roll-over protective structure, ROPS, designed for compact utility tractors to minimize the frequency and severity of crushing injury to the operator resulting from accidental tractor upset.
- 1.2 This Standard applies to compact utility tractors as defined in 3.1. It does not preclude the use of extendable or foldable ROPS as long as these ROPS meet the performance requirements of this Standard. Self-propelled implements are excluded. This Standard does not apply to tractors with mass as defined in 3.3 greater than 1800 kg.
- 1.3 Test procedures in this standard are limited to compact utility tractors. This Standard does not apply to tractors generally designed for mowing lawns and gardening work as defined in ASAE S323.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies unless noted. For undated references, the latest approved edition of the referenced document (including any amendments) applies.

ANSI/SAE S323, Definitions of Powered Lawn and Garden Equipment

SAE S203, Front and Rear Power Take-Off for Agricultural Tractors

SAE S217, Three-Point Free-Link Attachment for Hitching Implements to Agricultural Wheel Tractors

ASTM A370-09a, Standard Methods and Definitions for Mechanical Testing of Steel Products

ASTM A572M-07, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A1008M-09a, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

ASTM A1011M-09a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

ASTM A656M-05e1 Standard Specification for Hot-Rolled Structural Steel, High-Strength Low-Alloy Plate with Improved Formability

ISO 612:1978, Road vehicles—dimensions of motor vehicles and towed vehicles—terms and definitions

ISO 5353:1995, Earthmoving machinery, and tractors and machinery for agriculture and forestry—seat index point

SAE J114 JUN94, Seat Belt Hardware Webbing Abrasion Performance Requirements

SAE J140 JUN95: Seat Belt Hardware Test Procedure

SAE J141 JUN95: Seat Belt Hardware Performance Requirements

SAE J339: JUN94 Seat Belt Hardware Webbing Abrasion Test Procedure

SAE J1194 APR 2009, Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors (A)

SAE J2194 APR 2009, Roll-Over Protective Structures (ROPS) for Wheeled Agricultural Tractors (A)

3 Definitions

3.1 Compact utility tractor. A small agricultural tractor equipped with a 540 rpm rear PTO (ASAE S203) and a three-point hitch designed for Category 1 (ASAE S217) implements only. These tractors generally have a mass, as defined in 3.3, less than 1800 kg., have less than 30 PTO KW and are primarily designed and advertised for use with mowers and light duty material handling equipment.

3.2 Roll-over protective structure. ROPS: A cab or frame for the protection of operators of compact utility tractors to minimize the possibility of serious crushing injury to the operator resulting from accidental upset. The ROPS is characterized by providing space for the clearance zone (3.10) inside the envelope of the structure or within a space bounded by a series of straight lines from the outer edge of the structure to any part of the tractor that might come in contact with flat ground and is capable of supporting the tractor in upset position. The mounting structure and fasteners forming the mounting connection with the tractor are part of the ROPS.

3.3 Tractor mass. The mass of the unloaded tractor in operating order with tanks and radiators full, including protective structure with cladding and any wheel equipment or additional front-wheel drive components required to support the tractor static weight. The operator, optional hitch equipment, optional ballast weights, additional wheel equipment and other special equipment are not included.

3.4 Reference mass. A mass, not less than the tractor mass, selected for calculation of the force and energy inputs to be used during tests.

3.5 Seat index point, SIP. The seat index point shall be determined in accordance with ISO 5353:1995, with seat adjusted to the midpoint of its adjustments. For a suspended seat, the seat shall be set to the midpoint of the suspension travel, unless this is contradictory to clearly stated instructions by the manufacturer of the seat. Where special instructions for the seat setting exist, these shall be observed.

3.6 Static test horizontal loading. The application of a horizontal static load to the rear, front, or side of the ROPS.

3.7 Crushing test. The application of a vertical static load through a beam placed laterally across the uppermost members of the ROPS. The resultant of the initial crushing load shall be in the vertical direction and shall be in a vertical reference plane passing through the SIP and parallel to the longitudinal axis of the tractor.