



SURFACE VEHICLE STANDARD

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Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors

RATIONALE

This document has been determined to contain stable technology which is not dynamic in nature.

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1. Scope

1.1 Fulfillment of the intended purpose requires testing as follows:

- 1.1.1 A laboratory test, under repeatable and controlled loading, to permit analysis of the ROPS for compliance with the performance requirements of this SAE Standard. Either the static test (6.1) or the dynamic test (6.2) shall be conducted.
 - 1.1.2 A crush test to verify the effectiveness of the deformed ROPS in supporting the tractor in an upset attitude.
 - 1.1.3 A field upset test under reasonably controlled conditions, both to the rear and side, to verify the effectiveness of the protective system under actual dynamic conditions. (See 6.4.1.1 for requirements for the omission of this test).
 - 1.1.4 In addition to the laboratory and field loading requirements, there is a temperature-material requirement. (See 7.1.2.)
- 1.2** The test procedures and performance requirements outlined in this document are based on currently available engineering data.
- 1.3 Purpose**—The purpose of this document is to establish the test and performance requirements of a rollover protective structure (ROPS) designed for wheel-type agricultural tractors to minimize the frequency and severity of operator injury resulting from accidental upsets. All self-propelled implements are excluded.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J114—Seat Belt Assembly Webbing Abrasion Performance Requirements
SAE J140—Seat Belt Hardware Test Procedure
SAE J141—Seat Belt Hardware Performance Requirements
SAE J339—Seat Belt Assembly Webbing Abrasion Test Procedure
SAE J429—Mechanical and Material Requirements for Externally Threaded Fasteners
SAE J674—Safety Glazing Materials—Motor Vehicles
SAE J800—Motor Vehicle Seat Belt Assembly Installations
SAE J995—Mechanical and Material Requirements for Steel Nuts
SAE J1349—Engine Power Test Code—Spark Ignition and Compression Ignition—Net Power Rating

2.1.2 ASTM PUBLICATION—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 370-76—Standard Methods and Definitions for Mechanical Testing of Steel Products

2.1.3 ASAE PUBLICATION—Available from the American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085-9659.

ASAE R313

3. Definitions

3.1 Agricultural Tractor—An Agricultural Tractor, for purposes of this document, is defined as a 2- or 4-wheel-drive type machine of more than 15 kW (20 hp) net engine power as defined by SAE J1349, designed primarily to provide the tractive power to pull, push, carry, propel, and/or provide power to implements designed primarily for agricultural usage.

3.2 Tractor Mass—The Tractor Mass is defined as the maximum gross machine mass determined by the manufacturer or a minimum ratio of mass-to-maximum power takeoff power at rated engine speed of 67 kg/kW (110 lb/hp), whichever is greater. The mass includes the ROPS, all fuels, and other components required for normal use. (In case power takeoff power is not available, use 95% of net engine flywheel power.)

3.3 Rollover Protective Structure—A Rollover Protective Structure (ROPS) is a cab or frame for the protection of operators of agricultural wheeled tractors to minimize the possibility of serious operator injury resulting from accidental upsets. The protective structure is characterized by providing space for the clearance zone 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 that position if the tractor overturns. (See Figures 1, 2, and 3 for typical configurations.

3.3.1 SEAT REFERENCE POINT¹—(SRP in Figures 4, 5, and 6) is that point where the vertical line tangent to the most forward point at the longitudinal seat centerline of the seat back, and the horizontal line tangent to the highest point of the seat cushion intersect in the longitudinal seat centerline section. The SRP is determined with the seat unloaded and adjusted to the highest and most rearward position provided for seated operation of the tractor.

1. Consideration is being given to adopting the ISO definition when it is approved.

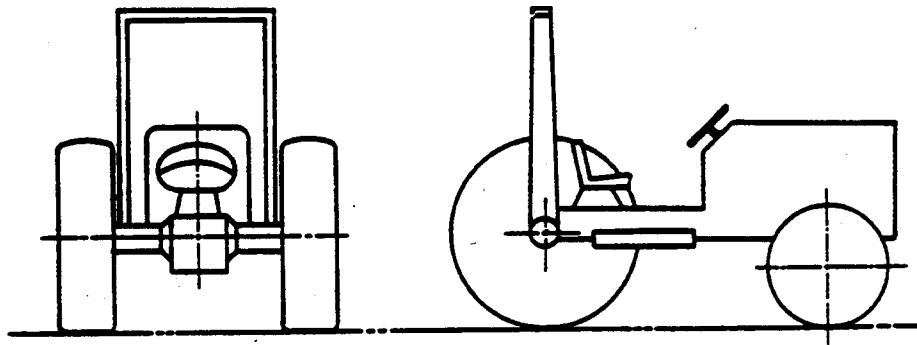


FIGURE 1—TRACTOR WITH TYPICAL TWO-POST ROPS

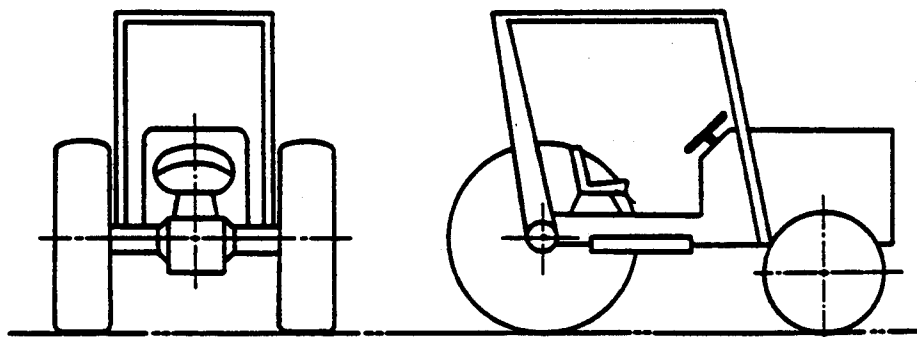


FIGURE 2—TRACTOR WITH TYPICAL FOUR-POST ROPS

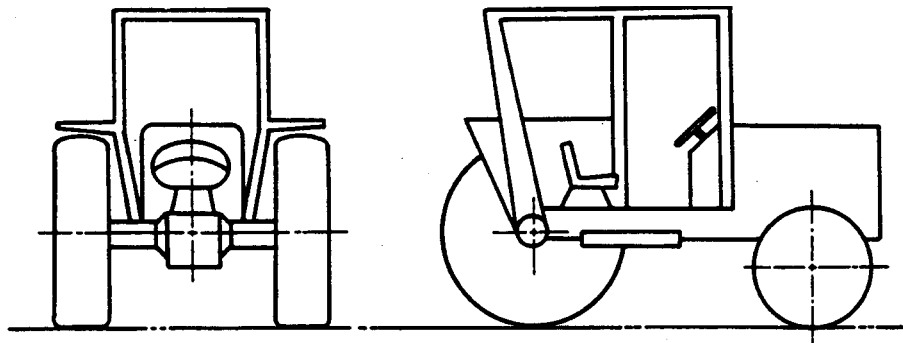


FIGURE 3—TRACTOR WITH TYPICAL PROTECTIVE ENCLOSURE

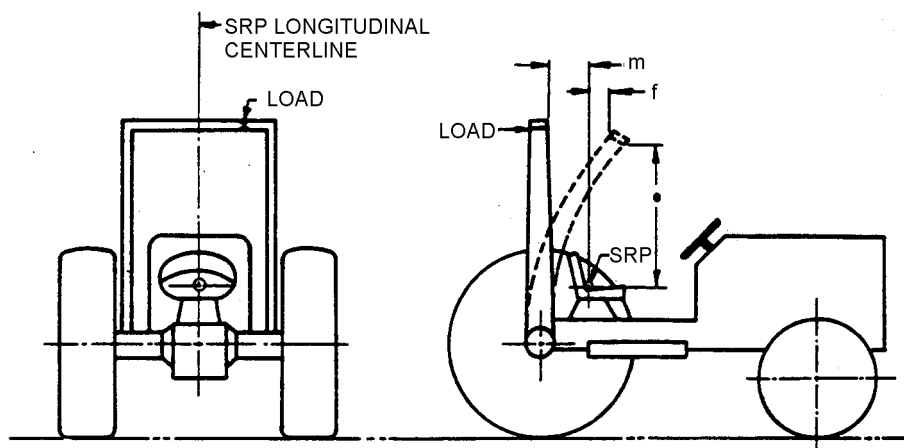


FIGURE 4—TYPICAL REAR LOAD APPLICATION

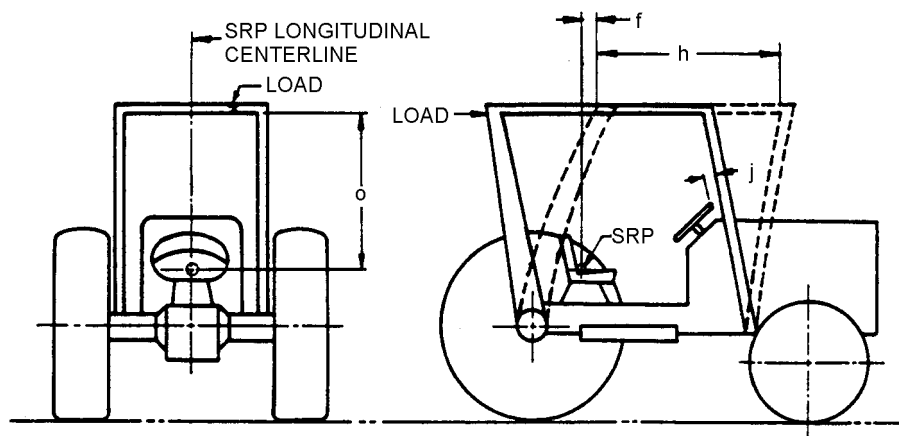


FIGURE 5—TYPICAL REAR LOAD APPLICATION

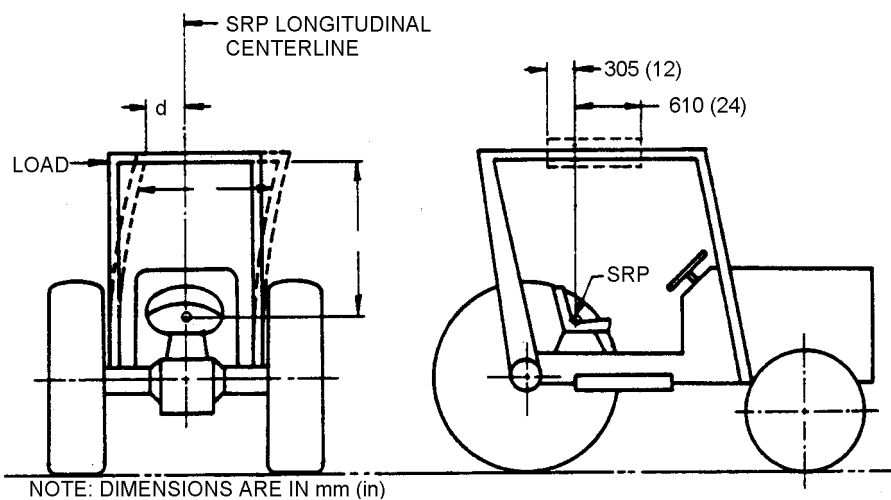


FIGURE 6—TYPICAL SIDE LOAD APPLICATION