ANSI/ASABE S648-1 MAR2020
Agricultural Field Equipment Braking — Part 1: General Requirements

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Developed with the assistance of the members of the Association of Equipment Manufacturers (AEM), members of the Farm Equipment Manufacturers Association (FEMA) and members of the Agricultural Manufacturers of Canada (AMC). Approved as an ASABE and American National (ANSI) standard March 2020.

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1 Purpose

The purpose of this part of ANSI/ASABE S648 is to define terms and establish common requirements, minimum performance criteria and performance test procedures that are common to agricultural field equipment.

2 Scope

This part of ANSI/ASABE S648 provides normative references, defines terms and definitions and establishes general test procedures for the performance of braking systems used on agricultural field equipment (as defined in ANSI/ASAE S390).

3 Normative References

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

The following references apply to all parts of the ANSI/ASABE S648 standards series.

ANSI/ASAE S390, Tractors and Machinery for Agriculture and Forestry — Basic Types — Vocabulary

ANSI/ASABE S648-2, Agricultural Field Equipment Braking — Part 2: Requirements for Agricultural Tractors

ANSI/ASABE S648-3, Agricultural Field Equipment Braking — Part 3: Requirements for Self-Propelled and Special Self-Propelled Machines

ANSI/ASABE S648-4, Agricultural Field Equipment Braking — Part 4: Requirements for Towed Vehicles

ANSI/ASABE S648-5, Agricultural Field Equipment Braking — Part 5: Requirements for the Interface between Towing Vehicle and Towed Vehicles

ASABE/ISO 15077, Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation

ISO 5697, Agricultural and forestry vehicles — Determination of braking performance

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4 Terms and Definitions

For the purposes of all parts of ANSI/ASABE S648, the terms and definitions found in ANSI/ASAE S390 and the following apply:

4.1 agricultural field equipment: agricultural tractors, self-propelled machines, implements and combinations thereof designed primarily for agricultural field operations

[Source: ANSI/ASAE S390]

4.2 agricultural tractor: self-propelled agricultural vehicle having at least two axles and wheels, or endless tracks, particularly designed to pull agricultural trailers and pull, push, carry and operate implements used for agricultural work (including forestry work) which may be provided with a detachable loading platform

NOTE: The agricultural vehicle has a maximum design ground speed of not less than 6 km/h and may be equipped with one or more seats.

[Source: ANSI/ASAE S390]

4.3 average deceleration: the deceleration rate of a machine defined by the formula:

$$a = \frac{V^2}{25.92\ S}$$

where:

a = average deceleration, m/s^2

V = initial speed, km/h

S = stopping distance, m

4.4 axle load: sum of the vertical static forces of the road surface on the wheels of the axle

4.5 braking system: Combination of parts whose function is to progressively reduce the speed of a moving vehicle or to bring it to a halt, or to keep it stationary if it has already halted; the system consists of the control device, the transmission and the brake.

4.5.1 hydraulic braking system: braking system in which the control and energy are transmitted from the point of application to the brakes by hydraulic transmission devices

[Source: ISO 611:2003]

4.5.2 pneumatic braking system: braking system in which the control and energy are transmitted from the point of application to the brakes by pneumatic transmission devices

[Source: ISO 611:2003]

4.5.3 secondary braking system: braking system used for stopping a machine in the event of a malfunction in the operation of the service brake system

4.6 control device: device actuated directly by the operator to supply the energy required for braking

NOTE: This energy may be the muscular energy of the operator, or energy from another source controlled by the operator, or in appropriate cases the kinetic energy of a towed vehicle, or a combination of these various kinds of energy.

4.7 control line: connecting line intended for towed vehicle service brake control

4.8 endurance braking system: Additional braking system having the capability to provide and to maintain a braking effect over a long period of time without a significant reduction in performance, including the control device which may comprise a single device or a combination of several devices each of which may have its own control.

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4.9 graduated braking: braking which, within the normal range of operation of the equipment, during either the application or the releasing of the brakes, fulfills all the following conditions

— the operator can, at any time, increase or reduce the braking force through action of the control device,

— it is possible to make a sufficiently fine adjustment to the braking force.

4.10 interchangeable towed machinery: machine which is designed to be towed by a tractor and changes or adds to its functions

NOTE 1 to entry: It may include a load platform designed and constructed to receive any tools and appliances needed for those purposes, and to store temporarily any materials produced or needed during work.

NOTE 2 to entry: Any vehicle intended to be towed by a tractor and permanently incorporating an implement or designed to process materials shall be considered interchangeable towed machinery if the ratio of the technically permissible gross mass to the unladen mass of that vehicle is less than 3,0.

[Source: ANSI/ASAE S390]

NOTE 3 to entry: Technically permissible gross mass is equivalent to maximum mass.

4.11 maximum allowable parking grade: The steepest slope, in the forward and reverse direction, on which a towed vehicle is capable of being parked per the manufacturer's recommendations when detached from the towing vehicle.

4.12 maximum design ground speed: speed based on the nominal design capability of the machine with tyres offered as original equipment

NOTE 1 to entry: The tyre size will be the largest diameter drive tyres on tractors and self-propelled machines but not necessarily on towed equipment.

[Source: ANSI/ASAE S390]

NOTE 2: The maximum design ground speed is considered to be in the forward direction of the vehicle travel unless otherwise explicitly noted.

4.13 maximum mass: mass stated by the agricultural vehicle manufacturer to be technically permissible

[Source: ANSI/ASAE S390]

4.14 maximum stationary axle load: stationary axle load achieved under the condition of the maximum transport mass of the vehicle

4.15 maximum transport mass: maximum allowable mass of the vehicle, specified by the manufacturer, for maximum transport speed or 50 km/h (31 mile/h) whichever speed is less

4.16 maximum transport mass ratio: maximum transport mass of towed vehicle divided by the minimum recommended towing vehicle mass

4.17 maximum transport speed: maximum travel speed recommended by the vehicle manufacturer, when vehicle is configured for transport, including on-road use.

4.18 mean fully developed deceleration: deceleration rate of a machine averaged with respect to change in velocity over the time period from V_b to V_e according to the following formula:

$$d_m = \frac{V_b^2 - V_e^2}{25.92(S_b - S_e)}, \text{ m/s}^2 \quad \text{(primary method)}$$

$$d_m = \frac{V_b - V_e}{3.6(t_b - t_e)}, \text{ m/s}^2 \quad \text{(optional method)}$$

where:

V_1 = initial vehicle speed is calculated as described in the NOTE below

V_b = vehicle speed at 0.8 V_1, km/h

V_e = vehicle speed at 0.1 V_1, km/h

S_b = distance travelled between V_1 and V_b, m

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