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Safety for Anhydrous Ammonia Application Equipment



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Safety for Anhydrous Ammonia Application Equipment

Developed by the X620 Standards development committee, approved by the ASABE Machinery Systems Technical Community; approved by ASABE and ANSI as an American National Standard March 2017; revised April 2022.

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1 Purpose and Scope

1.1 The purpose of this standard is to establish the safety requirements for implements of husbandry used in the local transport and application of anhydrous ammonia for agricultural fertilizer.

1.2 This standard does not cover bulk storage and handling equipment, manufacture of, or over-the-road bulk transport equipment (other than implements of husbandry) for anhydrous ammonia.

1.3 This standard is applicable to new equipment manufactured and assembled after the publication of this standard.

2 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.

ANSI/ASABE AD11684:1995, Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles

ANSI/ASABE AD3600:2015, Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and format

ANSI/ASAE S279, Lighting and Marking of Agricultural Equipment on Highways

ANSI/ASAE S318, Safety for Agricultural Field Equipment

ANSI/ASAE S338, Field Equipment for Agriculture — Safety Chain for Towed Equipment

ASAE S360, Test Procedure and Performance Criteria for the Under-carriage Load Carrying Ability of Farm Materials Transport Equipment

ANSI/ASAE S390, Definitions and Classifications of Agricultural Field Equipment

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

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

3 Definitions

Where possible, the terms and definitions used in this standard are aligned with ANSI/CGA G-2.1.

3.1 anhydrous ammonia (NH₃): The compound formed by the chemical combination of the element's nitrogen and hydrogen in molar proportion of one part nitrogen and three parts hydrogen. This relationship is shown by the chemical formula NH₃. On a weight basis, the ratio is 14 parts nitrogen to three parts hydrogen, or approximately 82% nitrogen to 18% hydrogen. Ammonia may exist in either gaseous, liquid, or solid state. It is not to be confused with aqua ammonia (ammonium hydroxide) which is a solution of ammonia in water (ANSI/CGA G-2.1).

3.2 anhydrous ammonia application unit (NH₃ applicator): An implement of husbandry used to apply NH₃ below soil surface. The shortened term "NH₃ applicator" is used throughout this standard.

3.3 back pressure check valve: A device that allows liquid or gas to flow in only one direction.

3.4 break-away coupler: An automatic, self-closing device designed to disconnect NH₃ hoses in case the nurse tank wagon(s) becomes detached.

3.5 excess flow valve: A device designed to automatically shut off the flow of NH₃ at a designated flow rate.

3.6 liquid withdrawal valve: A valve designed for a nurse tank's liquid withdrawal port.

3.7 mechanically secure point: Connection point affixed to the nurse tank or nurse tank wagon and affixed to the towing implement of husbandry for the attachment of the nurse tank hose(s). The mechanically secure point provides resistance allowing the break-away coupler to operate in the event of detachment of the nurse tank wagon from the towing implement.

3.8 nurse tank: A pressure vessel used exclusively for local transport and field application of anhydrous ammonia.

3.9 nurse tank hose: The anhydrous ammonia hose(s) between the mechanically secure point on the nurse tank or nurse tank wagon and the towing implement.

3.10 nurse tank wagon: A carrier of nurse tanks defined per 3.8. Nurse tank wagons are normally classified as over the road towed implement as a sub-category of agricultural vehicle per ANSI/ASAE S390.

3.11 rear hitch: A hitch point located at the rear of an implement of husbandry for attachment of a nurse tank wagon or other implement of husbandry.

3.12 swing arm: A structural arm attached to an NH₃ applicator that allows horizontal movement through a vertical pivot point located on the NH₃ applicator frame providing a mechanically secure point for mounting a break-away coupler.

3.13 swivel, pivot, or articulation point (of a break-away coupler): The location where the break-away coupler bends or swivels. Anything that allows the device to swivel so that it disconnects the nurse tank hose, even when at an angle, is considered a swivel/pivot/articulation point. It may be a bracket but is not limited to brackets.

3.14 vertical pivot (of a nurse tank wagon): The axis allowing horizontal movement for a nurse tank wagon tongue.

4 Requirements

4.1 Unless otherwise specified, ANSI/ASAE S318, Safety for Agricultural Field Equipment shall be followed.

4.2 ANSI/CGA G-2.1, Safety Requirements for the Storage and Handling of Anhydrous Ammonia provides the basis for regulatory and statutory law and shall be followed.

4.3 Total capacity of all nurse tanks mounted on farm wagons (implements of husbandry) shall not exceed 3000 gallons (water capacity).¹

5 Nurse Tank Wagon Safety and Anhydrous Ammonia Flow Control

5.1 Nurse tank valves and fittings: selection, installation, and excess flow valve rating

5.1.1 Every tank withdrawal valve shall be protected by an excess flow valve matched to the designed flow rate.

5.1.1.1 Flow capacity of the excess flow valve shall not exceed 170 L/min (45 gal/min) for 32 mm Diameter Nominal (DN) (1¼ in. Nominal Pipe Size (NPS)) nurse tank connections and 227 L/min (60 gal/min) for 40 mm DN (1½ in. NPS) nurse tank connections.

5.1.2 Piping, hoses, fittings, and valves installed downstream of the excess flow valve and up to the tool-bar connection shall have a greater flow capacity than the excess flow valve.

5.1.3 When using an open yoke type excess flow withdrawal valve in a tank opening, the opening shall not be reduced with bushings to accommodate the withdrawal valve.

5.1.3.1 A liquid withdrawal tank penetration utilizing a dip tube shall have the dip tube size and dimensions approved by the liquid withdrawal valve manufacturer for use with the withdrawal valves to be installed in the penetration.

5.2 Multiple nurse tank plumbing

5.2.1 Multiple nurse tanks on a single nurse tank wagon with shared plumbing circuits. If the tanks are not plumbed together, they shall be treated as single tanks.

5.2.1.1 Hose, fittings and valve selection shall meet requirements in Section 5.1, and ANSI/CGA G-2.1.

5.2.1.2 When plumbing multiple nurse tanks together on the same nurse tank wagon, all components for plumbing the tanks together shall be installed between a mechanically secure point on the wagon and the nurse tanks.

5.2.1.3 Multi-tank systems with more than one nurse tank hose connecting to the NH₃ applicator shall have an excess flow valve installed at each outlet of the connection fitting and upstream of the mechanically secure point. The flow rating of each excess flow valve shall be equal to or less than the lowest rating of the excess flow valves at the individual tank withdrawal valves in the multi-tank system, with the exception of larger lines downstream, no greater than 45 gal/min for a 1¼ in. line and 60 gal/min for a 1½ in. line (see the top layout in Figure 1).

For systems with single hoses connecting to the applicator (see the bottom layout in Figure 1):

Where the joining tee, fittings and down-stream hose are equal in size to the upstream components the flow rating of each excess flow valve shall be equal to or less than the lowest rating of the excess flow valves at the

¹ GCA G-2.1