

3-A® Sanitary Standards for Silo-Type Storage Tanks for Milk and Milk Products, Number 22-08

*Standards Developing Organizations
3-A Sanitary Standards, Inc. (3-A SSI)
in collaboration with
United States Public Health Service (USPHS)/
United States Food and Drug Administration (USFDA)
United States Department of Agriculture (USDA)
European Hygienic Engineering & Design Group (EHEDG)*

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Foreword

This 3-A Sanitary Standard is to establish minimum sanitary (hygienic) requirements for Silo-Type Storage Tanks. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

This 3-A Sanitary Standard is for voluntary use by directly and materially affected organizations such as equipment and machinery fabricators, processors, regulatory agencies and by 3-A SSI to assure adequate public health protection exist for the devices and covered products. 3-A Sanitary Standards, Inc. use these documents as the source for sanitary criteria as part of 3-A Symbol authorization.

This 3-A Standard was developed jointly by 3-A SSI, the United States Public Health Service (USPHS)/United States Food and Drug Administration (USFDA), the United States Department of Agriculture – Dairy Programs (USDA), and the European Hygienic Engineering & Design Group (EHEDG).

It is our purpose to encourage inventive genius and provide a forum to discuss new developments. Suggestions for improvement and new technology are welcome any time for consideration by the 3-A Sanitary Standards Committees. Please forward comments to the 3-A SSI, 1451 Dolley Madison Boulevard, Suite 210, McLean, VA 22101-3850, USA. By fax: 703-761-6284. By e-mail to: 3-ainfo@3-a.org.

A SCOPE

A1 These standards cover the sanitary aspects of silo-type storage tanks for milk and milk products used at dairy processing plants. These standards are not intended to cover silo-type tanks used on dairy farms.

A2 In order to conform to these 3-A Sanitary Standards, silo-type storage tanks shall conform to the following design, material, fabrication and refrigeration criteria.

B DEFINITIONS

B1 *Product:* Shall mean milk and milk products.

B2 *Silo-Type Tank:* Shall mean any vertical tank in excess of 10 ft. (3.05 m) inside height for the storage or storage and cooling of product.

B3 *Control Area(s):* Shall mean the area(s) in which all appurtenances for the operation of the silo tank are located and vent lines terminate, except as provided in Section D18 and shall be a part of one or more of the following:

B3.1 A processing area.

B3.2 An area in the plant at least the equivalent of a processing area.

B4 *Alcove(s):* Shall mean an extension of the control area(s) in which appurtenances and vent lines terminate.

B5 *Silo Rupture Disc:* Shall mean a membrane type differential pressure and/or vacuum device for venting a silo under emergency conditions (pressure and/or vacuum beyond design).

B6 *Silo Vacuum/Pressure Break:* Shall mean a mechanical differential pressure and/or vacuum device for venting a silo under emergency conditions (pressure and/or vacuum beyond design, see Appendix, Section I).

B7 *Silo Emergency Venting Sensor:* Shall mean a device to remotely indicate the actuation of the emergency venting device(s) (i.e., rupture disc or silo vacuum pressure break).

B8 *Mechanical Cleaning or Mechanically Cleaned:* Shall denote cleaning, solely by circulation and/or

flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B9 Surfaces

B9.1 *Product Contact Surfaces:* Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop, or be drawn into the product.

B9.2 *Lining:* Shall mean all surfaces used to contain the product, including the sides, bottom, and top.

B9.3 *Shell:* Shall mean the material covering the exterior of the insulation and/or heat exchange jacket.

B9.4 *Nonproduct Contact Surfaces:* Shall mean all other exposed surfaces.

C MATERIALS

C1 Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series¹ or corresponding Alloy Cast Institute² (ACI) types (See Appendix, Section F), or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

C1.1 Rubber and rubber-like materials may be used for umbrellas, slingers and drip shields for vertical agitator assemblies, agitator seals, gaskets, seals, caps, rupture discs and parts having the same functional purposes.

C1.2 Rubber and rubber-like materials when used for the above-specified applications shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

C1.3 Plastic materials may be used in sight and/or light openings and for umbrellas, slingers and drip

¹ The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, Table 2-1. Available from the American Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086.

² Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016.

shields for vertical agitator assemblies, bearings, gaskets, seals, caps, rupture discs and parts having the same functional purposes.

- C1.4 Plastic materials when used for the above-specified applications shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-as amended.
- C1.5 Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.
- C1.6 The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic.³
- C1.7 Where materials having certain inherent functional properties are required for specific applications, such as bearing surfaces and rotary seals, carbon and/or ceramic materials may be used. Carbon and/or ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, resistant to scratching, scoring and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.
- C2 In a silo-type tank to be sterilized by heat or operated at a temperature of 250°F (121°C) or higher, all materials having product contact surface(s) used in the construction of fittings, valves, tubing, gaskets, and nonmetallic component parts shall be such that they can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250°F (121°C) and (2) operated at the temperature required for product storage.
- C3 Nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces

³ Adhesives shall comply with 21 CFR 175 - Indirect Food Additives: Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D FABRICATION

- D1 All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section G.)
- D2 All permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices. (See Appendix, Section G.)
- D3 Welding shall produce product contact surfaces equivalent to D1, except that:
 - D3.1 Those permanent welded joints in CIP, venting, overflow, and vacuum/pressure break lines fabricated of tube or pipe are considered product contact surfaces when they contact product or CIP solutions. Metal tubing shall be welded in conformance to the 3-A Accepted Practices for Permanently Installed Product and Solution Cleaning Systems, Number 605-. The internal weld of the tube or pipe welded in accordance with 3-A Accepted Practices, Number 605- that may be a product contact surface does not require additional surface treatment. External welds of the tube or pipe that may be product contact surfaces and are visible shall conform to D1.
- D4 Silo-type tanks shall be provided with means for mechanical cleaning. The top head shall be dished or otherwise shaped so that it readily facilitates mechanical cleaning.
- D5 Silo-type tanks shall be designed so that the product contact surfaces of the tank, including the product contact surfaces of the opening for a vertical mechanical agitator, silo rupture discs, silo vacuum/pressure breaks, and all nonremovable appurtenances thereto can be mechanically cleaned and are accessible for inspection.
- D6 All product contact surfaces shall be self-draining. The bottom of the lining, if flat, shall have a minimum slope of 3/4 in. per ft. (60 mm per m)

toward the outlet or if the bottom of the lining is of the reverse dish-type the portion of the bottom adjacent to the side wall shall have a minimum slope of 3/4 in. per ft. (60 mm per m) toward the outlet. Silo-type tank bottoms shall be so constructed that they will not sag, buckle or prevent complete drainage.

D7 Gaskets

D7.1 Gaskets having a product contact surface(s) shall be removable or be bonded.

D7.2 Bonded rubber and rubber-like gaskets and bonded plastic gaskets shall be bonded in such a manner that the bond is continuous and mechanically sound and when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, or sterilization, the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D7.3 Grooves in gaskets shall be no deeper than their width, unless the gasket is readily removable and reversible for cleaning.

D7.4 Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide except those for standard O-rings smaller than 1/4 in. (6 mm).

D8 Radii

D8.1 All internal angles of 135° or less on product contact surfaces shall have radii of not less than 1/4 in. (6 mm) except that:

D8.1.1 Smaller radii may be used when they are required for essential functional reasons, such as those in flat sealing surfaces. In no case shall such radii be less than 1/32 in. (1 mm).

D8.1.2 The radii in gasket grooves, gasket retaining grooves, or grooves in gaskets, except for those for standard 1/4 in. (6 mm) and smaller O-rings, shall be not less than 1/8 in. (3 mm).

D8.1.3 The radii in grooves for standard 1/4 in. (6 mm) O-rings shall not be less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) O-rings shall be not less than 1/32 in. (1 mm).

D8.1.4 The minimum radii for fillets of welds in product contact surfaces shall be not less than 1/4 in. (6 mm) except that the minimum radii for such welds may be 1/8 in. (3 mm) when the thickness of one or both parts joined is less than 3/16 in. (5 mm).

D8.1.5 The minimum radii where head(s) and the side wall(s) join shall not be less than 1/2 in. (13 mm).

D8.1.6 The minimum radii on a bottom support or guide shall be 1/8 in. (3 mm).

D9 There shall be no threads in product contact surfaces.

D10 SILO RUPTURE DISCS AND SILO VACUUM/PRESSURE BREAKS

D10.1 Silo rupture discs and silo vacuum/pressure breaks, if used, shall be installed as close as practical to the highest elevation of the silo-type tank top head. The interior of the fittings as well as the interior of the venting device shall be designed to be mechanically cleaned and are to be considered product contact surfaces. The cleaning system design shall insure that the venting device will not be damaged by cleaning media impact.

D10.2 The silo emergency venting device shall be vented to a control area. (See Appendix, Section I).

D10.3 A silo emergency venting sensor shall be installed on each venting device to indicate failure or activation. Means shall be provided to test proper functioning of the sensor. Additionally, the entire emergency vent line shall be designed to be mechanically cleaned and is considered to be a product contact surface.

D10.4 The silo emergency venting device and associated line(s) shall be independent of CIP or vent lines.

D11 Rupture discs, if used, shall conform to applicable provisions of the 3-A Sanitary Standards for Rupture Discs for Milk and Milk Products, Number 60-.

D12 All sanitary fittings and connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Plug-Type Valves for Milk and Milk Products, Number 51-, Thermoplastic Plug-Type Valves for Milk and Milk Products, Number 52-, Compression-Type Valves for Milk and Milk Products, Number 53-, Diaphragm-Type Valves for