

3-A[®] Sanitary Standards for Storage Tanks, Number 01-08

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association for Protection (IAFP)
United States Public Health Service (USPHS)
The Dairy Industry Committee (DIC)
United States Department of Agriculture – Dairy Programs (USDA)

It is the purpose of the IAFIS, IAFP, USPHS, DIC, and USDA in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Storage tank specifications heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, DIC, and USDA at any time. The 3-A Sanitary Standards and 3-A Accepted Practices provide hygienic criteria applicable to equipment and systems used to produce, process, and package milk, milk products, and other perishable foods or comestible products. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

A SCOPE

A1 These standards cover the sanitary aspects of storage tanks for milk and milk products.

A2 In order to conform to these 3-A Sanitary Standards, storage tanks shall comply with the following design, material, and fabrication criteria¹.

B DEFINITIONS

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

B2 *Storage Tank*: Shall mean a satisfactorily shaped insulated storage tank used for the storage, or storage and cooling of product, except a vertical tank whose inside height is in excess of 10 feet (3.05 m)².

B3 Surfaces

B3.1 *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.

B3.2 *Nonproduct Contact Surfaces*: Shall mean all other exposed surfaces.

B3.3 *Lining*: Shall mean all surfaces used to contain the product, including ends, sides, bottom, and top.

B3.4 *Shell*: Shall mean the material covering the exterior of the insulation and/or heat exchange jacket.

B3.5 *Breast*: Shall mean that portion of the exposed metal used to join the lining to the shell.

B4 Cleaning

B4.1 *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.

B4.2 *Manual (COP) Cleaning*: Shall mean soil removal when the equipment is partially or totally disassembled. Soil removal is effected with chemical solutions and water rinses with the assistance of one or a combination of brushes, nonmetallic scouring pads and scrapers, high or low pressure hoses and tank(s) which may be fitted with recirculating pump(s), and with all cleaning aids manipulated by hand.

B5 *Bond*: Shall mean the adhesive or cohesive forces holding materials together. This definition excludes

¹ Use current revisions or editions of all referenced documents cited herein.

² Vertical tanks in excess of 10 feet (3.05 m) inside height are defined as silo-type tanks. Sanitary criteria for silo-type tanks are covered in 3-A Sanitary Standards for Silo-Type Storage Tanks, Number 22-, as amended.

press and shrink fits.

B6 *Close Coupled:* Shall mean mating surfaces or other juxtaposed surfaces that are less than twice the nominal diameter or cross section of the mating surfaces or a maximum of 5 in. (127 mm).

B7 *Coatings:* Shall mean the results of a process where a different material is deposited to create a new surface. There is appreciable, typically more than 1 µm, build-up of new material. The coating material does not alter the physical properties of the substrate.

B7.1 Coating processes include:

- B7.1.1
1. Chemical (conversion coatings)
 2. Engineering Plating, (e.g., Electrodeposition,³ gold plating)
 3. Thermal spraying (e.g., flame, plasma, arc spray)
 4. Physical Vapor Deposition
 5. Chemical Vapor Deposition
 6. Overlays and Encapsulation

B8 *Corrosion Resistant:* Shall mean the surface has the property to maintain its original surface characteristics for its predicted service period when exposed to the conditions encountered in the environment of intended use, including expected contact with product and cleaning, sanitizing, or sterilization compounds or solutions.

B9 *Easily or Readily Accessible:* Shall mean a location which can be safely reached by personnel from a floor, platform, or other permanent work area.

B10 *Easily or Readily Removable:* Shall mean quickly separated from the equipment with the use of simple hand tools if necessary.

B11 *Inspectable:* Shall mean all product contact surfaces can be made available for close visual observation.

B12 *Nontoxic Materials:* Shall mean those substances which under the conditions of their use are in

compliance with applicable requirements of the Food, Drug, and Cosmetic Act of 1938, as amended.

B13 *Simple Hand Tools:* Shall mean implements normally used by operating and cleaning personnel such as a screwdriver, wrench, or mallet.

B14 *Substantially Flush:* Shall mean mating surfaces or other juxtaposed surfaces shall be within 1/32 in. (0.794 mm).

C MATERIALS

C1 Metals

C1.1 All product contact surfaces, including the breast, shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series⁴, (excluding 301 and 302), or corresponding Alloy Cast Institute⁵ (ACI) types, 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 (See Appendix, Section E).

C2 Nonmetals

C2.1 Rubber and rubber-like materials may be used for umbrellas, slingers and drip shields for vertical agitator assemblies, gaskets, seals, protective caps for sanitary connections, and parts having the same functional purposes.

C2.1.1 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, Number 18-.

C2.2 Plastic materials may be used in sight and/or light openings and for umbrellas, slingers, and drip shields for vertical agitator assemblies, bearings, gaskets, seals, protective caps for sanitary connections, direct reading gauge tubes, and parts having the same functional purposes.

³Federal Specification #QQ-C-320B for Chromium Plating (Electrodeposited). Federal Specification #QQ-N-290A for Nickel Plating (Electrodeposited). Available from the General Services Administration, Federal Supply Services Bureau, Specification Section, 470 East L'Enfant Plaza, Suite 8100, Washington, DC 20407 (202) 755-0325.

⁴The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*. Available from the American Iron and Steel Society, 186 Thorn Hill Rd., Warrendale, PA 15086 (724) 776-1535.

⁵Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708) 299-9160.

- C2.2.1 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, Number 20-.
- C2.2.2 Plastic may be used in sight and/or light openings and for direct reading gauge tubes, and when used shall be of a clear, heat-resistant type.
- C2.3 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.
- C2.4 The adhesive, if used, on bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic⁶.
- C2.5 Where materials having certain inherent functional properties are required for specific applications, such as bearing surfaces and rotary seals, carbon, or ceramic materials, including tungsten carbide may be used. Carbon and 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.
- C2.6 Glass may be used in sight and/or light openings and for direct reading gauge tubes, and when used shall be of a clear heat-resistant type.

C3 Nonproduct Contact Surfaces

- C3.1 All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Nonproduct contact surfaces 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

⁶ 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 (202) 512-1800.

D1 Surface Texture

- D1.1 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 F.)

D2 Permanent Joints

- D2.1 All permanent joints in metallic product contact surfaces shall be continuously welded.
- D2.1.1 Welding shall produce product contact surfaces which are 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 F.)

D3 Bonded Materials

- D3.1 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D4 Cleaning and Inspectability

- D4.1 Storage tanks that are to be mechanically cleaned shall be designed so that the product contact surfaces of the storage tanks, including the product contact surfaces of the opening for a vertical mechanical agitator, and all nonremoved appurtenances thereto can be mechanically cleaned and are easily accessible, readily removable, and inspectable.
- D4.2 Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an installed position or when removed. Demountable parts shall be readily removable.
- D4.3 Appurtenances having product contact surfaces shall be readily removable, or they shall be readily cleanable when assembled or installed, and shall be easily accessible for inspection.

- D4.4 Storage tanks having an inside height of more than 96 in. (244 cm) shall be provided with means that will facilitate manual cleaning and inspection of all product contact surfaces or means shall be provided for mechanically cleaning the product contact surfaces of the tank and all nonremoved appurtenances thereto.
- D5 **Draining**
- D5.1 All product contact surfaces shall be self-draining except for normal clingage.
- D5.1.1 The bottom slope of a vertical cylindrical storage tank with a flat bottom shall be at least 3/4 in. per ft. (6.25 cm per m) toward the outlet. If the bottom of the lining is of the reverse dish type, the portion of the bottom adjacent to the sidewall shall have a minimum slope of 3/4 in. per ft. (6.25 cm per m) toward the outlet.
- D5.1.2 Horizontal storage tanks shall have a bottom slope of at least 1/4 in. per ft. (2.0 cm per m) toward the outlet when properly installed. Rectangular storage tanks shall have a built-in bottom slope of 3/4 in. per ft. (6.25 cm per m) toward the center line and, when properly installed, the center line shall have a slope of at least 1/4 in. per ft. (2.0 cm per m) toward the outlet.
- D6 **Gaskets**
- D6.1 Gaskets having a product contact surface shall be removable or bonded.
- D6.2 Grooves in gaskets shall be no deeper than their width unless the gasket is readily removable and reversible for cleaning.
- D6.3 Gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6.35 mm) in depth or be less than 1/4 in. (6.35 mm) wide except those for standard O-rings smaller than 1/4 in. (6.35 mm), and those provided for in Section D11.1.
- D7 **Radii**
- D7.1 All internal angles of less than 135° on product contact surfaces shall have radii of not less than 1/4 in. (6.35 mm), except that:
- D7.1.1 Minimum radii for fillets of welds in product contact surfaces may be 1/8 in. (3.18 mm) where the thickness of one or both parts joined is less than 3/16 in. (4.76 mm). (See also D7.1.6)
- D7.1.2 The radii in agitator shaft bottom supports or guides and in gasket grooves or gasket retaining grooves for removable gaskets, except those for standard 1/4 in. (6.35 mm) and smaller O-rings, shall be not less than 1/8 in. (3.18 mm).
- D7.1.3 Radii in standard O-ring grooves shall be as specified in Appendix, Section I.
- D7.1.4 Radii in nonstandard O-ring grooves shall be those radii closest to a standard O-ring as specified in Appendix, Section I.
- D7.1.5 The radii of covers and agitator assemblies shall be not less than 1/4 in. (6.35 mm).
- D7.1.6 The radius at a juncture of the end(s), sidewall(s), top, and bottom shall not be less than 1/2 in. (12.70 mm).
- D8 **Lining**
- D8.1 The lining shall be constructed so that it will not sag, buckle, or prevent complete drainage in normal use.
- D9 **Threads**
- D9.1 There shall be no threads on product contact surfaces.
- D10 **Sanitary Tubing**
- D10.1 All metal tubing shall conform to the applicable provisions of 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-, except that materials conforming to C2.1.1 or C2.2.1 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubes, fittings, or vents.
- D11 **Fittings and Valves**
- D11.1 All sanitary fittings and connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-.
- D11.2 All sanitary valves shall conform to the applicable provisions of the appropriate 3-A sanitary valve standard.