

**SHELLFISH INDUSTRY EQUIPMENT
CONSTRUCTION GUIDE**

Introduction

Since 1925 the Public Health Service, the States and the shellfish industry have cooperated in a program designed to maintain a high level of sanitation in the growing, harvesting, and processing of oysters, clams and mussels to be marketed as a fresh or frozen product. The basic sanitary standards used in this program are fully described in PHS Publication No. 33, Manual of Recommended Practice for Sanitary Control of the Shellfish Industry, Parts I and II. General construction standards for equipment used by the shellfish industry are an integral part of these basic standards.

The need for more specific construction guides for equipment used by the shellfish industry was reviewed at the 1958 Shellfish Sanitation Workshop¹ and the Public Health Service (PHS) was requested to initiate development of such guides. As result of this request, the PHS developed drafts of equipment construction guides. Agencies and organizations which received these initial drafts and thus contributed to the development of the completed construction guides included: Oyster Institute of North America, Bureau of Commercial Fisheries, Food and Drug Administration, Canadian Department of National Health and Welfare, and two equipment manufacturing companies. The completed construction guides were reviewed and adopted by the 1961 National Shellfish Sanitation Workshop. Subsequently, the 1993 annual meeting of the Interstate Shellfish Sanitation Conference asked FDA to review and update the definitions for consistency with other documents such as Model Code, Pasteurized Milk Ordinance, National Sanitation Foundation, and Code of Federal Regulations. FDA agreed to provide an update to the committee.

It is the purpose of this guide to describe construction and fabrication procedures which will ensure that blower tanks, skimmers, returnable shipping containers, shellfish shucking buckets and pans and will meet the equipment construction standard of the Cooperative program and the functional needs of the industry. However, the development of new methods of equipment construction or fabrication with acceptable materials, construction and fabrication is also encouraged. Therefore, shellfish equipment specifications developed which so differ in design, material, fabrication, or otherwise as not to conform with the following standards, but which in the fabricator's opinion are equivalent to or better may be submitted for consideration.

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

Scope

This guide covers the sanitary construction aspects of (1) shellfish blower tanks, including the sanitary piping for air, water, and drain lines; (2) the stand-supported skimmer, including the supporting stand; (3) returnable shipping containers; (4) shellfish shucking buckets; (5) shellfish shucking pans; (6) tables; (7) conveyors; (8) mechanical shucking devices.

This guideline will aid FDA, state regulatory officials and other interested individuals in making evaluations of the materials, construction and fabrication of equipment used to collect, convey, store, transport, process and package molluscan shellfish products.

This guideline will also provide manufacturers with knowledge of what documentation reviewers might expect them to provide in order to verify the acceptability of materials, construction and fabrication.

Definitions

(1) ***Air break*** - A piping arrangement in which a drain from a fixture, appliance, or device discharges indirectly into another fixture, receptacle, or interceptor at a point below the flood level rim.

(2) ***Air Gap*** - The unobstructed vertical distance (twice the diameter of largest inlet pipe) through the free atmosphere between the water inlet supplying a tank, plumbing fixture or other device and the effective overflow level of the receptacle.

(3) ***Air Under Pressure*** - The pressure of which has been increased by mechanical means to exceed atmospheric pressure, and which is used for agitation of shucked shellfish.

(4) ***Alternate Materials*** - Is whenever specific materials are mentioned, it is understood that the use of materials proven to be equally satisfactory from the standpoint of sanitation and protection of food is acceptable.

(5) ***Blower*** - A tank-like device for immersion washing of shucked shellfish. Air may be introduced at the bottom of the tank to produce agitation.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

(6) **Coatings** - The results of a process where a different material is deposited to create a new surface. There is appreciable build-up of new material, typically more than 1_m.

(7) **Corrosion Resistant Materials** - Those materials that maintain their original surface characteristics under normal exposure to the foods being contacted, normal use of cleaning compounds and bactericidal, and other conditions of use.

(8) **Cleaned-in-place** - Refers specifically to the cleaning and sanitizing of food processing equipment and piping in its assembled condition by recirculation of the necessary rinse, detergent and sanitizing solutions under appropriate conditions of time, temperature, detergency and physical action.

(9) **Dead End** - Area or space wherein a product, ingredient, cleaning, or sanitizing agent, or other extraneous matter may be trapped, retained or not completely displaced during operational or cleaning procedures.

(10) **Drain gate and chute** - The opening located either in the blower or skimmer through which the washed shellfish are discharged.

(11) **Drain valve** - The valve through which the wash water is released to the floor or waste line.

(12) **Easily Cleanable** - A surface which is readily accessible and is made of such materials, has a finish and is so fabricated that residue may be effectively removed by normal cleaning methods.

(13) **Equipment** - Blower, skimmer, tables, shucking benches, can seamer, sinks, refrigerators, and similar items other than utensils, used in the operation of a shellfish processing facility.

(14) **Filter Media** - Filters for the air intake of a blower shall consist of fiberglass with down stream backing dense enough to prevent fiberglass break off from passing through, cotton flannel, wool flannel, non-woven fabric or other suitable materials which under conditions of use, are non-toxic and nonshedding and which do not release toxic volatile or other contaminants to the air, or volatile which may impart any flavor or odor to the product. Disposable filter media are not intended to be cleaned or re-used.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

(15) ***Flood Level Rim*** - The edge of the receptacle from which water overflows.

(16) ***Food contact surface*** - Surface of equipment or a utensil with food normally normally comes into contact; or a surface of equipment or a utensil from which food or liquid may drain, drips, or splash into a food; or onto a surface normally in contact with food. Food contact surfaces include, but are not limited to, equipment and utensils such as; shucking knives and handles, shucking hammers and handles, shucking blocks, ice scoops and shovels, ice bins, skimmers, blower tanks, shucking pails, shellstock grinders.

(17) ***Metals*** - Metals which are nontoxic, nonabsorbent and corrosion resistant under conditions of intended use.

(18) ***Nonfood Contact Surfaces*** - All exposed surfaces other than food or splash contact surfaces.

(19) ***Nontoxic Materials*** - Materials which are free of substances which may render shellfish injurious to health or which may adversely affect the flavor, odor, composition or bacteriological quality of the product and which meet the requirements of the Federal Food Drug and Cosmetic Act as amended.

(20) ***Plastic*** - A material that contains as an essential ingredient an organic substance of high molecular weight, is solid in its finished state, and at some stage in its manufacture or in its processing into finished articles, can be shaped by flow.

(21) ***Rim*** - An unobstructed open edge of a fixture.

(22) ***Readily accessible*** - Exposed or capable of being exposed for cleaning and inspection without the use of tools.

(23) ***Readily Demountable or Removable*** - Capable of being taken away from a unit with the bare hands or the use of simple tools such as screwdriver, pliers or an open end wrench.

(24) ***Returnable Shipping Container*** - Multiple use container for holding or shipping of shucked shellfish.

(25) ***Safe Materials*** - Articles manufactured from or composed of materials that may not reasonably be expected to result, directly or indirectly, in their becoming a component or otherwise affecting the characteristics of any food.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

(26) **Sealed** - Free of cracks or other openings that permit the entry or passage of moisture.

(27) **Molluscan Shellfish** - All edible species of oysters, clams, mussels and whole scallops or roe-on scallops (scallops are excluded when the final product is the shucked adductor muscle only). Shellfish products which may contain any material other than the meats and /or shell liquor of oysters, clams, mussels or scallops will be regarded as a "processed food" and will not be included in the Cooperative Program.

(28) **Shellfish Shucking Bucket** - Containers for temporarily holding shucked shellfish during the shucking process.

(29) **Shellfish Shucking Pan** - Containers for temporarily holding shucked shellfish during the shucking process.

(30) **Shucked Shellfish** - Shellfish, or parts thereof, which have been removed from their shells.

(31) **Single Service Articles** - Any metal or plastic containers, lids and closures, wrapping materials such as burlap or hessian bags and similar materials intended for one-time use, one person use and then discarded.

(32) **Skimmers** - A perforated tray in which shucked shellfish are sprayed washed and/or drained.

(33) **Skimmers Paddle** - The utensils used as the gate on the skimmer exit chute and/or one used to scrape the product through the exit chute.

(34) **Smooth** - A surface free of pits and inclusions having a cleaning ability equal to or better than the following:

- a) food contact a No. 4 (150 grit) or better finish as obtained with silicon carbide, properly applied on stainless steel surface;
- b) Non-food contact surfaces free of visible scale.

(35) **Splash Contact Surfaces** - Any surfaces other than food contact surfaces which are subject to routine splash (wet or dry), spillage and contamination during normal use.

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

(36) **Toxic** - Having an adverse physiological effect on man.

(37) **Utensils** - Any implement used in the preparation, transportation, and storage of molluscan bivalves such as shucking knives, skimmer paddles, strainers, shucking buckets, shucking pans, etc.

(38) **Weld** - Permanent seams or joints. When welded seams are used, the weld area and the deposited material shall be as corrosion-resistant as the parent material.

Materials

I. Metals

A. Stainless Steel

Stainless steel is a family of iron based alloys that must contain at least 10.5% Chromium (**Cr**). The presence of chromium creates an invisible surface film that resists oxidation and makes the material “passive” or corrosion resistant (i.e. “stainless”). This family can be simply and logically grouped into five (5) branches. Each of these branches has specific properties and a basic grade or “type.” In addition, further alloy modifications can be made to “tailored” the chemical composition to meet the needs of different corrosion conditions, temperature ranges, strength requirements, or to improve welding, machine, work hardening and form.

Stainless is designated by three different systems: Metallurgical structure - Austenitic; Grade - 304 (most often used -- see photos for Polish No. 3 and No 4) and Unified Numbering System UNS.

Stainless steel product contact surfaces of the American Iron and Steel Institute (AISI) 303, 304, 316 Series³ or corresponding Alloy Cast Institute (ACI) types.⁴ Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM specifications A351/A351M, A743/A743M and A744/A744M.⁵ 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, can also be used, except that:

Equipment may also be made of stainless steel of the AISI 400 Series that is made as corrosion resistant as AISI 300 Series by surface treatment or coating(s) or made of nontoxic, nonabsorbent metal that is as corrosion resistant, under the conditions of intended use, as stainless steel of the AISI 300 Series.

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution



Photo 1 – Stainless Steel Type 304, No.3. Polish satisfactory for many industrial and commercial products requiring a good polished surface. Typical applications include vent hoods.

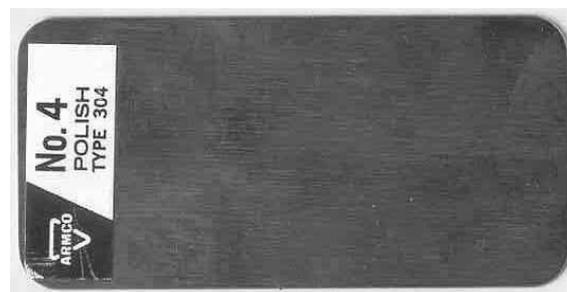


Photo 2 – Stainless Steel Type 304, No.4 Polish is exceptionally uniform. Normally used without further finishing. This is the established standard for dairy and food processing equipment because it is easy to keep clean and sanitary

B. Optional Metal Alloys

Metal alloy of the following types may be used but only in applications requiring disassembly and manual cleaning. (See **Table 1**) The values are shown as percentages.

Equipment made of optional metal alloy may have product contact surfaces modified by surface treating or coating.

C. Electroless Nickel Alloy Coating

An electroless nickel alloy coating having the following composition is acceptable:

Nickel — 90% minimum

Phosphorous — 6% minimum and 10% maximum as supersaturated solution of nickel phosphide in nickel

Trace amounts of carbon, oxygen, hydrogen and nitrogen

No other elements

Equipment to be manually or mechanically cleaned may be covered by an engineering coating of electroless nickel alloy conforming to the applicable provisions of military specification MIL-C-26074 E, as amended.⁶

Equipment may also be made of other nontoxic structurally suitable metal(s) that have their product contact surfaces modified by surface coating(s).

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

TABLE 1 -- OPTIONAL METAL ALLOYS

	UNS NO8367	UNS S21800	UNS S20161	UNS N26055	UNS N26455	UNS S17400	UNS S15500	UNS S32900	UNS R20500	UNS R50400
	ASTM A743 Grade CN- 3MN	ASTM A743 Grade CF-10 SMnN		ASTM A494 Grade CY5Sn BiM	ASTM A494 Grade CW-2M	ASTM A747 Grade CB7Cu-1	ASTM A747 Grade CB7Cu-2		ASTM A560 Grade 50Cr-50Ni	ASTM B67 Grade C- 2
C	0.03	0.1	0.015	0.05	0.02	0.07	0.07	0.2	0.1	0.1
M n	2.00	7.00 - 9.00	4.00 -6.00	1.5	1.00	0.70	0.70	1.00	0.30	
Si	1.00	3.50 - 4.50	3.00 - 4.00	0.5	0.80	1.00	1.00	0.75	1.00	
P	0.040	0.040	0.040	0.03	0.03	0.035	0.035	0.040	0.02	
S	0.010	0.030	0.040	0.03	0.03	0.03	0.03	0.030	0.02	
Cr	20.0- 22.0	16.00 - 18.00	15.0 - 18.0	11.0 - 14.0	15.0 - 17.5	5.50-17.7	14.0-15.5	23.0-28.0	48.0 - 52.0	

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

Ni	23.5-25.5	8.00-9.00	4.00-6.00	Balance	Balance	3.60-4.60	4.50-5.50	2.5-5.0	Balance	
	UNS NO8367	UNS S21800	UNS S20161	UNS N26055	UNS N26455	UNS S17400	UNS S15500	UNS S32900	UNS R20500	UNS R50400
M o	6.0-7.0			2.0-3.5	15.0-17.5			1.0-2.0		
Cb						0.15-0.35	0.15-0.35			
Cu	0.75					2.5-3.2	2.5-3.2			
N	0.18-0.26	0.08-0.18	0.08-0.020			0.05	0.05		0.30	
Fe	Balance	Balance	Balance	2.00	2.00	Balance	Balance	Balance	1.00	0.30
Sn				3.0-5.0						
Bi				3.0-5.0						
W					1.0					

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

Tl									0.50	Balance
Al									0.25	
Cu										H=0.015 N=0.03 O=0.25

NOTE: Metal alloys or metals other than the above may be as corrosion resistant as 300 Series Stainless steel. This may be shown when metal alloys or metals are tested in accordance with ASTM G31 Laboratory Immersion Corrosion Testing of Metals and have a corrosion rate of less than 20 mil per year. The test parameters such as the type of chemical(s), their concentration(s) and temperature(s) should be representative of cleaning and sanitizing conditions used in dairy equipment. **Alloys containing lead, leachable copper or other toxic metals should not be used.**

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

D. Solder

Solder, when used, should be silver bearing solder and should be corrosion resistant, free of cadmium, lead and antimony, nonabsorbent, and should not impart any toxic substance to the product when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment (or sterilization).

E. Aluminum

Aluminum is satisfactory for certain dry products applications. Aluminum may be used for liquid or high moisture content product contact surfaces only when a specific functional requirement exists and the parts are not subjected to strong caustic cleaning solutions or to the corrosive action of dissimilar metals.

The aluminum type chosen for the application shall be demonstrated to be appropriate and acceptable for the intended use. (Provisions have been made in existing 3-A (dry product) Standards for Aluminum Association designations 5052, 6061, 6063, A-360, A-380, A-319, A-315G, and C-413, Danish Standards DS#3002 and #4261, and ASTM standards B179, and S12c for certain specified uses.)

F. Nonmetals

Non-metallic materials may be used for food contact and non-food contact equipment and service items. When utilized these materials shall be in compliance with appropriate sections of the 21 Code of Federal Regulations, Parts 170-199 (21 CFR 170-199).

These materials shall be relatively inert, resistant to scratching, scoring, and distortion by the temperature, chemicals, and methods to which they are normally subjected in operation, or by cleaning and bactericidal treatment. They shall be non-toxic, fat resistant, relatively non-absorbent, relatively insoluble and shall not release component chemicals or impart a flavor to the product.

1. Rubber and rubber-like materials may be used where functionally appropriate. Rubber and rubber-like materials when used for the above specified application(s) should conform with 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- (or equivalent).

2. Plastic materials may be used where functionally appropriate. Plastic materials when used for the above specified application(s) should conform with the applicable provisions of the “3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment,” number 20 - (or equivalent).

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

When used in sight and/or light openings and as direct reading gauge tubes, plastic should be of a clear, heat resistance type.

3. Durability of rubber and plastic

Rubber and rubber-like materials and plastic materials having product contact surfaces should be of such composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment (or sterilization).

4. Bonded Rubber

The final bond and residual adhesive, if used, on bonded rubber and rubber-like materials and bonded plastic materials should be nontoxic⁷.

G. Materials for Non-product Contact Surfaces

Materials for non-product contact surfaces should be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used should adhere. All non-product contact surfaces should be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces should not be painted.

II. FABRICATION

A. Surface Texture

All product contact surfaces should have a finish at least as smooth as No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, constitutes a No.4 ground finish. A maximum Ra of 32 micro-inch (0.80), when measured according to the recommendations in ANSI/ASME B46.1⁸ - Surface Texture, is considered to be equivalent to a No. 4 finish.

B. Permanent Joints

1. Welding

Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. All permanent joints in metallic product contact surfaces should be continuously welded. Welded areas on product contact surfaces should be at least as smooth as No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices when in the final fabricated form except that:

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

2. Soldering

In such cases where welding is impractical, soldering, may be employed where necessary for essential functional reasons. Silver bearing solder may be used for producing fillets for minimum radii or other appropriate functional purposes.

3. Press fits or shrink-fits

Press-fits or shrink-fits may be used to produce crevice free permanent joints in metallic product contact surfaces when neither welding nor soldering is practical. Joints of these types may only be used to assemble parts having circular cross sections, free of shoulders or relieved areas. For example: they may be used to assemble round pins or round bushings into round holes. In both of these fits the outside diameter of the part being inserted is greater than the inside diameter of the hole.

In the case of the press-fit the parts are forced together by applying pressure. The pressure required is dependent upon the diameter of the parts, the amount of interference and the distance the inner member is forced in.

In shrink-fits, the diameter of the inner member is reduced by chilling it to a low temperature. Dry ice is commonly used to shrink the inner member. Heat may also be applied to the outer member of the press-fit. Less assembly force is required for this type of fit.

The design of these fits depends on a variety of factors. The designer should follow recommended practices to assure that a crevice-free joint is produced. A recognized authoritative reference is Machinery's handbook published by Industrial Press Inc., 200 Madison Avenue, New York, NY 10157.

4. Surface finish

Press-fitting, shrink-fitting or soldering should produce contact surfaces which are at least as smooth as No. 4 ground finish on stainless steel sheets and which are free of imperfections such as pits, folds and crevices.

C. Bonded Materials

Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces should 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 (or sterilization if applicable) the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

D. Coatings

Coatings, if used, should be free from surface delamination, pitting, flaking, spalling (chipping), blistering and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment (or sterilization).

E. Cleaning and Inspection

Equipment that is to be mechanically cleaned should be designed so that the product contact surfaces and all non-removable appurtenances thereto can be mechanically cleaned and are easily accessible and readily removable for inspection. Removable parts shall be readily demountable employing simple hand tools, which are available to operating or cleaning personnel; except that equipment that is to be CIP cleaned should have representative product contact surfaces easily accessible for inspection.

Product contact surfaces, not designed to be mechanically cleaned, should be accessible for cleaning and inspection when in an assembled position or when removed.

Appurtenances having product contact surfaces should be readily removable using simple hand tools or they should be cleanable when assembled or installed and should be easily accessible for inspection.

F. Draining

All product contact surfaces, when properly installed, should be self-draining except for normal clingage. However, if the product contact surfaces are not self-draining, they should have sufficient pitch to suitable drain points so they can be drained.

G. Fittings, Valves, Instruments and Similar Appurtenances

Sanitary fittings and connections which conform with the appropriate 3-A Sanitary Standards are acceptable. All other fittings must be reviewed using the criteria in this document.

The thermometer connections and/or openings, if provided or required, should be located so that the thermometer is not influenced by a heating or cooling jacket. If the fittings for temperature sensing devices do not pierce the tank lining, either the temperature sensing element receptacles should be securely attached to the exterior of the lining or means to attach the temperature sensing element(s) securely to the exterior of the lining should be provided.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

H. Sanitary Tubing

All metal tubing should conform with the applicable provisions for welded sanitary product pipelines found in the 3-A Accepted Practices for Permanently Installed Product and Solution Pipelines and Cleaning Systems Used in Milk and Milk Product Processing Plants, Number 605- or equivalent and with the 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33- or equivalent.

I. Gaskets

Gaskets having a product contact surface should be removable or bonded.

Grooves in gaskets should be no deeper than their width unless the gasket is readily removable and reversible for cleaning, (i.e., storage tank door gaskets).

Gasket retaining grooves in product contact surfaces for removable gaskets should not exceed 1/4" (6.35 mm) in depth or be less than 1/4" (6.35 mm) wide except those for standard O-rings smaller than 1/4" (6.35 mm) and those allowed in the 3-A Standard for Sanitary Fittings, Number 63.

J. Radii

All internal angles 135° or less on product contact surfaces, should have a minimum radii of 1/4" (6.35 mm) except that:

(i). Minimum radii for fillets of welds where head(s) and the side wall(s) of tanks join should not be less than 3/4" (19.05 mm).

(ii). Smaller radii may be used when they are required for essential functional reasons. In no case should such radii be less than 1/32" (0.794 mm).

(iii). The radii in gasket retaining grooves or grooves in gaskets, should be not less than 1/16" (1.59 mm) except for those standard, 1/4" (6.35 mm) and smaller O-rings, and those provided for in the "3-A Standards for Sanitary Fittings", Number 63.

(iv). The radii in grooves for standard 1/4 in. (6.35 mm) and smaller O-rings should be at least:

0.016 in. (0.406 mm) for 1/16 in. (1.59 mm) O-rings
0.031 in. (0.787 mm) for 3/32 in. (2.38 mm) O-rings
0.031 in. (0.787 mm) for 1/8 in. (3.18 mm) O-rings
0.062 in. (1.575 mm) for 3/16 in. (4.76 mm) O-rings
0.094 in. (2.388 mm) for 1/4 in. (6.35mm) O-rings

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

K. Threads

There should be no threads on product contact surfaces except where necessary for non-permanent joints in piping and for making various attachments to equipment.

In such case(s) the threads should conform with the “Acceptable Sanitary Thread”. The thread angle should be not less than 60° and with not more than eight threads to the inch (25.4 mm), nor less than 5/8" (15.88 mm) major basic diameter. The length of the nut should not exceed three-quarters of the basic thread diameter. The nut should be of the open type. Equipment with exposed threads as described above should be manually cleaned.

Equipment with enclosed threads, (such as “acorn” nuts used to attach impeller blades to pump shafts), should be designed for mechanical cleaning.

L. Perforated Product Contact Surfaces

Perforations in product contact surfaces may be round, square, or rectangular. If round the holes should be a minimum of 1/32" (0.794 mm) in diameter. If square, or rectangular, the least dimension should be no less than 0.020" (0.51 mm) with corner radii of no less than 0.0050" (0.13 mm). All perforations should be free of burrs.

M. Shafts and Bearings

Shafts entering equipment should have a seal of the packless type and sanitary design, and should be readily accessible for cleaning and inspection.

Where a shaft passes through a product contact surface, in a processing area, the portion of the opening surrounding the shaft should be protected to prevent the entrance of contaminants.

Bearings having a product contact surface should be of a non-lubricated type.

Lubricated bearings, including the permanent sealed type, should be located outside the product contact surface with at least 1" (25.4 mm) clearance open for inspection between the bearing and any product contact surface unless specifically provided for in a 3-A standards.

GENERAL EQUIPMENT AND SERVICE ITEMS

III. Blower Tank

A. Material

1. All product-contact surfaces shall be of A.I.S.I.² Type No. 304 stainless steel or equally corrosion resistant metal that is non-toxic and non-absorbent except that:

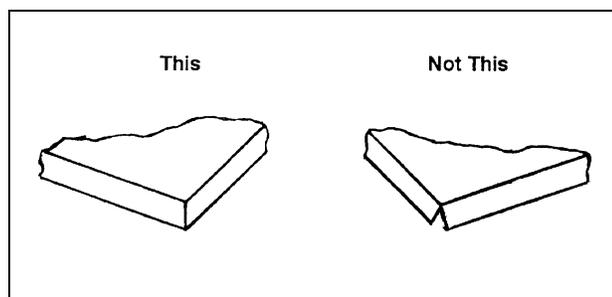
(a) Plastic materials may be used for the blower tank drain gate and drain valve. These materials shall be relatively inert, resistant to scratching, scoring, and distortion by the temperature, chemicals, and methods to which they are normally subjected in operation, or by cleaning and bactericidal treatment. They shall be non-toxic, fat resistant, relatively nonabsorbent, relatively insoluble, and shall not release component chemicals or impart a flavor to the product³.

(b) Rubber and rubber-like materials may be used for blower tanks paddles or gate, drain gate, and drain valve. These materials shall be relatively inert, resistant to scratching, scoring, and distortion by the temperature, chemicals, and methods to which they are normally subjected in operation, or by cleaning and bactericidal treatment. They shall be non-toxic, fat resistant, relatively non-absorbent, relatively insoluble and shall not release component chemicals, nor impart a flavor to the product.³

2. All non-product contact surfaces shall be of inherently corrosion-resistant material, shall be rendered corrosion-resistant, or shall be painted. Surfaces to be painted shall be effectively prepared for painting; and the paint used shall adhere, be relatively non-absorbent, and shall provide a smooth, cleanable and durable surface. Parts having both product-contact and non-product-contact shall not be painted.

B. Fabrication

1. All product-contact surfaces shall be at least smooth as No. 4 ground finish on stainless steel sheets.



**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

2. All seams in product-contact surfaces shall be welded with the welds ground smooth and polished to not less than a No. 4 finish. All outside seams shall be smooth and waterproof. All weld areas and deposited weld material shall be substantially as corrosion-resistant.

(Figure 1)

3. All appurtenances, including drain gates and chutes having product-contact surfaces, shall be easily removable for cleaning, or shall be readily cleanable in place.

4. All product-contact surfaces shall be easily accessible, visible, and readily cleanable, either when in an assembled position or when removed.

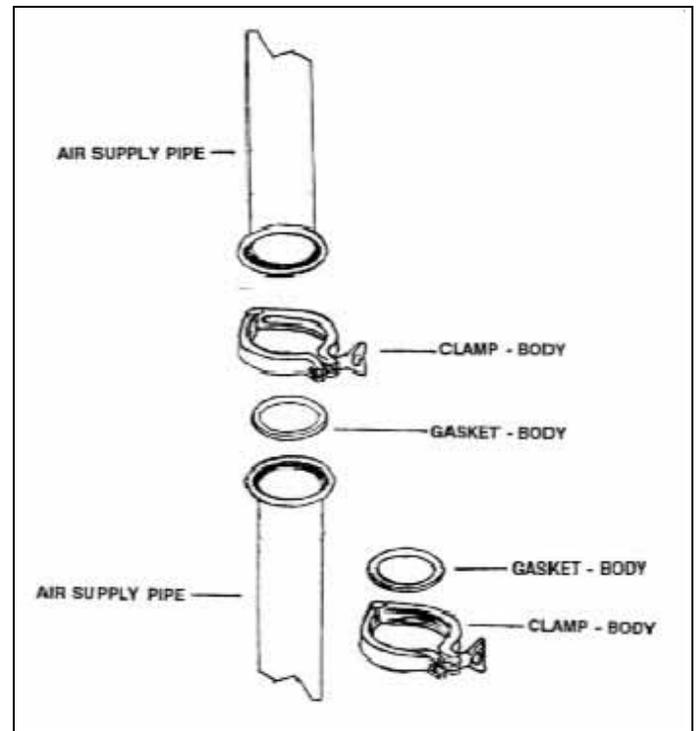
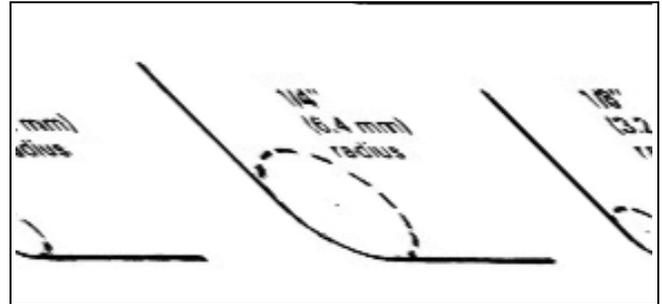
5. All internal angles of 135° or less on product contact surfaces shall have minimum radii of $1/4"$ (6.35 mm), except that minimum radii for fillets or welds in product-contact surfaces may be smaller for essential functional reasons. In no case shall radii less than $1/8"$ (3.18 mm).

(Figure 2)

6. All sanitary pipe fittings shall conform to "3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment," and supplements thereto.⁴ **(Figure 3)**

7. Nonproduct-contact surfaces shall have a smooth finish, be free of pockets and crevices, and readily cleanable.

8. Legs shall be of sufficient length to provide at least 12" (30.5 cm) clearance between the lowest fixed point of the tank and the floor, shall be smooth with

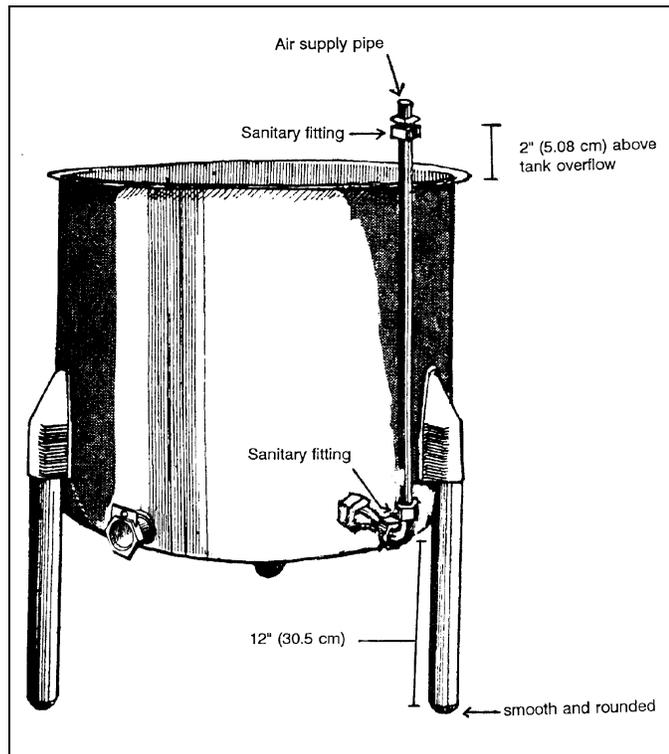


**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

rounded ends, and shall not hollow tube stock, they shall be effectively sealed. If legs are of hollow tube stock, they shall be effectively sealed. (See *Figures 4 and 5*)

9. All threads on product-contact surfaces shall comply with specifications for threads contained in the 3-A Sanitary Standards for Fittings.⁴

10. External and internal sections of the air pipe shall be easily cleanable to a



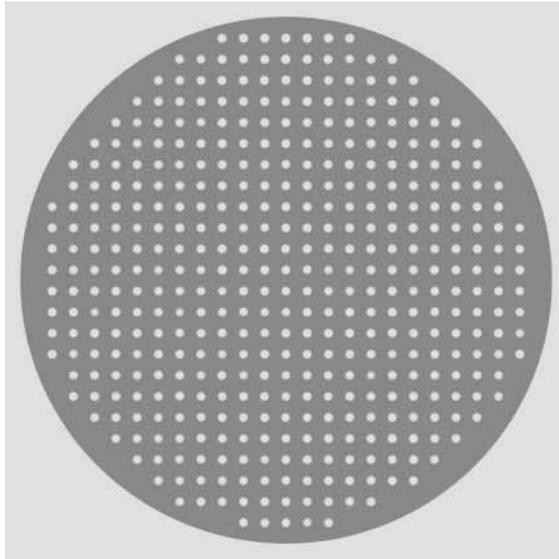
point at least two inches above the tank overflow level. (*Figure 4*)

11. The false bottom shall be so constructed as to be as rigid and, in any event,

of at least 16 U.S. Standard gage stainless steel, or equivalent material. (*Figure 6*)

12. Perforations or slots in the false bottom shall not be less than 3/16 inch (4.76 mm) in the minimum diameter and the end radius of the perforations shall be not less than 3/32 inch (2.38 mm). After perforation, the flat surface of the sheet from which the perforating punch or drill emerges on the down stroke shall be polished to the equivalent of not less than a No. 4 ground finish. (*Figure 6*)

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**



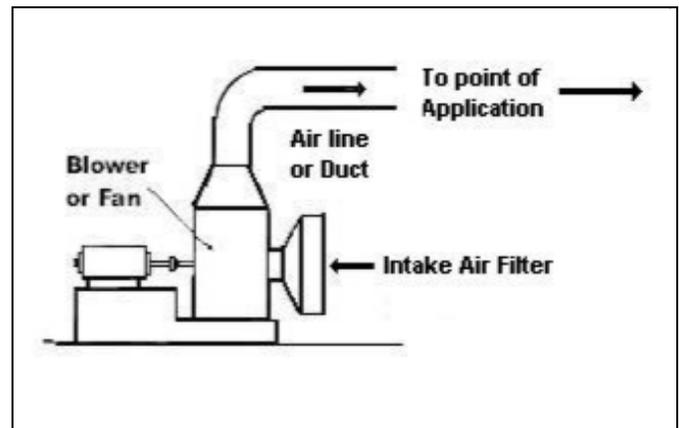
13. The compressing equipment shall be of such design so as to preclude contamination of the air with lubricant vapors and fumes. The air supply shall be taken from a clean space or from relatively clean outer air, and shall pass through a filter upstream from the compressing equipment. This filter shall be so located and constructed that it is easily accessible for examination, and the filter media are easily removable for cleaning or replacing. The filter shall be protected from weather, drainage, water, product spillage and physical damage (*Figure 7*).

14. Air distribution piping, fittings, and gaskets between the downstream terminal filter and any product or product contact surface shall sanitary 3-A design.

15. Air lines shall be easily cleanable construction to a point 2" (5.08 cm) above the tank over flow. (*Figure 4*)

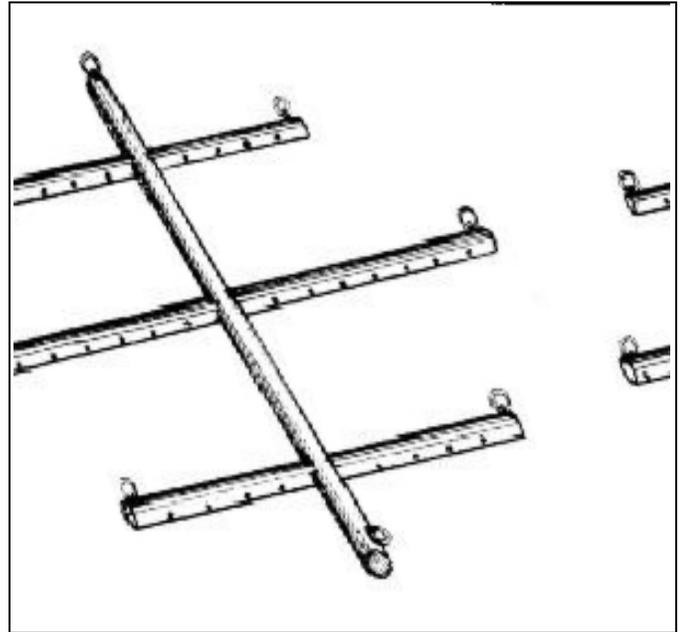
16. Filter should be located as close as possible to point of use.

17. Air distribution piping or manifold located inside the blower tank shall be designed so as to preclude contamination of the product. This manifold shall be designed to be easily removed from the tank and removable end caps to facilitate sanitary cleaning. (*Figures 8 and 9*)



**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

18. Perforations or slots in the manifold or air distribution pipe shall not be less than 1/8" (3.18 mm) in the minimum diameter. After perforation, the pipe from which the perforation punch or drill emerges on the down stroke shall be polished to the equivalent of not less than a No. 4 ground finish. (*Figure 9*)



19. Wire mesh shall not be used as a filter.

20. The blower tank shall be constructed so that it will not buckle or sag and so that it will be self-draining. Product-contact surfaces shall be constructed of not less than 16 U.S. standard gage stainless steel or equivalent material.

21. Maximum dimension of the tank from point of overflow to drain valve flange shall not exceed 40" (101.6 cm).

22. Drain valves and flange shall comply with the 3-A Sanitary Standards for Fitting used on Milk and Milk Products Equipment. The flange shall be welded to the body of the blower tank.

23. There shall be no exposed screw, bolt, or rivet heads in product-contact surfaces.



IV. SKIMMERS

A. Material

1. All product-contact surfaces shall be of A.I.S.I. type No. 304 stainless steel, or equally corrosion-resistant metal that is non-toxic and nonabsorbent, except that:

(a) Suitable plastic materials or rubber and rubber-like materials may be used for the skimmer paddle or gate. These materials shall be relatively inert, resistant to scratching, scoring, and distortion by temperature, chemicals, and methods to which they are normally subjected in operation, or by cleaning and bactericidal treatment. They shall be non-toxic, fat resistant, relatively nonabsorbent, relatively insoluble, and shall not release component chemicals nor impart a flavor to the product.³

2. All non product-contact surfaces shall be inherently corrosion-resistant, and except for funnel drain, shall be painted. Surfaces to be painted shall be effectively prepared for painting and the paint used shall adhere, be relatively nonabsorbent, and shall provide a smooth, cleanable, and durable surface. Parts having both product and non product-contact surfaces shall not be painted.

B. Fabrication

1. All product-contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets.

2. All seams in product-contact surfaces shall be welded with the welds ground smooth and polished to not less than a No. 4 ground finish. All outside seams shall be smooth and waterproof. All weld areas and deposited weld metal shall be substantially as corrosion resistant as the parent metal.

3. All appurtenances having product-contact surfaces shall be easily removable for cleaning, or shall be readily cleanable in place.

4. All product-contact surfaces shall be easily accessible, visible, and readily cleanable, either when in an assembled position or when removed. The skimmer shall be desmountable from the supporting stand for cleaning. (*Figure 11*)

5. All internal angles of 135° or less on product-contact surfaces shall have minimum radii of 1/4" (6.35 mm) except that minimum radii for fillets of welds in product-contact surfaces may be smaller for essential functional reasons. (*Figure 2*)

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

6. The skimmer shall be constructed so that it will not buckle or sag while in use, so that both the perforated area and drainage funnel are self-draining, and so as to provide plane surfaces free of depressions, indentations, or bulges which prevent draining when the pitch is not greater than 1" (25.4 mm) in 50" (127 cm). (Corners and rims of a perforated skimmer should be adequately reinforced to prevent damage from handling during cleaning and bactericidal treatment.)

7. The product-contact surfaces shall be constructed of not less than 16 U.S. standard gage stainless steel or equivalent material. The perforations or slots in the strainer shall be at least 1/4" (6.35 mm) in diameter or width, respectfully (*Figure 12 and Dimension A, Figure 13*) and not more than 1 1/4" (31.75 mm) apart (*Dimension B, Figure 13*)⁵. The strainer area shall have no perforations within 1/2" (12.7 mm) of the edge (*Dimension C, Figure 13*).⁴ After perforations, the flat surface of the sheet from which the perforating punch or drill emerges on the down stroke shall be polished to the equivalent of not less than a No. 4 ground finish. No bracing for the skimmer or the skimmer support stand shall block any perforations unless the brace is made of corrosion-resistant material and fabricated in a manner suitable for a product-contact surfaces, and unless it can be readily removed for cleaning. A minimum of 3 1/2" (8.89 cm) shall be provided between the strainer and the top of the skimmer (*Dimension E, Figure 13*).

8. A minimum vertical clearance of 2" (5.08 cm) shall be provided between the perforated skimmer area and the drainage funnel. (*Dimension D, Figure 13*).

9. The funnel drain shall have a discharge opening of a size sufficient to discharge the drainage without pooling above, and be not less than equivalent to a diameter of 4" (10.16 cm). The funnel drain shall terminate in a free discharge, a distance of at least 6" (15.24 cm) above the floor or the drain connection if located at a higher elevation than the floor. (*Figure 13*)

10. There shall be no threads on product contact surfaces except as provided for in the 3-A Sanitary Standards for Fittings.

11. Legs shall be smooth with rounded ends, and have no exposed threads. If legs are of hollow tube stock, they shall be effectively sealed. (*Figure 5*)

12. Frames, frame legs, and supporting edge for the skimmer shall have:

(a) Structural parts not in contact with the product, and parts constructed with a smooth finish so as to be readily cleanable.

(b) Self-draining exterior surfaces.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

(c) A minimum of 6" (15.24 cm) of space between the lowest part of the frame and the floor to provide ready access for cleaning legs and feet and those parts not readily removable.

13. The frame shall provide continuous support for the outside edge of the skimmer strainer.

(Figure 14)

14. The receiving-container shelf under the skimmer chute, where provided as an integral part of the skimmer support frame, shall be constructed of nonabsorbent, corrosion-resistant material and located so that the receiving-container rim will be at least two feet above the floor. *(Figure 14)*

15. All seams in the funnel drain area shall be smooth and waterproof, and substantially as corrosion resistant as the parent metal.

16. There shall be no exposed bolts, screws, or rivets in the product-contact surfaces.

17. Caster, rollers can be mounted on the skimmer. These shall be of such material, design and construction as to permit its being easily moved by one person. Casters shall be so installed as to be easily cleanable.

18. Reinforcing and framing members are to be placed in such a manner as to be easy to clean. All framing and reinforcing members shall be so placed as to eliminate harborage for vermin. The ends of all hollow sections of reinforcing and framing members shall be closed.

(a) Horizontal angle reinforcing and gussets shall not be placed where food or debris may accumulate thereon.

(b) Where angles are used horizontally, they shall have one leg turned down wherever the nature of the equipment permits or shall be formed integral with the sides.

(c) All vertical sections shall be either open or completely closed.

V. RETURNABLE SHIPPING CONTAINERS

A. Material

1. All metallic product-contact surfaces shall be of A.I.S.I. type No. 304 stainless steel or Aluminum Association type No. 5052-0 alloy, or equally corrosion-resistant metal that is nontoxic.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

2. Plastic materials may be used as a food-contact surface or non food-contact surface. When used, these materials shall be relatively inert, resistant to scratching, scoring, and distortion by the temperature, chemicals, and methods to which they are normally subjected in operation, or by cleaning and bactericidal treatment. They shall be non-toxic, fat resistant, relatively nonabsorbent, relatively insoluble, and shall not release component chemicals or impart flavor to the product.³

3. If constructed of stainless steel, the containers shall not be constructed of less than 20 gauge material. If constructed of aluminum alloy the material shall not have a thickness less than 0.064" (1.63 mm).

4. All non product-contact surfaces shall be of corrosion-resistant material, and shall provide a smooth, cleanable, and durable surface.

B. Fabrication

1. All product-contact surfaces shall be at least as smooth as a number 4 ground finish on stainless steel, or equivalent surface finish on aluminum.

2. All internal angles of 135° or less on product contact surfaces shall have minimum radii of 1/4" (6.35 mm).

3. There shall be no seams, crevices, or other openings within the food-contact surfaces.

4. The container rim shall be rolled so as to permit easy and complete cleaning. The bead shall either be an open type with an external radii of not less than 3/16" (4.76 mm) or a sealed closed type.

5. The container lid shall be so constructed as to afford easy and complete cleaning, shall be reasonably tight fitting, and a lip shall extend at least one inch down the outside of the container. Provisions shall be made for sealing the container so that any tampering will be evident. (*See Figure 15*)

6. Handles shall be provided on 5-gallon or larger containers. The handles shall be considered as a non product-contact surface.

VI. SHUCKING BUCKETS AND PANS

A. Material

1. All metallic product-contact surfaces shall be of A.I.S.I. type No. 304 stainless steel or Aluminum Association type No. 5052-0 aluminum alloy, or equally corrosion-resistant metal that is nontoxic.

2. Plastic materials may be used as a food-contact surface or non food-contact surface. When used, these materials shall be relatively inert, resistant to scratching, scoring, and distortion by the temperature, chemicals, and methods to which they are normally subjected in operation, or by cleaning and bactericidal treatment. They shall be non-toxic, fat resistant, relatively nonabsorbent, relatively insoluble, and shall not release component chemicals or impart flavor to the product.³

3. If constructed of stainless steel, the buckets shall not be constructed of less than 22 gauge material and the pans shall not be constructed with less than 24 gauge material or if constructed of aluminum alloy, the material shall not have a thickness less than 0.064"(1.63 mm).

4. All non product-contact surfaces shall be of corrosion-resistant material and shall provide a smooth, cleanable, and durable surface.

B. Fabrication

1. All product-contact surfaces shall be as smooth as a number 4 ground finish on stainless steel or equivalent surface finish on aluminum.

2. All internal angles of 135° or less on product-contact surfaces shall have minimum radii of 1/4" (6.35 mm)

3. The shellfish shucking bucket shall not exceed a nine-pint capacity, except for the soft clam (*Mya arenaria*) shucking pan which shall not exceed a four pint capacity. (**Figures 16 and 17**)

4. There shall be no seams, crevices or other openings within the food-contact surfaces, except that two holes 180° apart shall be permitted in the side of each bucket near the top o accommodate a removable ball-type handle. (**See Figure 18**)

5. The container rim shall be so constructed as to afford maximum strength and protection against damage, and shall be so rolled as to permit easy and complete

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

cleaning. The bead shall be open type with an external radii of not less than 3/16" (4.76 mm) or a sealed closed type.

6. The bail, if provided, shall be considered as contact surface and subject to material specifications as outlined in paragraph A of this standard. The bail shall be not less than 3/16" in diameter (4.76 mm); it shall be so constructed that it will be held into place by spring tension. The bail shall be so constructed that it can be easily removed from the shucking bucket for cleaning purposes.

VII. TABLES

A. Materials

1. All metallic product contact surfaces shall be of A.I.S.I. type No. 304 stainless steel or equally corrosion resistant metal that is nontoxic and non-absorbent.

2. Only such materials shall be used in the construction of a table as will withstand wear, penetration of vermin, the corrosive action of food, cleaning compounds and such other elements as may be found in the environment. Such materials shall not impart an odor, color, taste or toxic material to the food.

3. Whenever alternate materials are used, the use of such materials proven to be equally satisfactory from the standpoint of sanitation and protection of food is acceptable.

4. All non-product contact surfaces shall be inherently corrosion resistant, and shall provide a smooth, cleanable and durable surface. Parts having both product and non-product contact surfaces shall not be painted.

B. Fabrication

1. All product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets.

2. All seams in product contact surfaces shall be welded with the welds ground smooth and polished to not less than a No. 4 ground finish. All outside seams shall be smooth and waterproof. All weld areas and deposited weld metal shall be substantially as corrosion resistant as the parent metal.

3. All product contact surface shall be easily accessible, visible and readily cleanable, either when in an assembled position or when removed.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

(4) All internal angles of 135° or less on product contact surfaces shall have minimum radii of 1/4" (6.35 mm) except that minimum radii for fillets of welds in product contact surface may be smaller for essential functional reasons.

5. The table shall be constructed so that it will not buckle or sag while in use, so as to provide plane surface free of depressions, indentations, or bulges which prevents draining when the pitch is not greater than 1" (2.54 cm).

6. The product contact surfaces shall be constructed of not less than 16 U.S. standard gauge stainless steel or equivalent material.

7. The splash contact surfaces shall be of smooth, easily cleanable and corrosion resistant materials, or they shall be rendered corrosion resistant with a material which is non-cracking, non-chipping and non-spalling. Paint shall not be used.

8. Non-food contact surfaces shall be smooth and of corrosion resistant material or shall be rendered corrosion resistant or painted. Lead base paint shall not be used.

9. When welded seams are used, the weld area and the deposited weld material shall be as corrosion resistant as the parent material. The welded area surface requiring routine cleaning in surface in contact with food shall be smooth.

10. All exposed external angles or corners are to be sealed and smooth.

11. All joints and seams in the food zone shall be sealed and shall be smooth as the surfaces being joined. Wherever feasible and practical, equipment or parts in the food zone shall be stamped, extruded, formed or cast in one piece.

12. Exposed threads, screws, bolts and rivet heads, nuts shall be eliminated from the food contact surfaces.

13. Food contact surfaces which during the course of fabrication are so worked as to reduce their corrosion resistant characteristics, shall receive such additional treatment as is necessary to render, or to return them to a corrosion resistant state.

14. All exposed edges and nosings on horizontal surfaces shall be integral with tops, regardless of profiles, and where exposed to fingers and cleaning they shall be made smooth.

(a) Nosings shall be open 3/4" (19.05 mm) or completely closed against the body of the unit on all sides to prevent the harborage of insects.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

(b) The space between the top and the flange shall be not less than $\frac{3}{4}$ " (19.05 mm).

(c) The space between the sheared edge and the frame angle shall not be less than $\frac{3}{4}$ " (19.05 mm) to provide access for cleaning. (*Figure 19*)

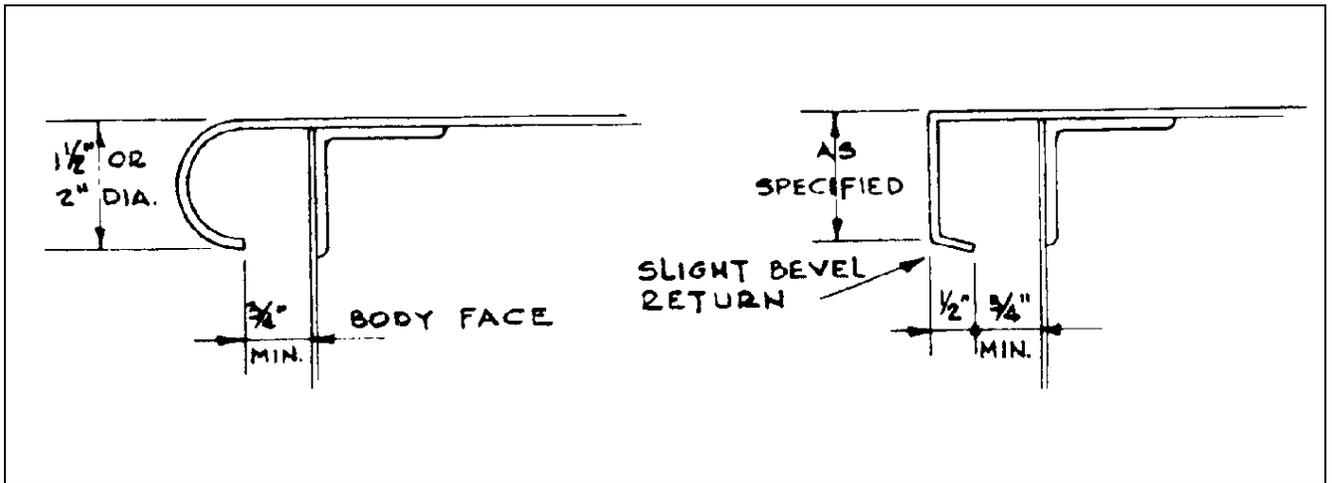


Figure 12 – Exposed edges and nosing on horizontal surfaces.

15. Legs and feet shall be non-absorbent and of sufficient rigidity to provide support with a minimum cross bracing and so fastened to the body of the equipment. (*Figure 20*)

(a) When the outside dimension of the leg is greater than the outside dimension of the foot by $\frac{1}{2}$ " (12.7 mm) or more in the same plane, the foot shall, at minimum adjustment extend 1" (2.54 cm) below the leg.

(b) All opening to hollow sections between feet and legs shall be drip proof construction with no opening greater than $\frac{1}{32}$ " (0.794 mm). All other opening to hollow sections shall be sealed.

(c) Gussets, when used, shall be assembled to the equipment in such a manner as to insure easy cleanability and to eliminate insect harborage. The assembly shall have no recessed areas or spaces. (*Figure 21*)

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Harvesting, Handling, Processing, Distribution**

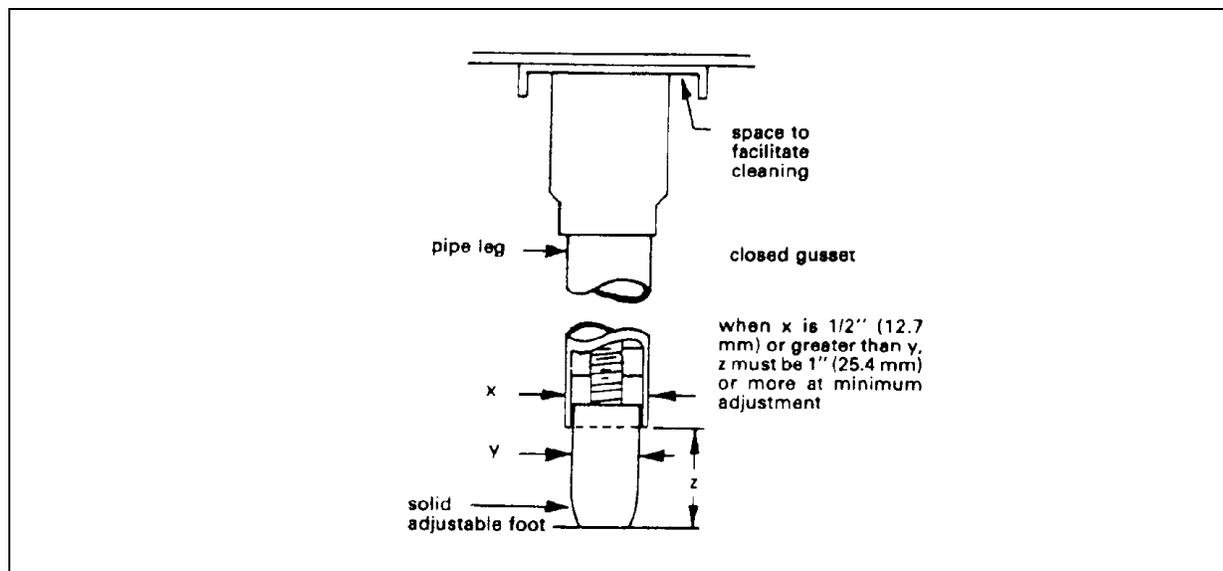


Figure 13 – legs and gussets.

16. Reinforcing and framing members not totally enclosed are to be placed in such a manner as to be easy to clean. (*Figure 21*)

- (a) All framing and reinforcing members shall be so placed as to eliminate harborage for vermin.
- (b) The ends of all hollow sections of reinforcing and framing members shall be sealed.
- (c) Horizontal angle reinforcing and gussets shall not be placed where food or garbage may accumulate thereon.
- (d) Where angles are used horizontally, they shall have one leg turned down wherever the nature of the equipment permits, or shall be integral with the sides.
- (e) All vertical sections shall be either completely closed or open to the floor.

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Harvesting, Handling, Processing, Distribution**

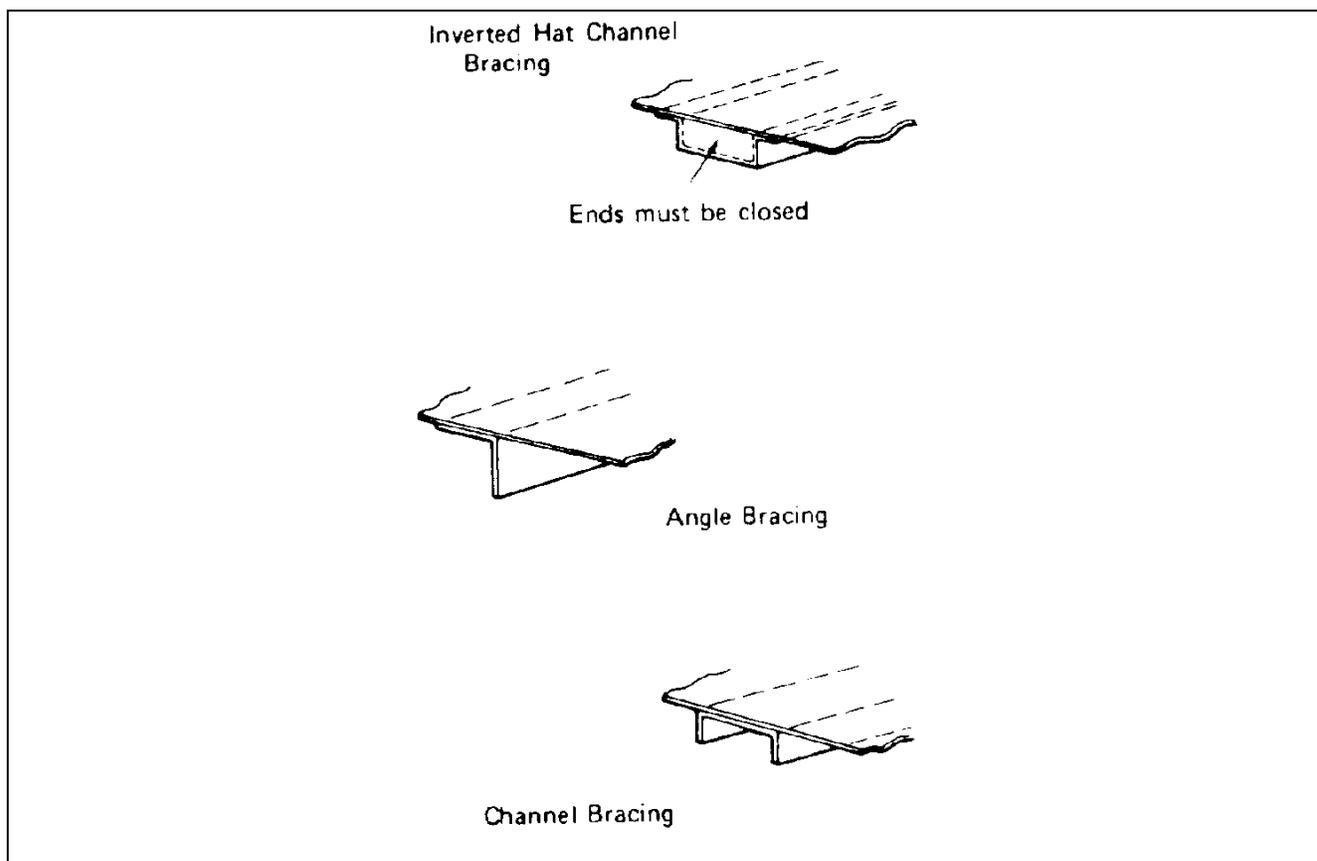


Figure 14 – Reinforcing and framing

VIII. CONVEYORS

A. Materials

1. Only those corrosion resistant materials capable of maintaining original surface characteristics under the prolonged influence of the use environment, including the expected food contact and normal use of cleaning compounds and sanitizing solutions shall be used.
2. Belt materials shall be nontoxic, oil proof and of such construction that raw edges and sides will be sealed. The belt shall be relatively nonabsorbent. Belt lacings or fastenings shall meet the applicable clean ability requirements for food, splash and nonfood zones.
3. Whenever alternate materials are used, the use of such materials proven to be equally satisfactory from the standpoint of sanitation and protection of food is acceptable.

**GUIDANCE DOCUMENTS –
Harvesting, Handling, Processing, Distribution**

B. Fabrication

1. Conveyor belt, belt support pan, rollers, driving mechanism and pulleys shall be readily accessible for cleaning.
2. The base of conveyor units shall have readily removable access panels to permit cleaning.
3. Readily removable catch pans of proper design and adequate capacity shall be provided wherever spillage, splash and similar debris may accumulate. Food waste collection and disposal stations shall be designed, constructed and equipped to facilitate the collection and/or disposal of shell waste in an acceptable manner and to be easily cleaned.
4. Drains, when provided in connection with conveyors shall be equipped with readily removable strainer baskets or similar device.
5. Motors shall be so located as to be protected against splash, spillage and the like, or to be otherwise protected.
6. In the non-food zone, exposed threads and projecting screws and studs should be used only when it has been demonstrated that other fastening methods are impractical and they shall be eliminated from the splash contact surfaces.
 - (a) Exposed rivet, screw, or bolt in the splash zone shall be of low profile type such as brazier, or modified brazier rivets or pan and oval screw and bolt heads. (*Figure 22*)

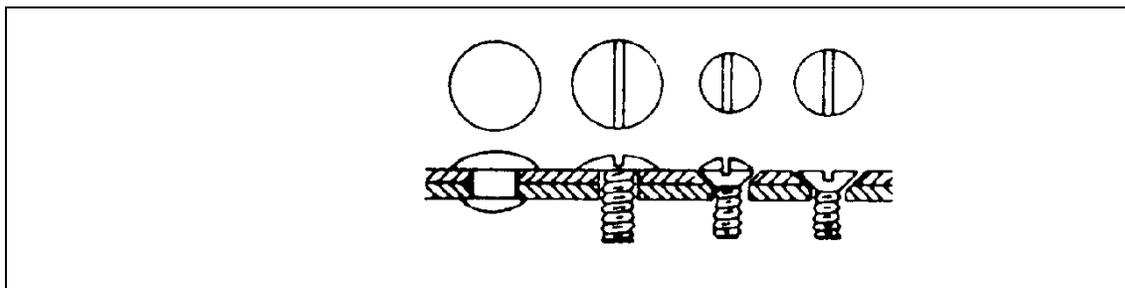


Figure 24 – Low profile fasteners for nonfood contact surfaces.

IX. OYSTER SHUCKING GRINDERS

A. Materials

GUIDANCE DOCUMENTS – Harvesting, Handling, Processing, Distribution

1. Only those corrosion resistant materials capable of maintaining original surface characteristics under the prolonged influence of the use environment, including the expected food contact and normal use of cleaning compounds and sanitizing solutions shall be used. The machine is designed to operate in a wet spray environment.
2. Food contact surfaces shall be effectively washed to remove or completely loosen soils by manual or mechanical means such as the application of detergents; hot water; brushes; or high pressure sprays.
3. Parts of a shellstock grinder which are considered food contact surfaces include; the blade, the area behind the blade including the motor shaft from the blade to the motor housing, and the inside surface of the housing or cover surrounding the blade. These food contact parts shall be manufactured from high impact materials that are easily cleanable and non-corrosive. The grinder must be constructed to be easily disassembled and assembled to facilitate inspection, maintenance, cleaning, and sanitizing.

B. Fabrication

1. The motor shaft should be of corrosion resistant material.
2. Juncture point where the motor shaft enters the blade chamber must be sealed to reduce dirt and detritus deposition around the shaft.
3. The blade must be made from a single piece of high impact non-corrosive material. Blade teeth must be an integral part of the blade, or if grinding surfaces are used instead of teeth, they must be welded to the face of the blade with all welds ground smooth.
4. The housing around the blade assembly must be constructed of material that is corrosion resistant.
5. Bolts or screws must be constructed of corrosion resistant material to prevent rust and corrosion.
6. The inside surface of the blade housing must be smooth, and if welded ground smooth for easy cleaning.
7. The blade housing must be designed with an easily removable cover that will open up the entire blade assembly area to facilitate inspection, cleaning, sanitizing, and maintenance.

Notes:

1. Proceedings, 1958 Shellfish Sanitation Workshop, U.S. Public Health Service, Washington DC.
2. American Iron and Steel Institute. Copy of the AISI Steel Products Manual, Stainless & Heat Resisting Steels can be obtained from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086, Telephone 412-776-9460.
3. Plastic, rubber, and rubber-like materials used for equipment may be subject to the Food Additives Amendment to the Federal Food, Drug, and Cosmetic Act. The acceptability of such materials under Food Additive Amendment shall be obtained from equipment manufactures.
4. Sanitary standards describing the construction of valves, fittings, and pumps may be obtained from International Association of Milk and Environmental Sanitarians, Inc., 200 W Merle Hay Centre, Suite 404, Cedar Rapids, IA, 52402, Telephone 319-395-9151, FAX 319-393-1102.
5. Skimmer size: The Food and Drug Administration definition and standard of identity for raw oysters states in part: "The oysters are drained on a strainer or skimmer which has an area of at least 300 square inches per gallon of oysters drained, and has perforations of at least 1/4 of an inch in diameter and not more than 1 1/4 inches apart, or perforations of equivalent areas and distribution. (Definitions and Standards under the Federal Food, Drug, and Cosmetic Act, Title 21, Part 36, Federal Register, August 27, 1946)."

References:

3-A Sanitary Standard Committee, 3-A Sanitary Standards for Sanitary Fitting for Milk and Milk Products Number 63-00 (08-17 Amended), 6245 Executive Boulevard, Rockville, MD 29852.

3-A Sanitary Standard Committee, 3-A Sanitary Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products and Food Contact Surfaces Serial #60403, 6245 Executive Boulevard, Rockville, MD 29852.

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Harvesting, Handling, Processing, Distribution**

3-A Sanitary Standard Committee, 3-A Sanitary Standards for Mechanical Conveyors For Dry Milk and Milk Products #41-00, 6245 Executive Boulevard, Rockville, MD 29852.

3-A Sanitary Standard Committee, 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, No. 20-17, 6245 Executive Boulevard, Rockville, MD 29852.

3-A Sanitary Standard Committee, 3-A Sanitary Standards for Uninsulated Tanks for Milk and Milk Products, No. 32-01, 6245 Executive Boulevard, Rockville, MD 29852.

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National Sanitation Foundation, Food Service Equipment Standards, 3475 Plymouth Road, Ann Arbor, Michigan, 48106, September 1978.

Office of the Federal Register, 21 Code of Federal Regulations, Parts 170-199, U.S. Government Printing Office, Washington, DC, 1992.

Stainless Steel Information Center, Specialty Steel Industry of North America, STAINLESS STEEL: An introduction to a versatile, aesthetically pleasing and "full life cycle" material, 3050 K Street, N.W. Washington, DC 20007. Website <http://www.ssina.com>

U.S. Food and Drug Administration, Milk and Milk Product Equipment: A Guide for Evaluating Sanitary Construction, Developed by the Milk Safety Branch, Division of Cooperative Programs, 200 "C" Street, SW, Washington, DC 20204.

U.S. Food and Drug Administration, Grade "A" Pasteurized Milk Ordinance, Developed by the Milk Safety Branch, Division of Cooperative Programs, 200 "C" Street, SW, Washington, DC 20204, 1991 Revision.

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U.S. Food and Drug Administration, Standards for the Fabrication of Single Service Containers and Closures for Milk and Milk Products, Developed by the Milk Safety Branch, Division of Cooperative Programs, 200 "C" Street, SW, Washington, DC 20204, 1991 Revision.

U.S. Food and Drug Administration, Food Service Sanitation Manual: A Model Food Service Sanitation Ordinance, H.E.W. Publication No. (FDA) 78-2081, Developed by the Division of Retail Food Protection, Division of Cooperative Programs, 200 "C" Street, SW, Washington, DC 20204, 1978.

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