

**American National Standard
for Bakery Equipment –
Sanitation Requirements**



Secretariat

American Society of Baking

Forward (This forward is not part of the standard).

The Baking Industry Sanitation Standards Committee and Secretariat (American Society of Baking) shall not be responsible to anyone for the use of this standard, and will not incur any liability for damages resulting from the application or interpretation of this standard.

This standard is based on the years of work and standards development of the Baking Industry Sanitation Standards Committee and more recent activity of the Sanitation Task Committee of the Secretariat (American Society of Baking). In 1949, the Baking Industry Sanitation Standards Committee was formed with representatives from six national organizations serving the baking industry: American Bakers Association, American Institute of Baking, Bakery Equipment Manufacturers Association, Biscuit and Cracker Manufacturers Association and the Retail Bakers of America. Although the original purpose was to develop and publish voluntary standards for the design and construction of bakery equipment has not changed, its sanitation standards have been revised and rewritten over the years to reflect developments in the industry. The Baking Industry Sanitation Standards Committee standards were published together in a single booklet in 1977, 1981, 1986, 1990, 1994 and 1998.

In 2002, the Baking Industry Sanitation Standards Committee revised its sanitation standards. That revision served as the basis for the Z50-2003 standard. The standard was revised or updated in 2008 and 2013. This 2015 standard was developed under the committee procedures of the American National Standards Institute to address the sanitation issues of machine design and operation. Current safety requirements published by the American National Standards Institute (ANSI/Z50.1-2006 (R2011)) were promulgated independently from this standard and nothing in this standard is designed to supersede safety requirements.

This 2015 revision, sponsored by the American Society of Baking, brings the standard up to date with the latest developments in the baking industry.

All new installations of bakery machinery and equipment, individual items of new equipment, and new designs, are to conform to the requirements of this standard.

Suggestions for improvement in this standard will be welcomed. They should be sent to the Z50 Committee c/o American Society of Baking, 7809 N. Chestnut Avenue, Kansas City, MO 64119. Website is www.asbe.org.

This standard was processed and submitted for approval to ANSI by Accredited Standards Committee on Bakery Equipment, Z50. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the Z50 Committee had the following members:

Charles. D. "Toby" Steward, Chair
Philip Domenicucci, Vice Chairman

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Mike Elenz, Youngstown, OH
Michael Torstrup, Bridgewater, NJ
Rick Myette, Lawrence, MA
Rich Zaremba, New Haven, IN
Rod Harris, Odessa, FL
Robert Burgh, Buford, GA
Steve Berne, Kansas City, MO

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1 BASIC CRITERIA FOR BAKERY EQUIPMENT

1.1 Scope

The requirements of this standard apply to the design, construction and cleaning of various items and groups of items of bakery equipment as specifically set forth herein. This standard applies equally to accessory equipment where applicable.

Equipment shall be designed and engineered to maintain sanitary conditions. All surfaces within the product zone and non-product zone shall be easily cleanable and constructed so as to prevent retention of food particles, condensation, spillage and other foreign material.

1.2 Purpose

The purpose of this standard is to serve as the basic criteria for the sanitary design of bakery equipment to be used by:

1.2.1 Manufacturers, in the design and construction of machinery and equipment, which can readily be maintained in a clean condition.

1.2.2 Users of such equipment in the selection, purchase, installation and modification.

1.2.3 Federal, state, county, district and municipal health authorities and other food regulatory agencies.

1.3 New Developments

It is intended that this standard shall allow and encourage freedom for inventive genius and new developments. Equipment specifications which are developed proposing differences in design, material, construction or other features, and which are, in the opinion of the manufacturer or fabricator, equivalent or better, may be submitted at any time for consideration to the ANSI Z50 Committee c/o American Society of Baking.

1.4 New Equipment

After the date on which a specific standard is adopted, all new items or equipment referred to in the standard shall conform to the requirements of the standard.

1.5 Existing Equipment

This standard is not intended to be retroactive in its application to existing installations, but when modifying existing equipment, the modification shall conform to the standard covering this equipment.

1.6 Safety Code

Attention is directed to the American National Standards Institute (ANSI) Safety Requirements for Bakery Equipment (Z50.1 latest version), the provisions of which should be observed in the manufacture, installation and operation of bakery machinery and equipment. Nothing in this standard is designed or intended to conflict with or supersede safety requirements.

1.7 Fire Code

All equipment shall fulfill the requirements of the applicable National Fire Protection Association (NFPA) National Fire Codes or the authority having jurisdiction.

1.8 Plumbing

All plumbing shall fulfill the requirements of the state, county and municipal codes applicable to each installation.

1.9 Effective Date

This standard shall become effective on the date of publication indicated. Review for revision is periodic and at the discretion of the ANSI Z50 Committee c/o American Society of Baking.

1.10 Interpretations

For uniform and reasonable application of this standard, interested persons are invited to submit comment and inquiries to the ANSI Z50 Committee.

1.11 Areas of Responsibility

It shall be the responsibility of the equipment supplier and equipment buyer to ascertain that the delivered equipment conforms to the applicable cleaning standards for such equipment. The equipment supplier shall provide information on how to access the equipment and give recommended cleaning procedures. Upon completion of delivery, it shall be the responsibility of the equipment buyer to maintain the equipment in a clean and sanitary condition.

2 DEFINITIONS

2.1 Accessible: A surface which is or can be quickly exposed for inspection and cleaning using simple tools.

2.1.1 Readily Accessible: A surface, which is or can be easily and quickly exposed for inspection and cleaning without the use of tools.

2.2 Cleanability: Made of such materials, so finished, and so fabricated that soil may be effectively removed by appropriate cleaning means.

2.3 Cleaning Methodology

2.3.1 Cleaning in Place (CIP): A method of cleaning that removes soil from product contact surfaces by circulating, spraying, or flowing chemical solutions and water rinses onto and over surfaces to be cleaned.

2.3.2 Cleaning Out of Place (COP): A method of cleaning that removes soil from product contact and non-product contact surfaces that requires the removal of the equipment or components from its production position.

2.3.3 In-Place Cleaning (IPC): A method of cleaning that is neither Cleaning In Place (CIP) or Cleaning Out of Place (COP).

2.3.3.1 Mechanical Cleaning: A dry cleaning procedure such as brushing, wiping, scraping, vacuuming, or using compressed air to adequately remove debris, scrap, and residue.

2.3.3.2 Wash Down Cleaning: A method of manual cleaning using potable water and appropriate cleaning compounds to remove residual soil and biofilm from equipment surfaces and product contact surfaces. This method will often require the use of energy in the form of heat, chemical or physical activity to effectively remove soil deposits.

2.4 Closed: Fitted together tightly with no openings large enough to permit the entry of moisture, liquids and solids.

2.5 Corrosion Resistant: A material that maintains its surface characteristics under prolonged influence of the normal components of the environment, such as product, ingredients, ambient conditions, and cleaning material.

2.6 Dead End: A place wherein product, ingredients, and cleaning agents, or extraneous matter may be trapped, retained or not completely displaced in normal operation or cleaning procedures.

2.7 Equipment Disassembly Procedures: Detailed, written procedures provided by the manufacturer to allow the end-user to adequately disassemble, clean and reassemble the machine.

2.8 Non-Absorbent: A material under ordinary conditions of use, that will not retain an amount of the substances with which it normally comes in contact nor be affected adversely or affect adversely the product or ingredients with which it comes in contact.

2.9 Non-Toxic: Materials, which under conditions of their use, conform to the procedures and requirements of the U.S. Food and Drug Administration as being non-toxic.

2.10 Product Zone: All surfaces of the equipment with which product or ingredients may normally come in contact, including any surfaces from which condensate

or foreign material may drip, drop, fall or enter the product stream.

2.10.1 Non-Product Zone: All surfaces of the equipment outside the product zone as defined in Section 2.10.

2.11 Protective Coating: A protective coating shall prevent corrosion of the base material, shall not affect or be affected by the substances in contact with it, shall be non-toxic, non-absorbent, shall not impart an odor or taste to the product, and shall be bonded to the underlying surface so as to be resistant to chipping and peeling. It shall have a durable, smooth and continuous surface without exposing the base material, shall resist abrasion in ordinary use, and shall maintain its surface characteristics under prolonged influence of the environment, such as the product and cleaning agents.

2.12 Removable: A part which can be quickly separated from the machine or equipment using simple tools.

2.12.1 Readily Removable: A part which can be easily and quickly separated from the equipment without the use of tools.

2.13 Sealed: The permanent condition resulting from the filling of a crack, crevice, joint or opening, so as to effectively prevent the entry or passage of moisture, liquids and solids.

2.14 Shall: When the verb "shall" is used, the requirements of these standards can be met only by literal compliance.

2.15 Should: Use of the verb "should" indicates a preferred condition.

2.16 Simple Tools: Tools that are commonly available to maintenance and cleaning personnel such as screwdrivers, pliers, open-ended wrenches, and Allen wrenches.

2.17 Smooth: A uniform surface free of pits, pinholes, cracks, crevices, inclusions, rough edges, scale and other surface imperfections detectable by visual and tactile inspections.

2.18 Special Disassembly Tools and Equipment: The tools and/or special equipment that may be required to disassemble the machine to ensure satisfactory cleaning.

2.19 Sufficient Clearance: Shall mean designed and installed to permit adequate access to all areas for inspection, maintenance and cleaning.

3 GENERAL PRINCIPLES OF DESIGN, CONSTRUCTION AND CLEANING FOR ALL BAKERY EQUIPMENT

The following general principles of design, construction, and cleaning shall apply to all equipment covered in this standard, except where exemption from compliance is specifically stated in the Specific Design Requirements in each section relating to individual types of equipment. Particular attention is called to accessories, such as pumps, valves, pipe couplings and thermometers, which may be an integral part of the equipment.

3.1 Product Zone

3.1.1 All surfaces shall be smooth, except where a textured surface is required for the process. If coated, surfaces shall have a protective coating that will not flake, peel or separate under conditions of intended use and cleaning.

3.1.2 All surfaces should be readily accessible or readily removable, and shall be accessible or removable.

3.1.3 All surfaces shall be non-toxic and shall not impart tastes, odors or colors to product or raw materials. Coatings shall be food grade and FDA Acceptable.

3.1.4 All surfaces should be non-absorbent. Absorbent surfaces should be cleanable.

3.1.5 All surfaces shall be of corrosion-resistant material under the conditions of their intended use and cleaning.

3.1.6 Dissimilar materials shall not be used where galvanic corrosion may take place during use or during exposure to their normal cleaning materials.

3.1.7 Cadmium, chromium, lead, antimony or other toxic substances shall not be used. Lead-containing solder shall not be used.

3.1.8 Wood should not be used, except for hard maple or an equivalently hard, close-grained wood when required by the process.

3.1.9 Copper, brass and other copper alloys shall not be used where edible oils, liquid shortening, chocolate liquor and other fatty food products come in contact with the metal.

3.1.10 Structural members and braces shall be designed to provide a minimum of horizontal surface and shall be arranged so as not to form traps, recesses or pockets. If made of hollow stock, frame members shall have the ends closed and all openings sealed.

3.1.11 Permanently joined metal surfaces shall be butted and continuously welded, brazed or silver soldered, and finished flush and equal to surrounding area. Chemical adhesives, which are non-toxic, and the use of which results in a joint of sufficient mechanical strength for the purpose intended are permissible.

3.1.12 Permanently joined surfaces having interior angles shall be accessible and should be curved, rounded, cove-shaped or radiused. The minimum radius will be the minimum allowable bend radius for the thickness of the material being used, but not less than 1/16 inch (1.5mm) minimum radius or curvature.

3.1.13 Bearings/bushings should be outside the product zone and should be sealed or self-lubricating. Bearings, bushings or other surfaces requiring lubrication in the product zone shall conform to the requirements of Sections 3.1.1, 3.1.2 and 3.1.3, and lubricants shall be of food grade material. Bearings/bushings requiring other than food grade lubrication shall be outside the product zone, and the design and construction of these shall be such that lubricant cannot leak, drip or be forced into the product zone.

3.1.14 Seals shall be non-toxic, non-absorbent, non-exuding, self-lubricating and smooth, and shall not affect or be affected by the product, ingredients or cleaning compounds. Seals shall be removable and installed in such a manner which results in a true fit to prevent protrusion in the product zone or creation of recesses or ledges between the sealed joints. Stuffing boxes should not be used.

3.1.15 Belting shall be made of odorless, non-toxic materials and should be coated or impregnated. Where the process requires a non-coated belt, it should be cleanable or replaceable.

3.1.16 Gaskets shall be non-toxic, non-absorbent and non-exuding, and shall not affect or be affected by the product, ingredients, or cleaning compounds. Gaskets shall be installed in such a manner which results in a true fit to prevent protrusion in the product zone or creation of recesses or ledges between the gasketed joints.

3.1.17 Hinges and latches shall be removable and cleanable and shall be so constructed that when taken apart no cracks or crevices exist.

3.1.18 Inspection windows and light ports shall be of shatter-resistant material. They shall be sealed or removable.

3.1.19 Air or other gases mechanically introduced into the product or product zone shall be filtered or washed to remove particles 5 microns or larger, and shall not contain oil, water and other liquids, unless such materials are specifically required as an operational procedure.

3.1.20 Air within the bakery delivered by small centrifugal blowers at pressures less than 10 inches (250mm) water column shall be filtered or washed to remove particles 50 microns or larger.

3.1.21 Covers shall be of the overlapping type and if they are in two or more parts, they shall be designed with drip protectors. Hinged covers shall be designed to

provide access and not create an unsanitary condition. Horizontally mounted covers shall be designed with vertical, overlapping, interlocking or similar edges near the hinges to prevent product contamination.

3.1.22 Dead ends shall not be permitted.

3.1.23 Thermometers and sensor measuring devices shall be designed to prevent contamination by any portion of the measuring elements. Where protecting wells are provided, weep holes shall be provided and shall drain to the outside of the product zone. Mercury or other toxic materials shall not be used in product zones.

3.1.24 Tracks and guides for doors, covers and access panels shall be designed to be easily cleanable and constructed so as to prevent retention of food particles, condensation, spillage and other foreign material.

3.1.25 Bottom guides for sliding doors shall have sufficient opening to facilitate cleaning and drainage. Bottom guide grooves shall have open ends.

3.1.26 Screws, bolt heads, nuts, rivets and similar fasteners shall not form pockets or areas difficult to clean. Where practical, there should be a minimum number of fasteners in the product zone. Fasteners should have a magnetic property.

3.1.27 Air cylinders should not be located over exposed product unless equipped with a drip pan that prevents product contamination.

3.1.28 Drive guards should be designed so as not to trap foreign material.

3.2 Non-Product Zone

3.2.1 All surfaces, unless sealed, shall be accessible or removable for cleaning.

3.2.2 All materials shall be suitable for the purpose intended and shall conform to the requirements of cleanability.

3.2.3 All surfaces, including joints and surfaces of insulation unless sealed, shall be cleanable and impervious to moisture.

3.2.4 Screws, bolt heads, nuts, rivets and similar projections shall not form pockets or areas difficult to clean.

3.2.5 All joints and edges where two members are permanently joined shall be joined in such a manner as to minimize horizontal ledges, cracks, crevices and protrusions.

3.2.6 Equipment, other than that which is portable or on solid bases sealed to the floor, shall provide a floor

clearance of at least 6 inches (150mm) or greater and shall provide adequate access for cleaning.

3.2.7 Whenever practical, surfaces of equipment or components should be angled or curved to minimize horizontal surfaces, prevent accumulation of food particles, liquids and foreign material and provide for ease of cleaning. These surfaces should be sloped away from the product zone to prevent food particles, liquids and foreign material from falling into the product zone.

3.2.8 Structural members and braces shall be designed to provide a minimum of horizontal surface and shall be arranged so as not to form traps, recesses or pockets. If made of hollow stock, frame members shall have the ends closed and all openings sealed.

3.2.9 Hollow spaces within the frame, which do not contain functional parts, shall be sealed. Hollow spaces within the frame, which contain functional parts, shall be sealed or closed, and readily accessible. When using hollow members for wiring, proper seal integrity shall be maintained at entrance and exit points to prevent the entry of moisture, liquids and solids.

3.2.10 Guards shall either be hinged or removable or shall be fitted with covers that are either hinged or removable. All guards shall be constructed so that foreign material will not be retained.

3.2.11 Permanently joined surfaces having interior angles shall be accessible and should be curved, rounded, cove-shaped or radiused. The minimum radius will be the minimum allowable bend radius for the thickness of the material being used, but not less than 1/16 inch (1.5mm) minimum radius or curvature.

3.2.12 Where lubrication is required, the design and construction shall be such that the lubricant cannot leak, drip or be forced into the product zone.

3.2.13 Equipment name plates shall be sealed or permanently affixed in a manner and position as to prevent accumulation of foreign material.

3.2.14 Motors and accessory equipment shall be mounted with adequate space for proper cleaning on all sides, top and bottom of the motor or motor and accessory equipment.

3.2.15 Face-flange or base-mounted motors or accessory equipment with machined surfaces are permitted.

3.2.16 All light bulbs, lamps and tubes shall be protected against falling, and shall be shatter-resistant, housed in shatter-resistant fixtures, or otherwise protected against breakage.

3.2.17 Inspection windows and light ports shall be of shatter-resistant material. They shall be sealed or removable.

3.2.18 Tracks and guides for doors, covers and access panels shall be designed to be easily cleanable and constructed so as to prevent retention of food particles, condensation, spillage and other foreign material.

3.2.19 Bottom guides for sliding doors shall have sufficient opening to facilitate cleaning and drainage. Bottom guide grooves shall have open ends.

3.2.20 The frame and/or base of the equipment shall be so designed that areas difficult to clean are not created when the equipment is installed.

3.2.21 Surfaces shall be corrosion-resistant, non-absorbent and non-flaking, or shall have a protective coating that does not flake.

3.2.22 Surfaces shall be made of materials that do not transfer odor to the product.

3.2.23 Fan-cooled motors shall not blow air on product or product contact surfaces.

3.3 Cleaning of Equipment

3.3.1 Written Instructions: Written instructions on how to properly clean and maintain the equipment shall be incorporated into training materials and made readily available to operating, maintenance and sanitation personnel. Continuous training is to be provided by the end user.

3.3.2 Cleaning Personnel: Sanitation and cleaning personnel shall be restricted to properly trained, designated and instructed employees. It is the responsibility of the employer to train sanitation and cleaning personnel in the performance of their responsibilities.

3.3.3 Clean in place (CIP) equipment in the bakery shall conform to the current revision of 3-A® Accepted Practices for Permanently Installed Product and Solution Pipelines and Cleaning Systems Used in Milk and Milk Product Processing Plants, Number 605.

3.3.4 Components of clean in place (CIP) equipment, which are not designated or designed to be cleaned in place, are to be removed from the equipment to be cleaned out of place or manually cleaned.

3.3.5 All clean in place (CIP) systems shall be self-draining and capable of being completely drained of cleaning and sanitizing solutions.

3.3.6 All clean in place (CIP) systems shall have no dead ends and shall be readily accessible for inspection.

4. SPECIFIC PRINCIPLES TO COVER EXCEPTIONS AND ADDITIONS TO THE DESIGN, CONSTRUCTION AND CLEANING

OF ALL BAKERY EQUIPMENT, AS DEFINED IN SECTION 3.

4.1 DESIGN REQUIREMENTS FOR HANDLING AND STORING DRY INGREDIENTS EQUIPMENT

4.1.1 Design Requirements for All Systems

4.1.1.1 All stainless steel or aluminum surfaces should be butt welded where possible and have a smooth finish.

4.1.1.2 Product entry and discharge openings connected to the attendant conveying equipment shall be sealed to prevent dusting and product loss and shall be accessible.

4.1.1.3 Silos, day tanks, hoppers and any intermediate storage vessels shall be sealed against entry of foreign material and shall be provided with cleanable and removable filters to exclude particles of 5 microns or larger from entering the vessels during normal operation.

4.1.1.4 Permanent lighting fixtures shall not be installed within the product zone. If interior lighting is required, externally mounted fixtures shall be used with shatter-proof transparent panels or disks, flush mounted.

4.1.1.5 Level controls shall be accessible for cleaning, inspection and maintenance.

4.1.1.6 All discharging surfaces shall be adequately sloped or equipped with mechanical means to cause discharge of product.

4.1.1.7 Equipment designed for outside installation shall be suitably covered or sealed to prevent entry of water and foreign material.

4.1.1.8 The attachment mechanisms for holding inspection port covers, access doors, and other removable accessories shall have no loose parts.

4.1.1.9 Air activator assemblies shall be accessible for inspection and removable for cleaning or replacement.

4.1.2 Specific Design Requirements for Mechanical Conveying Equipment

4.1.2.1 Screw conveyor housings shall include hinged access doors or removable panels so the helical flights can be cleaned from the outside, or the screw shall be removable for cleaning. Sufficient clearance shall be provided around the screw to allow for cleaning. The screw housing shall be dust-tight.

4.1.2.2 Continuous welding on both sides of the spiral flight shall be used for fastening the spiral to the shaft.

4.1.2.3 Screw housings in bin bottoms shall be designed for cleaning with the rest of the bin. Fixed

supports or plates in such openings shall have a width not greater than two-thirds the pitch of the screw.

4.1.2.4 Buckets shall be of seamless construction. Spaces between buckets and chain or carrier belts shall not be less than ¼ inch (6mm).

4.1.2.5 Drag-chain conveyors shall not be permitted.

4.1.2.6 Belt conveyors for dry materials shall be designed for inspection and cleaning.

4.1.3 Specific Design Requirements for Pneumatic Conveying Equipment

4.1.3.1 Straight runs of pneumatic conveyors, valves and rotary feeders shall comply with the provisions of Sections 3.1 and 3.2 except that piping, tubing, valves or feeders which are self-purging shall be exempt from the requirements of accessibility.

4.1.3.2 The pneumatic conveyor system shall be dust tight. Parts of the pneumatic conveyor system that are in wet clean areas shall be watertight.

4.1.3.3 Vent openings on equipment shall be protected with filters.

4.1.3.4 Air supply for blowers or compressors shall be filtered to exclude particles of 5 microns or larger.

4.1.4 Specific Design Requirements for Sifters

4.1.4.1 Sifters shall permit continuous discharge of tailings through dust-tight connections to an enclosed container.

4.1.4.2 Sifters shall employ no rubbing action to facilitate product flow.

4.1.4.3 Sifter screen frames shall be designed to prevent replacement in an improper position and shall be removable for cleaning.

4.1.4.4 Sifter screens shall be minimum mesh to allow passage of product.

4.1.5 Specific Design Requirements for Weigh Hoppers

4.1.5.1 A removable flexible connection shall be provided between the inlet to the hopper and the product delivery equipment.

4.1.6 Specific Design Requirements for Dump Bins

4.1.6.1 The bag rest shelf shall either be readily removable or readily accessible.

4.1.6.2 Protective grids shall be removable.

4.1.6.3 Covers or doors shall be provided to enclose the product zone.

4.1.7 Specific Design Requirements for Storage and Portable Bins

4.1.7.1 Cages used for bin cleaning shall be designed and constructed of round metal except for the floor, which may be constructed of flat bars installed on edge.

4.1.7.2 Auxiliary agitators shall be designed and constructed to be smooth, crevice-free and accessible.

4.1.7.3 Access openings shall be provided in all storage bins. The openings shall be at least 18 inches (460mm) in its smaller dimension and shall have exterior rims raised at least 1 inch (25mm). Covers or filters for all openings shall be designed to permit ready replacement and sealing. Bins shall have an access opening not more than 48 inches (1.25 meter) above the discharge opening.

4.1.8 Specific Design Requirements for Transport Vehicles

4.1.8.1 If the vehicle is pneumatically discharged, the air supply shall be filtered so as to remove particles of 5 microns or larger, and the filters shall be accessible for inspection and cleaning.

4.1.8.2 Discharge piping and unloading hoses shall comply with provisions of Section 4.1.3 of this standard.

4.1.8.3 Discharge piping and unloading hoses shall be equipped with caps.

4.1.8.4 Unloading hoses, if carried, shall be carried in an enclosed space, which is accessible and completely drainable.

4.1.8.5 Rail car unloaders shall comply with Sections 4.1.2 and 4.1.3 of this standard, whichever is appropriate.

4.1.8.6 Air relief assemblies shall be accessible for inspection and cleaning.

4.1.8.7 All joints in bulk railroad cars and truck tanks shall be welded and made smooth. Joints between the sides and hopper sheets are exempted from the requirement for butt welding.

4.1.8.8 The delivery vehicles shall be constructed of a non-corrosive, food grade material or coated on the interior surface (food contact surface) with an appropriate food grade non-toxic material.

4.1.9 Specific Design Requirements for Reclaiming Systems

4.1.9.1 Ingredient reclaiming systems shall be designed and constructed to be accessible for cleaning.

4.1.9.2 Dust shall be collected and contained for easy disposal.

4.2 DESIGN REQUIREMENTS FOR DOUGH TROUGHS

4.2.1 Definitions

4.2.1.1 The product zone of a dough trough shall include all inside surfaces, the exterior of the rim, and all other surfaces with which the product may come in contact.

4.2.2 Specific Design Requirements

4.2.2.1 All surfaces shall be of corrosion-resistant material or shall be of protectively coated material approved by the U.S. Food and Drug Administration for contact with food.

4.2.2.2 Trough rims shall be so constructed that the underside and corners shall be readily accessible for cleaning or, if closed, shall be sealed by welding or by other suitable means. The trough rim corners shall be structurally reinforced to reduce damage.

4.2.2.3 Division boards are part of the product zone.

4.2.2.4 The interiors of top extensions and trough covers are part of the product zone.

4.2.2.5 If hinges are used in the product zone, they shall be designed so that all parts of the hinge are accessible for cleaning.

4.2.2.6 Bearings shall be outside the product zone, shall be sealed or self-lubricated, and the design and construction shall be such that lubricant cannot leak, drip or be forced into the product zone.

4.2.2.7 Rack-and-pinion-type ends shall be designed so that the gate is removable and readily accessible for cleaning.

4.2.2.8 Chute-type ends shall be designed so that the hinge, over-lapping guides and other parts that come in contact with the dough shall be readily accessible for cleaning.

4.2.2.9 Gate-type ends shall be designed so that all parts in the product zone shall be readily accessible for cleaning.

4.2.2.10 Guide grooves in slide-end troughs shall be rounded to provide for drainage and shall be readily accessible.

4.2.2.11 All non-product zone surfaces shall be smooth and may be protectively coated except in moving contact areas where wear may occur.

4.2.2.12 Caster shoes shall be totally enclosed. When permanently attached, such attachment shall be a continuous weld.

4.2.2.13 Hoisting hooks and other outside attachments shall be attached to the trough so that no gaps or crevices are formed.

4.2.2.14 Hollow shafts or pipes used in locking devices shall be sealed.

4.2.2.15 The exteriors of top extensions and trough covers are part of the non-product zone.

4.3 DESIGN REQUIREMENTS FOR MECHANICAL INTERMEDIATE PROOFERS

4.3.1 Definitions

4.3.1.1 Proofing: That operation where the dough pieces, after fermentation and/or dividing into suitably sized sections, are allowed to "rest" and regain the proper dough condition for moulding or other make-up in the baking process.

4.3.1.2 Intermediate Proofer: That enclosure, cabinet, machine or device in which dough pieces are allowed to regain their proper condition for make-up, and includes all belts, trays, housing structural supports, motors, chains, and loading, driving and discharge mechanisms used to accomplish the proofing process.

4.3.2 Specific Design Requirements

4.3.2.1 All internal and external framework, bumpers, guides, tracks or supports resting on floors or attached to ceiling or walls shall be sealed at the point of contact, and supports and braces, if hollow, shall be sealed. All components shall be easily accessible for thorough cleaning.

4.3.2.2 External hinges, attachment mechanisms and latches for holding inspection doors, port covers, access doors and other detachable parts shall be of the simple take-apart type.

4.3.2.3 Base of the proofer unit, except for vertical support members, shall have a minimum clearance of 6 inches (150mm) above the floor.

4.3.2.4 Catch pans under any section of the proofer shall be readily removable and shall not rest directly on the floor.

4.3.2.5 Top of proofer housing shall be so designed that flour or dust cannot sift down into the product zone or mechanism.

4.3.2.6 Trays shall be readily removable or readily accessible for thorough cleaning.

4.3.2.7 Fabric linings for trays shall be readily removable.

4.3.2.8 Trays should not be hollow, but if hollow, shall be constructed of durable and shatterproof material, and sealed.

4.3.2.9 Proofer sprockets, chains and other mechanisms shall be accessible and shall be so constructed and located that lubricant cannot leak, drip or be forced into the product zone.

4.3.2.10 Discharge conveyor housings shall be removable and accessible for cleaning.

4.4 DESIGN REQUIREMENTS FOR MECHANICAL WASHERS

4.4.1 Specific Design Requirements

4.4.1.1 The surfaces of the equipment in contact with the items being washed shall be considered product zone and shall comply with the provisions of Section 3.1.

4.4.1.2 All covers or hatches shall be designed so that when opened or closed, any condensate, wash water or rinse water shall drop within the confines of the tank or housing.

4.4.1.3 All doors shall be designed so that when closed, condensate, wash water or rinse water shall drip within the confines of the tank or housing and when opened the drippage shall be held to a minimum.

4.4.1.4 Complete drainage shall be provided for water reservoirs and points in the air handling system where water may collect.

4.4.1.5 Vent openings shall be provided on the machine for installation of vent fans or ductwork.

4.4.1.6 Curtains shall be made of non-toxic and non-absorbent material and shall be removable and cleanable.

4.4.1.7 If a hold-down device is used, it should be self-cleaning.

4.4.1.8 Individual burners shall be protected from drippage by plates extended across the entire width of the burner.

4.4.1.9 All structural members and braces shall be designed to provide a minimum of horizontal surface.

4.4.1.10 Fans shall be accessible.

4.4.1.11 Air ducts shall be provided with openings or removable sections to permit internal visual inspection and cleaning.

4.4.1.12 Materials used in air handling equipment and exhaust ducts shall be non-absorbent, non-toxic, odorless, and shall be either corrosion resistant or have a protective coating.

4.4.1.13 A continuous-type pan washer should have a crumb collector, pre-rinse section, power wash section, water rinse and drying section.

4.4.1.14 The power wash and rinse sections shall provide sufficient volume, pressure and exposure time, with effective coverage to thoroughly wash and rinse the items.

4.4.1.15 The fresh water inlet pipes shall be located not less than 1 inch (25mm) or twice its diameter (whichever is greater) below the maximum overflow level of the tank. The inlets shall direct the water vertically into the tank and shall be located away from the overflow. Vacuum breakers will be permitted on inlet lines to prevent siphoning from solution tanks.

4.4.1.16 Wash and rinse tanks shall have provisions for removing solids.

4.4.1.17 Pumps and motors shall be mounted in such a way as to provide easy access for cleaning and maintenance. Sump pumps used for returning washing and rinsing solutions to the recirculating tanks shall be mounted so as to remove as much solution from the sump as possible.

4.4.1.18 Horizontal pumps shall be equipped with drains from pump packing glands.

4.4.1.19 All spray headers and spray pipes shall be readily accessible and removable. Spray pipes shall have removable end fittings.

4.4.1.20 Spray nozzles shall be constructed to minimize clogging, and shall be accessible or removable.

4.4.1.21 The bottom of the scum gutter or skimmer trough of all solution tanks shall slope toward the drain at a minimum rate of ½ inch (12mm) vertically to 12 inches (300mm) horizontally. A combination overflow and drain stand pipe may be used.

4.4.1.22 The bottoms of all solution tanks shall slope a minimum of ¼ inch (6mm) vertically to 12 inches (300mm) horizontally to provide for complete drainage. All tank bottoms shall be smooth and slope to the provided drain.

4.4.1.23 The drains shall be designed and located to ensure complete tank drainage.

4.4.1.24 Submerged heating coils bolted to solution tanks shall be the smooth welded or brazed type. Submerged fin coils shall not be used. There shall be a minimum clear distance of 1½ inches (40mm) between

outer coil surfaces and between such outer coil surfaces and adjacent bottom or side tank walls.

4.4.1.25 All submerged heating coils bolted to solution tanks shall be removable or accessible. All permanently installed submerged heating coils continuously welded to the solution tanks shall be designed to be cleaned in place.

4.4.1.26 Dryer section, in continuous-type washers, shall be accessible.

4.4.1.27 The bottom of a dryer section shall slope to drain or drains.

4.4.1.28 If individual gas burners are used in dryer sections, separate connections shall be provided for readily removing the individual burners.

4.4.1.29 Combustion air used in the heaters of drying sections of washers and not in contact with product, shall be exempt from the requirements of Section 3.1.19.

4.4.1.30 Insulation shall be enclosed and sealed.

4.4.1.31 If a discharge table is used, it shall be self-draining to a suitable drain.

4.4.1.32 Rack washers shall provide fresh water or recirculating rinse. If a recirculating rinse is used, then a final fresh water rinse shall be required.

4.4.1.33 If a lower sump is used on a rack washer, an access door shall be provided on this tank for inspection and cleaning.

4.4.1.34 Monorails, if provided in rack washers, shall conform to the requirements of Section 4.7.

4.4.1.35 Batch-type pan and utensil washers shall provide a final fresh water rinse that will provide a flow rate of not less than 1 gallon per minute per square foot (40 liters per minute per square meter) of table area, at a flow pressure of not less than 20 psi (14 newtons per cm²).

4.4.1.36 Frames used to hold the pans or utensils in batch-type washers shall be so designed as to allow free circulation of water to all surfaces of the items being washed.

4.4.1.37 The mesh size or openings in items being washed must be large enough to allow for complete pass-thru and drainage of wash water and/or particulates.

4.5. DESIGN REQUIREMENTS FOR CAKE DEPOSITORS, FILLERS AND ICING MACHINES

4.5.1 Specific Design Requirements

4.5.1.1 If any part of the machine cannot be cleaned from the floor level, the machine shall be equipped with step plates so located as to permit easy access, or accessory shall be furnished to provide such access.

4.5.1.2 All parts of scaling devices, other than gaskets, shall be constructed of corrosion-resistant material. Pistons should be designed to function without rings. If rings are used, they shall be of the circle-ring type. Where a piston, worm or screw type of displacement is used, it shall be readily removable, including the drive shaft and packing.

4.5.1.3 Flexible tubing shall be transparent or translucent. Nozzles on flexible tubing shall be readily removable.

4.5.1.4 Cylinders and manifolds shall be constructed so that it is possible to brush straight through all openings and passage. There shall be no dead end passages.

4.5.1.5 Screens or strainers for fluids shall be made from perforated or slotted material and shall be readily removable.

4.5.1.6 Drives shall be so designed and so located that they can be cleaned, as indicated in the equipment disassembly procedures. Pulleys shall be so located and protected as to avoid contact with the product. Pulleys shall have sides closed without dead ends.

4.5.1.7 Sprockets in the product zone shall be smooth, solid disks.

4.5.1.8 Conveyors which are an integral part of the equipment and which carry the product through a filling, icing or glazing application shall be readily removable or appropriately fitted for in-place cleaning.

4.5.1.9 The reservoir for the product shall be accessible without dismantling the conveyor.

4.5.1.10 Pumps, valves, pipe fittings, including those used to insert thermometers and pressure gauge bulbs, shall be of the sanitary take-apart type and shall be readily accessible or removable for cleaning.

4.6. DESIGN REQUIREMENTS FOR HORIZONTAL, VERTICAL AND SPIRAL MIXERS

4.6.1 Specific Design Requirements for Horizontal Mixers

4.6.1.1 Agitators and agitator shaft assemblies shall be designed and constructed to permit all surfaces, except those that are pressure-tight, to be effectively cleaned.

4.6.1.2 Where machine faces are joined, the joints shall be made smooth, and shall be pressure-tight over the

entire face of the joint. Fillers or bonding compounds shall not be used in the product zone.

4.6.1.3 Agitator ends shall have a minimum of 1 inch (25mm) clearance to adjacent bowl ends, with the exception of the wipers, which can be as close as is required for performance, but have a maximum width of 1 inch (25mm). Agitator hubs may be less than 1 inch (25mm), providing the opening in the bowl end for the readily removable seal housing is of a greater diameter.

4.6.1.4 Shaft seal rings shall be readily accessible and readily removable or retractable to permit cleaning of all product zone surfaces thereon, including the face of the agitator hub.

4.6.1.5 Surfaces on the shaft passing through the seals shall meet all product zone criteria.

4.6.1.6 Agitator shaft seals shall be provided with convenient means for adjustment to prevent leakage, and shall have complete drainage to the exterior to avoid accumulations of material in the event that leakage does occur.

4.6.1.7 Shaft seals shall be self-lubricating.

4.6.1.8 Openings provided for the addition of ingredients shall be of adequate size to prevent spillage, and shall be flanged outward 3/8 inch (10mm). The door or cover of the opening shall fit tightly when shut.

4.6.1.9 The diameter of the shaft opening in the bowl ends shall be at least 1½ inches (40mm) larger than the diameter of the shaft.

4.6.1.10 A minimum distance of 4 inches (100 mm) shall be provided between the mixer bowl head and the end frame housing.

4.6.1.11 The flour inlet gate assembly shall be readily removable and all component parts shall be removable.

4.6.1.12 Liquid ingredient inlets shall be of stainless steel with sanitary fittings and shall be no longer than twice their diameter, or shall be removable. Inlets shall not project into the bowl, and should be located in the cover or upper portion of the bowl. Check flaps shall not be used.

4.6.1.13 Liquid ingredient inlet pipes, valves and fittings shall be of sanitary take-apart type, and shall be removable back to the point where the line is normally continuously filled. Terminal lengths of such pipe lines shall be self-draining.

4.6.1.14 Potable water inlet lines shall terminate not less than 1 inch (25mm) or twice the inlet pipe diameter, whichever is greater, above the overflow level of the bowl.

4.6.1.15 Stationary mixer bowls shall drain completely. Close-coupled sanitary drain valves, which are accessible or removable, shall be provided.

4.6.1.16 Frame access openings shall permit easy access to all internal surfaces.

4.6.1.17 Closures for access openings to hollow spaces within the frame shall be designed and constructed to prevent the entry of water.

4.6.1.18 Convenient access for cleaning outside surfaces of movable or pivoted mixer bowls shall be provided.

4.6.1.19 Gaskets between the bowl and cover shall be readily removable.

4.6.1.20 Vacuum mixers shall be equipped with a readily removable sanitary check valve to prevent the return of materials from the vacuum line to the mixing chamber. Vacuum lines between the check valve and trap shall be readily removable.

4.6.1.21 Traps in the vacuum lines shall be readily removable.

4.6.1.22 Vacuum relief valves shall be readily removable.

4.6.1.23 Electrical control cabinets mounted on the exterior of the mixer shall be watertight and sealed to the supporting member, or spaced sufficiently away from the member to permit cleaning of all surfaces.

4.6.1.24 Bearing caps and split hub agitators may be secured with acorn nuts with no exposed threads or hex head bolts.

4.6.1.25 Roller or breaker bar ends shall extend beyond the end of a “thru bore” bushing to prevent a burr from developing as wear occurs. For “blind bore” bushings, the blind end must be the thrust surface for the end of the roller or breaker bar.

4.6.1.26 On agitator assembly or inside mixing bowl, there shall be no metal-to-metal contact between parts that move during operation.

4.6.1.27 Roller bar bushings shall be flanged or shouldered to prevent migration out of agitator. Pins shall not be used to secure bushings.

4.6.1.28 Housings on enclosed frame mixers shall be self-draining to the exterior.

4.6.1.29 Oil bath chain housings shall not be used.

4.6.1.30 Any recessed surface on underside of canopies (bowl tops) shall be accessible from the surface above the canopy.

4.6.1.31 Unused inlets shall have plugs that are flush with the underside of canopy.

4.6.1.32 On tilt bowl mixers, the exterior of the bowl shall be considered part of the product zone.

4.6.1.33 Spring steel in the product zone on a mixer shall be a minimum of 0.03 inches (0.8mm) thick.

4.6.1.34 Hardware in or above the product zone shall have a minimum of ¼ inch (6mm) thread diameter.

4.6.1.35 Bowl interior shall be free of mill and casting scale.

4.6.2 Specific Design Requirements for Vertical Mixers

4.6.2.1 Part numbers where required on beaters, shall be stamped on the top end surface of the shank or sleeve

4.6.2.2 Permanently joined metal surfaces with a total included internal angle less than 135 degrees on agitators shall have a radius of not less than 1/8 inch (3mm) tangential to both adjacent surfaces.

4.6.2.3 The requirements of a radius shall not apply to points of wire attachment and support on wire whip agitators. However, the space between wires at points of attachment shall not be less than two diameters of the wire, but in no case shall this space be less than ¼ inch (6mm).

4.6.2.4 Wire whip agitators shall be constructed so that all wires are held rigidly at the point of attachment and all other contact between wires shall be separable.

4.6.2.5 Scrapers shall be readily removable from the agitator.

4.6.2.6 Shaft seal rings of agitators passing through bowl or cover shall be readily accessible and readily removable or retractable to permit cleaning of all product zone surfaces thereon, including the face of the agitator hub. The diameter of the shaft opening in the mixer head shall be at least 1½ inches (40mm) larger than the diameter of the shaft.

4.6.2.7 Surfaces on the agitator shaft passing through the seals shall meet all product zone criteria.

4.6.2.8 Agitator shaft seals shall be provided with convenient means for adjustment to prevent leakage, and shall have complete drainage to the exterior to avoid accumulations of foreign matter in the event that leakage does occur.

4.6.2.9 Agitator shaft seals shall be self-lubricating.

4.6.2.10 Potable water inlet lines shall terminate not less than 1 inch (25mm) or twice the inlet pipe diameter,

whichever is greater, above the overflow level of the bowl.

4.6.2.11 Fixed mixer bowls shall drain completely. Close-coupled sanitary drain valves, which are accessible or removable, shall be provided.

4.6.2.12 Bowl top rims shall be of one-piece construction, or shall be sealed to the mixer bowl by welding or by other suitable means.

4.6.2.13 All attachments to bowl exteriors shall be joined so as not to create any cracks or crevices.

4.6.2.14 Frame access openings shall permit easy access to all internal surfaces.

4.6.2.15 Transmissions shall be adequately housed to prevent leakage or migration of lubricant into the product zone.

4.6.2.16 Covers for mixer bowls shall be constructed so that drainage from the exterior of the cover shall be to the outside of the bowl in all cover bowl positions.

4.6.2.17 Gaskets between the bowl and cover shall be readily removable.

4.6.2.18 Vacuum mixers shall be equipped with a readily removable sanitary check valve to prevent the return of materials from the vacuum line to the mixing chamber. Vacuum lines between the check valve and trap shall be readily removable.

4.6.2.19 Traps in the vacuum lines shall be readily removable.

4.6.2.20 Vacuum relief valves shall be readily removable.

4.6.2.21 Motors and accessory equipment sealed within the mixer housing shall be exempt from the requirements of Section 4.28.

4.6.2.22 Rotating parts above the product zone shall be free of paint.

4.6.2.23 The headspace of a planetary mixer shall be fully accessible for cleaning.

4.6.3 Specific Design Requirements for Spiral Mixers

4.6.3.1 Agitators and agitator shaft assemblies within the product zone shall be readily accessible for cleaning.

4.6.3.2 When agitators are assembled by joining, the joints shall be closed and the surfaces ground flush and free of crevices.

4.6.3.3 Agitator hubs and spacing collars shall have matched diameters and faces to afford a tight fit and to eliminate the formation of a shoulder where the hubs are joined. Set screws shall not be used.

4.6.3.4 Drip protection shall be provided to prevent lubricant from entering the product zone.

4.6.3.5 Liquid ingredient inlet lines shall terminate not less than 1 inch (25mm) or twice the inlet pipe diameter, whichever is greater, above the over-flow level of the bowl when in position for mixing.

4.6.3.6 Liquid ingredient inlet pipes, valves and fittings shall be of sanitary take-apart design and shall be removable for cleaning, back to the point where the line is normally continuously filled. Check valves shall not be permitted. Terminal lengths of such pipe lines shall be self-draining.

4.6.3.7 Covers shall be provided on the mixer to cover the bowl during mixing. Covers for mixer bowls shall be constructed so that drainage from the exterior of the cover shall be to the outside of the bowl in all cover bowl positions. All openings shall have a raised rim at least 3/8 inch (10mm).

4.6.3.8 Scrapers shall be readily removable from the agitator.

4.6.3.9 Fixed mixer bowls shall drain completely. Close-coupled sanitary drain valves, which are accessible or removable, shall be provided.

4.6.3.10 Bowl top rims shall be of one-piece construction, or shall be sealed to the mixer bowl by welding or by other suitable means.

4.6.3.11 All attachments to bowl exteriors shall be joined so as not to create any cracks or crevices.

4.6.3.12 Rotating parts above the product zone shall be free of paint.

4.7 DESIGN REQUIREMENTS FOR CONVEYORS

4.7.1 Definitions

4.7.1.1 Product zone, as defined in Section 2.12, includes the surfaces of such adjuncts as side guides and fittings, with which ingredients, mixes, or unwrapped bakery products may have contact during the course of manufacture. The return strands of conveyors having a product zone shall be considered as product zone.

4.7.1.2 Non-Product zone, as defined in Section 2.12.1, includes drive mechanisms and housing, but excludes hermetically sealed spaces and oil filled gear cases.

4.7.2 Specific Design Requirements

4.7.2.1 Catch pans shall be readily accessible or readily removable and shall not rest on the floor.

4.7.2.2 All structural members shall provide a minimum amount of flat horizontal surfaces.

4.7.2.3 All surfaces and areas where crumbs, carbonized particles, flour dust, or foreign material accumulate shall be readily accessible for cleaning.

4.7.2.4 Rollers, pulleys, sprockets, and trolley wheels shall be free of end recesses and shall be closed if hollow. All belt support rollers that are in contact with the product side of belts carrying raw or unwrapped product shall be readily accessible or readily removable for cleaning purposes.

4.7.2.5 The joints between rollers, pulleys and sprockets, and the shafts on which they are mounted and tightly fitted, do not have to meet the requirements of Section 3.1.11.

4.7.2.6 Housings and hoods shall be accessible or removable.

4.7.2.7 Drive mechanisms should be mounted below or at side of product zone and off the floor. Drive mechanisms above the product zone shall have drip pans, which are removable or accessible.

4.7.2.8 "Flatflex" wire-type belting or ladder chain shall have openings with minimum dimension of 7/32 inch by 1 inch (5.5mm by 25mm) and shall be removable or provided with facilities for in-place cleaning.

4.7.2.9 Flat wire rod connected "Omniflex" type belting shall have minimum openings of 3/8 inch (10mm) in the smallest dimension and shall be removable or provided with facilities for in-place cleaning.

4.7.2.10 Woven spiral "Cordweave" balanced or similar wire belting shall be removable for cleaning or be provided with facilities for in-place cleaning.

4.7.2.10.1 "Cordweave" and similar type belts should be of material and design capable of withstanding temperatures required to release imbedded materials.

4.7.2.11 Wire or rod-type conveyors shall be removable or provided with facilities for in-place cleaning.

4.7.2.12 Drip or catch pans shall be provided under all trolley-type conveyors and shall be readily removable or readily accessible.

4.7.2.13 Pan carrying accessories such as hooks or racks shall be removable, or facilities shall be provided for washing and in-place cleaning.

4.7.2.14 Belts having rough textured surfaces may be used for empty pan conveyors but, if used, shall be removable, or facilities shall be provided for washing and in-place cleaning.

4.7.2.15 Cable may be used for pan return conveyors, but if used, shall be of the non-raveling type.

4.7.2.16 Chains may be used for pan return conveyors, but if used, they shall be accessible or removable.

4.7.2.17 Conveying surfaces shall be supported by the minimum amount of carrying surface or bed, as required. Rods, slats, rollers or like supports shall be used where practical.

4.7.2.18 The spaces between slats on slat conveyors shall be wide enough to facilitate cleaning and shall be not less than one-half the depth of the slats, with a minimum of ½ inch (12mm) between slats.

4.7.2.19 "Table Top" type conveyor chains shall be removable for cleaning or facilities provided for in-place cleaning.

4.7.2.20 Fabric belts shall comply with Section 3.1.15 and side edges shall be sealed.

4.7.2.21 Scrapers, brushes or other attachments used to prevent accumulation of deposits on belt surfaces or pulleys shall be removable.

4.7.2.22 Drip or catch pans shall be provided under all scrapers, brushes, or other attachments to prevent accumulation of deposits on belt surfaces or pulleys and shall be removable or accessible.

4.7.2.23 Monorail systems with carrying attachments above the product zone, shall be provided with drip pans or guards under the attachments.

4.7.2.24 All monorail track shall be of single piece construction with all surfaces accessible. All joints shall be closed.

4.8 DESIGN REQUIREMENTS FOR DIVIDERS, ROUNDERS AND BUN MACHINES

4.8.1 Definitions

4.8.1.1 Dividing: That operation and process whereby dough is either formed, extruded or cut into separate pieces of baking size.

4.8.1.2 Rounding: Rounding is that operation and process whereby divided dough pieces are formed into balls.

4.8.1.3 Bun Machine: A bun machine consists essentially of a dividing and rounding mechanism with

or without a dry proofing attachment. In connection with a bun machine there may also be a moulding device. The dividing and the rounding mechanism shall conform to the pertinent provisions of these standards for dividers and rounders; the moulder mechanism shall meet the pertinent provisions of Section 4.3 and Section 4.9.

4.8.2 Specific Design Requirements

4.8.2.1 When part numbers are required on a part in the product zone, they should be placed on a surface that does not normally come in contact with the product. The number should be engraved or etched at a minimal depth, rather than stamped so product does not accumulate.

4.8.2.2 The rounder cone shall be exempt from the definition of "smooth" insofar as grooves may be cut in the rounder cone surface. These grooves shall have a rounded radius at the bottom of at least 1/16 inch (1.5mm); or if a groove is less than 1/8 inch (3mm) in width, it shall have a semi-circular contour. The surface of these grooves shall be as smooth as manufacturing process shall permit, and shall be easily cleaned.

4.8.2.3 All surfaces, except the contact surface between the bar, race or spiral and the rounding surface, shall be accessible to both sight and reach.

4.8.2.4 Permanently joined metal surfaces shall be butted and welded, and finished flush and equal to the surrounding area. Where two metals are bolted together so that the joint may be separated for maintenance, the surfaces shall be accurately fabricated before assembly so that a tight fit is obtained and the joints sealed.

4.8.2.5 The system for lubricating dough-contact surfaces, as distinct from the means of mechanical lubrication, shall have a reservoir accessible or removable for cleaning. Distribution lines, valves and pumps shall be accessible for cleaning or so designed to permit cleaning in place (CIP).

4.8.2.6 Dusting boxes shall be provided with attached covers, and the dusting mechanism shall be accessible, or the parts removable. Other types of dusting mechanisms shall be constructed so that they are accessible for cleaning.

4.8.2.7 Dust shields and canopies, if used on rounders, shall be considered a part of the product zone, and shall be accessible for cleaning or removable.

4.8.2.8 Lubricated transmissions shall be designed to prevent leakage and placed so that lubricant cannot leak, drip or be forced into the product zone.

4.8.2.9 Openings of sufficient size and proper arrangement shall be provided to permit access to surfaces for inspection or cleaning as indicated in the equipment cleaning procedures. Covers or doors for these access openings shall be removable or hinged.

4.8.2.10 Base or base supports shall be so designed that they can be sealed to the floor, or there shall be 6 inches (150mm) minimum clearance provided between the lowest horizontal surface and the floor, except for the vertical support members or legs.

4.8.2.11 All non-product zone surfaces of castings shall be free of coarse impressions or holes. The base frame and supporting member shall be designed to be cleaned, and shall be free of pockets, crevices and inaccessible spaces.

4.9 DESIGN REQUIREMENTS FOR BREAD MOULDERS

4.9.1 Definitions

4.9.1.1 Moulding: That operation and process in the bakery whereby the dough pieces are shaped and formed into rolls or loaves.

4.9.1.2 Moulder: That mechanism or device in which dough pieces are shaped and formed into rolls or loaves.

4.9.1.3 Moulder-Panner: A device that automatically deposits the moulded or shaped dough into baking pans, onto peel boards, onto a conveyor, or other baking surfaces.

4.9.1.4 Panner Indexer: A device, which controls the movement of pans, indexing them into position to receive moulded or shaped dough pieces.

4.9.2 Specific Design Requirements

4.9.2.1 Sheetting rolls shall be arranged to facilitate and allow cleaning of grooves and flutes; such grooves and flutes shall have rounded bottoms. Curling chains or belts shall be arranged so they can be accessible or removable for cleaning.

4.9.2.2 Dusting boxes shall be provided with attached covers, and the dusting mechanism shall be accessible for cleaning, disassembly and maintenance.

4.9.2.3 The dough surface lubrication system shall conform to Section 3.1.

4.9.2.4 All internal and external framework, bumpers, guide tracks or supports resting on floors or attached to ceiling or walls shall be sealed at the point of contact except for the vertical support members or legs. Supports and braces, if hollow, shall be sealed.

4.9.2.5 A cleanable collection device should be provided where dusting material and dough particles may accumulate.

4.9.2.6 Machines incorporating conveying equipment shall conform to the requirements of Section 4.7.

4.10 DESIGN REQUIREMENTS FOR PREFABRICATED ENCLOSURES AND AIR CONDITIONING EQUIPMENT FOR FERMENTATION, PROOFING, COOLING AND RETARDING

4.10.1 Definitions

4.10.1.1 Air Conditioning: The process of treating air to control its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space.

4.10.2 Specific Design Requirements

4.10.2.1 All internal and external framework, bumpers, guides, tracks or supports resting on floors or attached to ceiling or walls shall be sealed at the point of contact, and supports and braces, if hollow, shall be sealed.

4.10.2.2 External hinges, attachment mechanisms and latches for holding inspection doors, port covers, access doors and other detachable parts shall be accessible.

4.10.2.3 The interior surfaces of air conditioning unit housing and exterior of parts therein shall be accessible for cleaning.

4.10.2.4 Fans shall be accessible.

4.10.2.5 Complete drainage shall be provided for water reservoirs and points where water may collect.

4.10.2.6 All air mechanically introduced into the air conditioning space shall be properly filtered or washed to remove particles 50 microns or larger, and shall not contain oil, water and other liquids unless specifically required as an operational procedure.

4.10.2.7 Joints occurring where walls, ceiling or floor surfaces form one or more sides of a duct shall be sealed, or the duct shall be removable. Wall and ceiling panels need to be sealed to prevent harborage.

4.10.2.8 Ducts shall be constructed and assembled so that the joints are sealed, or shall be provided with openings or removable sections so located and installed that they will permit visual inspection and cleaning.

4.10.2.9 Ducts, wherein water may accumulate, shall be pitched to provide complete drainage, and arranged so that water shall not leak or drip onto the product.

4.10.2.10 Ductwork which is not removable, but adjacent to a fixed surface, shall either be sealed thereto or the duct shall be spaced away from the fixed surfaces to allow for proper and thorough cleaning. Round ducts shall be spaced from fixed surfaces so that duct and adjacent surfaces shall be readily accessible.

4.10.2.11 Enclosures for automatic conveyor-type proofers and coolers shall provide space for washing and cleaning equipment where such washing or cleaning equipment is not provided external to the enclosure.

4.10.2.12 Proofer humidifier heating coils shall be constructed of a non-corrosive material.

4.11 DESIGN REQUIREMENTS FOR INGREDIENT WATER COOLERS AND ICE MAKERS (ATMOSPHERIC-TYPE)

4.11.1 Definitions

4.11.1.1 The product zone shall include all surfaces of the cooling and ice making equipment with which the ingredient water has contact before, during or after cooling or freezing.

4.11.2 Specific Design Requirements

4.11.2.1 All product zone surfaces shall be enclosed, but shall be readily accessible either in an assembled position or removed.

4.11.2.2 Adjacent product zone surfaces shall not be less than 4 inches (100mm) apart, or shall be readily removable. Where two or more such surfaces are so spaced, they shall not extend more than 36 inches (900mm) from open side. Where cooler surfaces are submerged, they shall have a minimum clearance of 4 inches (100mm) from tank bottom and sides.

4.11.2.3 Pipe coils or plates shall be so designed and located within the tank as to permit the cleaning of all sections, joints and fittings, as well as adjacent tank surfaces.

4.11.2.4 Scrapers, ice breakers, drums or other harvest devices on ice machines shall be readily removable, or shall be equipped with a specifically designed system for effective in-place cleaning. If surfaces are intended for in-place cleaning, tubing, pipe fittings and valves shall be so arranged that cleaning solutions can be circulated throughout the fixed system. Such systems must be completely drainable. Systems designed for cleaning in place (CIP) must have removable section for inspection.

4.11.2.5 A drain pipe at least one pipe size larger than the inlet, but not less than 1½ inches (40mm), shall be provided and the tank or storage reservoir sloped thereto so as to permit complete drainage.

4.11.2.6 In all tanks, excluding ice storage bins, an overflow pipe at least one pipe size larger than inlet shall be provided to prevent flooding. The discharge of this pipe from the tank shall be provided with a readily removable, corrosion-resistant screen of 30 mesh.

4.11.2.7 The discharge opening of the water inlet shall be located at least 1 inch (25mm), or twice the diameter

of the inlet pipe, whichever is greater, above the flood level rim.

4.11.2.8 If ball float valves are used, the ball and arm assembly shall be of corrosion-resistant material, seamless and smooth. The valve body and mechanism shall be located above the flood level rim.

4.11.2.9 Distributing troughs shall be readily removable.

4.11.2.10 A corrosion-resistant enclosure shall house the cooler surfaces and shall have lift-off cover plates providing access to the sides of the cooler surfaces. Such cover shall prevent water from passing in or out around the edges.

4.11.2.11 Complete drainage shall be provided for all points where water (condensate and drip) may collect.

4.11.2.12 All surfaces of insulation, unless enclosed and sealed, shall be impervious to moisture, and shall be accessible for cleaning.

4.11.2.13 Tank covers shall be provided, and shall be of the overlapping type, and if they are in two or more parts, they shall be tight-fitting in closed position, and shall be so constructed to prevent foreign material on the cover from falling or draining into the product zone when cover is opened or closed. Hinged covers shall pivot outboard. No horizontal stationary surfaces shall be used where such surfaces exceed 36 inches (900mm) from outside of machine. If surface exceeds 36 inches (900mm), surface must be capable of reach from both sides.

4.11.2.14 Stationary portions of the tank cover shall be sealed around the edges, and around pipes and fittings passing through them.

4.11.2.15 Refrigerant piping or compartments must be designed to permit possible leak sources, such as seals, flexible connections and bushings on rotating drums, from contacting the product zone. These points must be kept in non-product zone.

4.11.2.16 All refrigerant piping shall have shut-off valves on either side of evaporator to allow shutdown in case of leaks.

4.11.2.17 Refrigeration coils or plates exposed within the product zone shall be smooth. Fin-type coils or plates shall not be permitted.

4.11.2.18 Ventilation louvers for openings shall be effectively screened with 30-mesh screen or equivalent. Screens shall be removable for easy cleaning. Compressor compartments are exempt from this requirement provided the area inside is accessible. All louvers shall be of drip-proof construction.

4.11.2.19 Protective devices such as strainers, filters, check valves and pressure control valves shall be accessible for cleaning.

4.11.2.20 The product zone valves, exclusive of water supply inlet valves, shall conform to the material and design provisions of Section 3.1, and shall be accessible for cleaning.

4.11.2.21 Temperature sensor connections of 2 inches (50mm) or smaller in diameter shall be welded into place and ground flush on the interior, and shall contain no internal threads or inaccessible recesses in the product zone. Threadless flange connections shall be used at openings larger than 2 inches (50mm), and shall be welded in place and ground flush on the interior.

4.11.2.22 Meters shall conform to the requirements of Section 4.26.

4.11.2.23 Lubrication points shall not be located directly above a product zone.

4.12 DESIGN REQUIREMENTS FOR COATING EQUIPMENT

4.12.1 Definitions

4.12.1.1 The product zone, as defined in Section 2.12, shall include all surfaces, including bottoms, with which ingredients used in the coating of food products in normal production may have contact, magazines, entry pipes, fittings, pumps, agitators, blowers, and those surfaces over or through which forced flows of air are directly applied to the product, conveyor belts and such adjuncts as side guards, fittings, carrying rollers, and devices with which the coating and other food products may have direct or indirect contact during the process of drying and cooling, and the interior surfaces of cooling and drying tunnels, housings and ducts therein over or through which forced flows of air are directly applied to the food product.

4.12.2 Specific Design Requirements

4.12.2.1 Openings for the introduction of coating and ingredients shall be designed so as to prevent spillage. Covers shall be provided for such ingredient openings and shall be removable, easy to clean and equipped with a means of protection against the entry of foreign material from the exterior of the cover. Such openings shall have a raised rim of at least 3/8 inch (10mm).

4.12.2.2 The coating reservoir shall be accessible without cutting the conveyor belt or dismantling the conveyor and easily accessible for cleaning.

4.12.2.3 The coating reservoir shall be self-draining.

4.12.2.4 Air ducts and baffles for the delivery and distribution of air shall comply with Section 3.1

4.12.2.5 Blowers, which remove coatings from food product, shall be readily accessible and shall comply with Section 3.1.

4.12.2.6 Blower intake hoods shall be readily removable. Blower blades, motor mounts, and related parts shall be readily accessible.

4.12.2.7 Air distribution horn or cone shall be removable. Horn or cone adjustments shall be readily accessible and removable.

4.12.2.8 Wire belt rollers shall be readily accessible.

4.12.2.9 Flow pans or systems for distributing or depositing coating shall be removable and readily accessible. Flow pan screens shall be made from perforated or slotted material and be readily removable.

4.12.2.10 Heater units installed under a coating return section shall be readily accessible.

4.12.2.11 Product conveying surfaces shall be readily accessible and removable, and shall be designed for minimum product retention and complete cleaning.

4.12.2.12 Attachments used to prevent accumulations on aprons or belts shall be readily accessible and removable.

4.12.2.13 Readily removable drip or catch pans shall be provided under cleaning attachments and transfer points.

4.12.2.14 Sensing devices used in the product zone shall be suitable for the application and shall have shatter-resistant faces.

4.12.2.15 Pumps, valves, pipes and fittings, including those used to insert sensing bulbs, except those which are normally continuously filled, shall be of the sanitary take-apart type and shall be readily accessible or readily removable.

4.12.2.16 All devices, including the mounting brackets, used for the purpose of stacking, shingling or otherwise aligning the food products prior to packing, shall comply with Section 3.1.

4.12.2.17 Enclosure panels shall be smooth and readily removable for cleaning.

4.12.2.18 Insulation within doors or access panels shall be isolated by sealing the fabricated joint or seam of the door or access panel. When multiple insulated panels are used (as in tunnel walls or tops), insulations shall be isolated within each individual panel by sealing.

4.12.2.19 Shaft seal rings shall be readily accessible and readily removable or retractable, to permit cleaning of all product zone surfaces thereon, including the face of the agitator hub.

4.12.2.20 Take-up rollers and their bearings shall be removable.

4.12.2.21 Rollers, pulleys, sprockets and wheels shall be free of end recesses. Sprockets and wheels in the product zone shall be solid disks.

4.12.2.22 Electrical, plumbing and sensing device lines shall be grouped and protected by seal enclosures.

4.12.2.23 Cooling coils shall be readily accessible and easily cleanable.

4.12.2.24 A minimum space of 8 inches (200mm) shall be provided between the floor and the bottom of the coater.

4.12.2.25 A minimum space of 12 inches (300mm) shall be provided between the floor and the bottom of the frame and body of the conveyor.

4.12.2.26 Bunker boxes and other refrigeration or heating equipment used under processing conveyors shall have condensate drainage, and the drainage pans shall be designed so as to prevent entry to food products. A minimum space of 6 inches (150mm) shall be provided between the floor and bunker boxes or related equipment.

4.13 DESIGN REQUIREMENTS FOR CUTTING AND SLICING EQUIPMENT

4.13.1 Specific Design Requirements

4.13.1.1 The ends of the drive drum and idler drum of the band knives shall be sealed.

4.13.1.2 Blade hones shall be exempt from Sections 3.1.1 and 3.1.4.

4.13.1.3 Machines incorporating conveying equipment shall conform to the pertinent provisions of the requirements of Section 4.7.

4.14 DESIGN REQUIREMENTS FOR OVENS

4.14.1 Specific Design Requirements

4.14.1.1 All non-metallic materials, such as stone and ceramic, used in construction of baking hearths should be free of protrusions and cavities. Oven hearths should be cleanable and free from inaccessible crevices.

4.14.1.2 Wire mesh, metal band, stone, ceramic or steel plate hearths shall be provided with means of cleaning the baking surface.

4.14.1.3 Splash guards shall be provided to protect the product from contact with lubricated chains. A catch pan

shall be provided in the area for lubrication to allow for removal of excess accumulated lubricant.

4.14.1.4 The ceiling or crown of an oven shall be stainless steel or non-corrosive material and/or properly coated in such a way as to not pose a food safety problem.

4.14.1.5 Ovens shall be so constructed that carrier chain lubricant can be applied at a place other than at a sprocket.

4.14.1.6 All surfaces where crumbs or topping may accumulate shall be readily accessible and cleanable.

4.14.1.7 Observation windows shall be readily accessible or removable, and shall be constructed of shatter-and heat-resistant materials.

4.14.1.8 The area beneath and behind the oven loader and unloader conveyors shall be readily accessible. A 6 inch (150mm) minimum clearance shall be maintained between the loader and unloader conveyor return and the floor.

4.14.1.9 Pipe insulation shall be cleanable and impervious to moisture.

4.14.1.10 All external surfaces of insulation should be hard finished, smooth and easily cleanable.

4.14.1.11 The top surface of an oven shall be hard finished and easily cleanable. Ancillary equipment on the top of the oven, such as gas trains, blowers, burners, fans, ducts and chimneys, should be designed and arranged to comply with section 2.3.3.1 Mechanical Cleaning.

4.14.1.12 Exterior finish other than insulating panels should be readily removable and the bottom edges of such sheets should terminate not less than 2 inches (50mm) above the floor.

4.14.1.13 Recirculating fans or agitators shall be accessible.

4.14.1.14 The oven heating system shall be designed and constructed to prevent the entry of soot or fly ash into the baking space.

4.14.1.15 Hoods used above oven in-feeds and/or discharges shall be built of corrosion and heat resistant material. Returns on the underside of the hood for collecting condensate or other debris should have at least one 1 inch (25mm) IPS drain that can be piped to an indirect drain. The returns in the underside of the hood should be easily cleanable, have a notch to allow debris to be cleaned out, and not allow for large amounts of debris. The cleanout notch and drain shall not be above the product zone.

4.14.1.16 Hood and steam exhaust stacks, chimneys, vertical ducts or combustion exhaust stacks shall have a cone-shaped condensate collector to prevent condensate from dripping back into the hood or oven. The condensate collector should be made of stainless steel and include at least a 12" x 12" (305mm x 305mm) leak proof cleanout door opposite of the "Y" connection. The drip leg should have a drain of at least 1.5 inch (38mm) IPS pipe connected to a cleanout "T" with plug.

4.14.1.17 Ductwork for condensate collectors for hood or steam exhausts should be either fully welded at each joint and seam or be reverse fit (upper duct fitting into lower duct) to prevent condensate from running down the outsides of the duct.

4.14.1.18 All ovens with hearths of mesh belt, hinge plates, or stone plates should have some method described by the manufacturer to clean under the hearth. Ovens shall be equipped with removable access panels to clean the underside of the hearth, where technically feasible.

4.14.1.19 Ovens with stone plate hearths should be inspected annually for cracks to prevent debris from contacting product as part of the OEM inspection protocol.

4.14.1.20 Hearths that have products baked directly upon them shall have an OEM recommended method to clean the hearth surface to prevent debris from contaminating the products being baked.

4.14.1.21 Tunnel ovens where product is baked directly on the hearth should have a baffle at the beginning of the hearth return plenum to prevent the accumulation of product that may become stuck to the hearth surface and fall off in the return plenum. The area near the baffle should be accessible for cleaning.

4.14.1.22 Ovens equipped with steam zones should have a condensate collector before all of the steam nozzle pipes to prevent liquids from blowing on to baked products. The condensate collector should have a suitably sized condensate trap that is properly drained.

4.14.1.23 Built-in steam generators for ovens shall be made of stainless steel. All heat sinks shall be of stainless steel. All steam generator parts shall be accessible for cleaning.

4.14.1.24 Built-in steam generators shall have an overflow collection box that flows to a steam trap or suitable type of drain with backflow prevention.

4.14.2 Specific Design Requirements for Indirect Fired Tunnel Ovens

4.14.2.1 Ovens with steam systems should have a method to clean beneath the hearth in the steam zone to prevent debris from blowing onto the product.

4.14.2.2 Steam curtains or door curtains before and after the steam zone shall be removable and easily cleanable.

4.14.3 Specific Design Requirements for Rack Ovens

4.14.3.1 Rack support systems that have a top bearing should have a method to prevent lubricant from the bearing from dripping on the products below.

4.14.3.2 Built in steam generators shall be made of stainless steel. All heat sinks shall be made of stainless steel. All steam generator parts shall be accessible for cleaning.

4.14.3.3 Built in steam generators shall have an overflow collection box that flows to a steam trap or suitable type of drain.

4.14.3.4 Air circulation type rack ovens should have removable inside wall panels to allow for the removal of debris in the air plenums next to the baking chamber.

4.14.3.5 Rack ovens that support the baking rack from below such as a frame or turntable shall be built so that the area under the frame or turntable can be cleaned.

4.14.4 Specific Design Requirements for Multi Deck Ovens

4.14.4.1 Oven doors shall be removable and cleanable.

4.14.4.2 Doors hinged from above shall be built in such a way as to prevent debris from falling from the hinges on to the product when loading or unloading the oven deck.

4.14.4.3 Stone hearths shall be fit tight enough to prevent crumbs or seeds from getting in between the stone slabs. The area around the walls shall be covered with a cove-like trim if the stone slabs are not tight to the walls.

4.14.5 Specific Design Requirements for Thermo Deck Rack Ovens

4.14.5.1 Thermo deck rack ovens shall have a method to prevent debris from falling from each heat exchanger level on to the product below.

4.14.6 Multi Level Thermo Oil Tunnel Ovens

4.14.6.1 Levels used for baking directly on the hearth shall have a method of cleaning the hearth to remove debris.

4.14.6.2 Levels using hinged plates (shinierplatten) shall have a method to remove debris from between the hinges.

4.14.6.3 All levels shall have a method to prevent debris from the level above from dropping on to product being loaded or unloaded below that level.

4.14.6.4 All levels shall have a method recommended by the manufacturer on how to clean between hearths in each level.

4.14.6.5 The manufacturer shall supply a recommended decontamination procedure for cleaning the levels in the event of an oil leak.

4.14.7 Band Ovens

4.14.7.1 Band oven clean-out door sill shall be even or below the baking chamber floor. Clean-out doors should be provided where possible along the length of the baking chamber.

4.15 DESIGN REQUIREMENTS FOR CASTER ASSEMBLIES AND WHEELS

4.15.1 Specific Design Requirements

4.15.1.1 A caster assembly shall not be used in the product zone.

4.15.1.2 Dead ends shall not be permitted.

4.15.1.3 All surfaces should be corrosion-resistant or shall have a protective coating. Paint shall not be used.

4.15.1.4 Axle bolt ends should be flush, and shall not extend more than 2½ exposed threads beyond the retaining nut.

4.15.1.5 Washers shall not be used between the horn and the axle retaining nut.

4.15.1.6 All structural members shall have a minimum of horizontal flat surfaces.

4.15.1.7 All bearings shall be sealed and lubricated for life.

4.15.1.8 A clearance of not less than 3/16 inch (5mm) shall be provided between the horn assembly and the maximum width of the vertical surfaces of the wheel of all casters having wheel diameters of 4 inches (100mm) or less. A clearance of not less than 3/8 inch (10mm) shall be provided between these same surfaces of casters with wheels larger than 4 inches (100mm) for cleaning.

4.15.1.9 A clearance of not less than ¼ inch (6mm) shall be provided between the horn assembly and the rolling surface of wheels 4 inches (100mm) and smaller. A clearance of ½ inch (12mm) shall be provided between these same surfaces on casters with wheels larger than 4 inches (100mm) for cleaning.

4.15.1.10 The plate mounting shall be constructed to have a flat top surface. The angle between the top surface and the edge of the plate shall be 90 degrees or less.

4.15.1.11 Mounting holes and other devices provided for installation shall be so designed as to prevent the formation of pockets or areas difficult to clean.

4.15.1.12 The horn assembly or fork shall be constructed so that the surface facing the wheel shall have no concave surface except that part joining the horn plate.

4.15.1.13 Kingpin assemblies that have the nuts on the bottom should be flush and shall not extend allowing more than 2 ½ exposed threads beyond the nuts. Rivets on the bottom shall be finished flush.

4.15.1.14 Axles shall be so constructed that cotter pins or castellated nuts are not used.

4.15.1.15 Caster wheels should be constructed so as to have no concave surfaces facing the horn assembly except that part which joins the hub. The included angles between all vertical and horizontal surfaces shall have a radius of not less than ¼ inch (6mm). Caster wheels shall have solid webs.

4.15.1.16 Brakes and locking devices when attached to caster assemblies or wheels shall comply with the requirements of Section 3.2.

4.16 DESIGN REQUIREMENTS FOR DOUGHNUT EQUIPMENT

4.16.1 Specific Design Requirements

4.16.1.1 Proofing cloths shall conform to the requirements of Section 3.1, except they may be of absorbent material but shall be readily removable for laundering.

4.16.1.2. Inspection windows, panels and covers shall be of shatter-resistant materials and, if used in high temperature equipment, they shall also be of heat resistant materials. They shall be sealed or readily removable.

4.16.1.3 Separate flues shall be provided for venting vapors from the frying section and/or venting products of combustion from the combustion chamber used to heat the fat.

4.16.1.4 Heating surfaces within the product zone shall be readily accessible or shall be removable.

4.16.1.5 Product zone surfaces of the frying kettle shall be readily accessible and constructed so as to drain completely.

4.16.1.6 All assembled joints shall be sealed or removable and accessible. This requirement does not apply to piping connections.

4.16.1.7 Conveyors in the frying zone shall not have projecting screws or bolts except where necessary for conveyor adjustment or accessibility.

4.16.1.8 Stacks, ducts, hoods and canopies shall be designed, constructed, located and protected so that drippings of condensate, grease, carbon or other extraneous substances cannot fall into the product zone.

4.16.1.9 Stacks, ducts and hoods shall be designed and constructed so the entire interior is accessible. Internal protrusions such as screws, boltheads, nuts, rivets and similar projections shall not be permitted.

4.16.1.10 Ducts shall be designed, constructed and assembled so that the joints are sealed or the sections removable.

4.16.1.11 Ducts, wherein water may accumulate, shall be pitched to provide complete drainage, and arranged so that the water shall not leak or drip into the product zone. Stacks, which carry off combustion gases, are exempt from this requirement.

4.16.1.12 Rectangular ducts which are not removable, but adjacent to a fixed surface, shall either be sealed thereto, or the duct shall be spaced away from the fixed surfaces a distance equal to one-fifth (1/5) of the width of the duct, except that such distance shall not be less than 2 inches (50mm). The space shall be 18 inches (460mm) if adjacent to unprotected combustible material.

4.16.1.13 Round ducts shall be spaced from fixed surfaces so the duct and adjacent surfaces shall be readily accessible.

4.16.1.14 Reservoirs or hoppers shall be provided with covers of the overlapping type, and if they are in two or more parts, they shall be designed with drip protectors. Hinged covers shall pivot outboard.

4.16.1.15 Water used for air scrubbing, air humidifying and evaporative cooling shall be from a potable source.

4.16.1.16 Pumps, piping, valves and fittings used to dispense or convey frying fats, batter, glaze, icings, jellies and fillings shall be of sanitary, take-apart type at least equal to 3A Standards, and shall be accessible for inspection and cleaning.

4.16.1.17 Kettles, tanks and piping systems shall be constructed and installed to provide suitable pitch for complete drainage.

4.16.1.18 Ingredient sifters shall employ no rubbing action or other physical pressure to facilitate flow. Bristles shall not be used.

4.16.1.19 Roller chains of the riveted type that operate in the frying fat shall conform to all the provisions of Section 3.1 except Sections 3.1.2, 3.1.11 and 3.1.12.

4.16.1.20 Insulation of fryers shall be enclosed with metal and sealed at all metal joints. A vent hole will be permitted.

4.16.1.21 Hoisting mechanisms shall be designed, installed and protected to prevent foreign material from falling into the product zone. The provisions of Section 3.2.1 shall apply to wire cable. Chain or rope shall not be used in hoisting mechanisms.

4.16.1.22 Equipment shall be constructed to provide a floor clearance of at least 6 inches (150mm). Structural members shall be arranged as not to form traps, recesses or pockets. If made of hollow stock, frame members shall have the ends closed.

4.17 DESIGN REQUIREMENTS FOR PAN GREASERS

4.17.1 Specific Design Requirements

4.17.1.1 The reservoir for pan grease shall be readily accessible and so constructed as to drain completely. If a valve is used, it shall be of a sanitary take-apart design at least equal to the 3-A Standard for valves, and shall be readily accessible for cleaning.

4.17.1.2 Heating elements inside grease reservoirs shall be smooth, corrosion-resistant, and readily removable. Heating elements on the outside of the grease reservoir shall be sealed or mounted in such a manner as to be removable.

4.17.1.3 Openings for the introduction of pan grease into the reservoir shall be of such design as to prevent spillage and contamination of materials by contact with non-product zone surfaces. Such openings shall have a raised rim at least 3/8 inch (10mm). Where an exterior opening is provided for filling, a suitable cover shall be provided which shall be readily removable.

4.17.1.4 Pumps shall be of a sanitary take-apart design equal to the 3-A Standards for pumps, and shall be readily accessible for cleaning.

4.17.1.5 Spray heads, nozzles, and disks shall be removable. Disks with non-smooth surfaces shall be permitted where the practical function so requires.

4.17.1.6 All lines carrying pan grease shall be readily removable and readily accessible.

4.17.1.7 Screens, filters, or other equipment used for the removal of crumbs or foreign particles shall be constructed of corrosion-resistant materials. They shall be readily accessible and readily removable for cleaning. Screens shall be constructed of perforated material.

4.17.1.8 Pan conveyors shall be designed to preclude contamination of all pan surfaces by dirt, carbonized particles, and other foreign material.

4.17.1.9 All oil reservoirs shall be designed to prevent contamination.

4.17.1.10 All internal and external framework, bumpers, guides, tracks or supports attached to ceiling or walls shall be sealed at the point of contact. Hollow supports and braces shall be sealed. Equipment resting on floors or pads shall be supported on sanitary legs or shall be sealed to the floor.

4.18 DESIGN REQUIREMENTS FOR CONTINUOUS MIX EQUIPMENT

4.18.1 Definitions

4.18.1.1 Product zone as defined in Section 2.11 shall include such accessory equipment as pumps, valves and fittings.

4.18.2 Specific Design Requirements

4.18.2.1 Product zone surfaces shall be readily accessible or removable for cleaning.

4.18.2.2 Permanently joined product zone surfaces with internal angles less than 135 degrees shall have a radius of not less than 1/4 inch (6mm) except where a small radius is required for proper mechanical functioning. In such case the radius shall not be less than 1/32 inch (0.8mm), and cleanable.

4.18.2.3 Pumps, valves, piping and fittings in the product zone, including those used to insert thermometer and pressure gauge bulbs, shall be of the sanitary take-apart type, and shall be readily accessible and removable for cleaning.

4.18.2.4 Bearings in the product zone shall be self-lubricating and readily removable. All surrounding surfaces shall be readily accessible.

4.18.2.5 Shaft seal assemblies and seal rings shall be both readily accessible and easily retractable, or shall be readily removable for cleaning.

4.18.2.6 Shaft seal assemblies shall be designed to provide complete drainage away from the product zone to prevent accumulation of foreign material in the event leakage does occur.

4.18.2.7 Legs shall be of a sanitary design, and shall be free of pits, crevices, scale, and without exposed threads, and may be painted.

4.18.2.8 Skirts or aprons shall be removable.

4.19 DESIGN REQUIREMENTS FOR LIQUID FERMENTATION EQUIPMENT

4.19.1 Definitions

4.19.1.1 Liquid Fermentation Equipment is that equipment in which a part of the ingredients for bakery products is fermented in a liquid media.

4.19.1.2 Fermentation Tanks shall include those tanks for products of fermentation whether designed for mixing, holding, aging, cooling or for any other function within a liquid fermentation system.

4.19.2 Specific Design Requirements

4.19.2.1 The system shall be designed to facilitate cleaning in place (CIP) or sanitary take-apart. All components of the system shall be constructed to facilitate complete drainage.

4.19.2.2 That portion of the metal used to join the inside tank lining to the outer wall shall be integral with or welded to the inside lining and the tank's metal rim shall be sloped or so arranged that all drainage will be away from the product zone.

4.19.2.3 Tank bridges shall be pitched to the outside of the tank for complete drainage and shall have a raised rim of at least 3/8 inch (10mm) where edges meet covers. Bridges shall be installed so that the underside is readily accessible from outside the tank.

4.19.2.4 The exterior of processing tanks shall be of corrosion-resistant material.

4.19.2.5 If the lip or edge of a tank, cover or bridge is rolled, the arc of roll shall not exceed 180 degrees, and the returned edge shall be at least 3/4 inch (20mm) from the adjacent surfaces.

4.19.2.6 Process piping, valves, fittings and heat exchangers shall conform to the applicable 3-A Sanitary Standards.

4.19.2.7 Inlet, agitator shaft, or instrument openings in the cover or bridge to which connections are not permanently attached shall be raised at least 3/8 inch (10mm). Pipelines, agitator shafts, or accessories entering through cover or bridge shall be fitted with a sanitary umbrella that overlaps edges of openings.

4.19.2.8 Discharge openings of the water inlet shall be located at least 1 inch (25mm) or twice the diameter of

the inlet pipe, whichever is greater, above the flood level rim.

4.19.2.9 Permanently installed inlet or outlet lines, or instrument wells, through equipment sidewalls, shall be welded. Level sensors installed on bottom or side shell should be flush type to avoid contamination in recessed areas or removable to clean.

4.19.2.10 Agitators permanently mounted are not required to be removable if they do not interfere with drainage from the tank and are readily accessible. If a support in the product zone is necessary for the operation of an agitator, it shall be of a packless bearing type and agitator or support shall be readily accessible or removable.

4.19.2.11 In totally enclosed tanks for the storage of liquid ferment, a hooded air vent of not less than 3 square inches (58cm²) in free open air shall be installed at the top of the tank. The air vent shall be equipped with a perforated screen having openings no greater than 1/16 inch (1.5mm) in diameter, or slots no wider than 1/32 inch (0.8mm). All parts shall be readily accessible and, except for the housing, shall be readily removable.

4.19.2.12 Unless other comparable means of egress are provided, a manhole shall be provided at the drainage end or side of the tank. The dimensions of the manhole opening shall be not less than 15 inches (380mm) vertical and 20 inches (500mm) horizontal, or 18 inches (460mm) in diameter. The cover shall be of the inside-outside swing-type and shall be readily removable.

4.19.2.13 Pumps for liquid ferment shall meet the following requirements:

4.19.2.13.1 Permanently joined surfaces with a total included internal angle less than 135 degrees shall have a radius of not less than 1/32 inch (0.8mm) tangential to both adjacent surfaces.

4.19.2.13.2 Parts forming the space between the motor and the pump body shall be constructed to be readily accessible and drain freely.

4.19.2.13.3 Shaft seals shall be readily removable.

4.19.2.13.4 Either single service gaskets or readily removable multi-use gaskets shall be used.

4.19.2.13.5 Inlets, outlets, and impeller fastenings shall conform to the applicable 3-A Sanitary Standards.

4.19.2.14 Liquid meters for liquid ferment shall conform to the requirements of Section 4.26.

4.19.2.15 Unless sealed to floor, cylindrical tanks standing on end with a diameter greater than 72 inches (1.75 meters) shall have a minimum clearance of 8 inches (200mm) from the floor.

4.19.2.16 For pumps mounted on legs, the legs shall be smooth with round ends and no exposed thread. Legs made of hollow stock shall be sealed. On pumps with legs designed to be fixed to the floor, the minimum clearance between the lowest part of the base and the floor shall be 4 inches (100mm). When a pump is mounted on a base, a minimum clearance of at least 2 inches (50mm) shall be provided between the pump belly and the base. Readily portable pumps not permanently attached shall have leg heights of not less than 2 inches (50mm).

4.19.2.17 All exterior seams of the outer shell of tanks shall be sealed by welding.

4.19.2.18 All equipment, piping, and conduit in the liquid ferment area shall be of a wash down design.

4.20 DESIGN REQUIREMENTS FOR DOUGH CHUTES, DOUGH HOPPERS, DOUGH RESERVOIRS, DOUGH TROUGH HOISTS AND AUTOMATIC DOUGH TROUGH DUMPS

4.20.1 Specific Design Requirements

4.20.1.1 All product surfaces shall be sloped adequately or equipped with mechanical means to cause discharge of product.

4.20.1.2 Rims shall be so constructed that the underside and corners shall be readily accessible or, if closed, shall be sealed by welding or by other suitable means.

4.20.1.3 There shall be no open tapped holes, set screws or exposed threads in the product zone.

4.20.1.4 Hoisting mechanisms shall be designed, constructed and installed to prevent foreign material from entering the product zone.

4.20.1.5 The use of platforms and other horizontal surfaces shall be held to a minimum. If used, they shall be designed to prevent foreign material from entering the product zone.

4.20.1.6 Rack-and-pinion, chute, and gate-type ends shall be designed so that all parts that come in contact with the dough shall be readily accessible for cleaning.

4.20.1.7 The system for lubricating dough contact surfaces shall be removable or designed for in-place cleaning.

4.20.1.8 Openings of sufficient size and arrangement shall be provided to permit access to all surfaces. Covers or doors for these access openings shall be readily removable or hinged.

4.20.1.9 Lubricated transmissions shall be designed to prevent leakage, and placed so that lubricant cannot leak, drip or be forced into the product zone.

4.20.1.10 Permanently mounted base or base supports shall be so designed that they can be sealed to the floor, or there shall be a 6 inch (150mm) minimum clearance provided between the lowest horizontal surface and the floor except for the vertical support members or legs.

4.21 DESIGN REQUIREMENTS FOR DEPANNERS AND DELIDDERS FOR BAKERY PRODUCTS

4.21.1 Definitions

4.21.1.1 Depanning: The operation in the bakery in which the baked products are removed from their baking containers.

4.21.1.2 Delidding: The operation in the bakery in which the lid or cover is removed from the baking container.

4.21.2 Specific Design Requirements

4.21.2.1 Vacuum conveyor belting shall be of a non-absorbent material, and readily accessible or removable.

4.21.2.2 Vacuum devices of depanners, which contact the product, shall conform to Section 3.1, and shall be readily removable with all surfaces readily accessible for cleaning.

4.21.2.3 Vacuum depanners shall employ a particle-retention device.

4.21.2.4 Air handling equipment shall be constructed of materials that shall be non-absorbent, non-toxic, odorless and either corrosion-resistant or have a protective coating.

4.21.2.5 The interior surfaces of air handling equipment and exterior of parts therein shall be accessible.

4.21.2.6 Ducts shall be provided with openings or removable sections so located and installed as to permit visual inspection and cleaning.

4.21.2.7 Ducts shall be constructed and assembled so that the joints are sealed or the sections are removable.

4.21.2.8 Ducts shall be spaced from fixed surfaces so that duct and adjacent surfaces shall be readily accessible.

4.21.2.9 Conveyors, used with depanners and delidders, shall conform to the requirements of Section 4.7.

4.22 DESIGN REQUIREMENTS FOR WEIGHING SYSTEMS

4.22.1 Specific Design Requirements

4.22.1.1 All surfaces in the product zone shall be readily accessible or removable for cleaning.

4.22.1.2 Rollers, pulleys, sprockets, and trolley wheels shall be free of end recesses.

4.22.1.3 Horizontal surfaces should be kept to a minimum.

4.22.1.4 Surfaces of castings shall be free of coarse impressions or holes. Part or pattern numbers, if used, shall not form pocket patterns or areas difficult to clean.

4.22.1.5 Enclosures for scale operating mechanism should minimize the entry of dust and moisture. Openings of such size and location shall be provided to permit access to all internal surfaces that require periodic inspection or cleaning. Covers or doors for these access openings shall be removable or hinged.

4.22.1.6 All flat scale platforms shall be provided with an apron overhang or drip lip, to protect the under surface and parts from spillage.

4.22.1.7 The indicator face cover shall be shatter-resistant, sealed and free of ledges.

4.22.1.8 The indicator face cover retaining mechanism shall exclude dust and moisture, and must not create grooves or recesses that will retain product residues and other contaminants.

4.23 DESIGN REQUIREMENTS FOR RACKS, PAN TRUCKS AND DOLLIES

4.23.1 Definitions

4.23.1.1 Product zone, as defined in Section 2.12, shall include:

4.23.1.1.1 All parts of caster mounted racks exclusive of casters and mounting bolts.

4.23.1.1.2 All parts of suspended racks exclusive of drip pans, hanger bar and trolley.

4.23.1.1.3 All parts of trucks and dollies exclusive of casters and underside of platforms.

4.23.2 Specific Design Requirements

4.23.2.1 Suspended racks with the support over the product zone shall be equipped with a drip pan which protects the product zone and can be readily removable for cleaning.

4.23.2.2 Supports for shelves or pans shall be considered a product zone and shall be readily accessible or readily removable for cleaning.

4.23.2.3 Fastening devices used to attach the running gear to racks, pan trucks and dollies shall not extend through the base, platform or bed.

4.23.2.4 Mounting brackets for handles, wheels and casters shall be designed and constructed to eliminate pockets or areas difficult to clean.

4.23.2.5 The underside of the pan truck bed should be designed and constructed to eliminate open horizontal flat surfaces other than the bottom of the truck bed.

4.24 DESIGN REQUIREMENTS FOR KETTLES AND ACCESSORY EQUIPMENT

4.24.1 Specific Design Requirements

4.24.1.1 All internal angles shall have radii of not less than ¼ inch (6mm) except where a thermometer bulb is installed in kettle, in which case no soil-retaining crevices shall be formed. Inlet, thermometer or control openings in the cover or bridge to which connections are not permanently attached shall be flanged upward at least ¼ inch (6mm). All pipe lines or accessories entering through cover or bridge shall be fitted with a sanitary umbrella deflector that overlaps edges of openings through cover.

4.24.1.2 Clamp-type covers shall be made of corrosion-resistant materials, and shall have readily removable bolts or clamps that are easily cleaned.

4.24.1.3 All product piping fittings on kettles shall be of sanitary design and conform to 3-A Standards.

4.24.1.4 Kettles shall be self-draining and the outlet shall be of sanitary design. It shall be close coupled, preferably a flush valve, and shall be easily cleanable.

4.24.1.5 Agitators permanently mounted through a bridge are not required to be removable if they do not interfere with drainage from the kettle and are readily accessible. Drip protection shall be provided to prevent lubrication from entering the product zone.

4.24.1.6 The design and construction of the permanently mounted agitator and shaft assembly shall permit all surfaces to be easily cleanable.

4.24.1.7 All surfaces of shaft seal ring assemblies and the surfaces of the agitator hub shall be accessible or removable.

4.24.1.8 Packing seals shall not be used. Shaft seals shall be designed to prevent leakage and shall have complete drainage to the exterior.

4.24.1.9 For double-motion agitators having a shaft within a shaft, the seal for the inner shaft shall be above the product level.

4.24.1.10 All agitator bars, which are fastened to the inner shaft, shall be readily removable. Support bars fastened to the outer shaft shall be permanently joined as provided in Sections 3.1.11 and 3.1.12.

4.24.1.11 Where agitators are equipped with an outer frame to which rubber, plastic or other similar scraping edges are attached, the entire unit shall be constructed so that it can be tilted or lifted out of the kettle.

4.24.1.12 Flush bulb sensing devices shall be readily removable. Instrument wells, through equipment sidewalls, shall be welded. Level sensors installed on bottom or sidewall should be flush type to avoid contamination in recessed areas or removable to clean.

4.24.1.13 Scrapers shall be readily removable from the agitators.

4.24.1.14 Access openings to the frame equipped with covers or doors shall permit easy access to all internal surfaces that require periodic inspection or cleaning, and shall be of adequate size and convenient arrangements. Hinges, where used, shall be of the take-apart type.

4.24.1.15 Bases of kettle frames shall be sealed to or raised a minimum 6 inches (150mm) above the mounting surface.

4.24.1.16 When drive mechanism is supported on a bridge across the top of the kettle, the support members shall be made of corrosion-resistant material, and if made of channel, the legs of the channel shall be turned up. Channel shall be pitched from center to outside for drainage. All other supports attached to the bridge shall be of corrosion-resistant material, or shall be provided with a protective coating. The bridge shall be provided with a minimum radius of ¼ inch (6mm) at its joining to the top side of the kettle.

4.24.1.17 Convenient access shall be provided for cleaning outside surfaces of movable or pivoted kettle bowls.

4.25 DESIGN REQUIREMENTS FOR LIQUID MEASURING SYSTEMS

4.25.1 Specific Design Requirements

4.25.1.1 All surfaces in the product zone shall be smooth. Surfaces, which contact highly perishable products such as eggs, ferment, milk and milk products, shall be equivalent to not less than a #4 mill finish on stainless steel sheet.

4.25.1.2 Permanently joined surfaces with a total included internal angle less than 135 degrees shall have a radius of not less than 1/32 inch (0.8mm) tangential to both adjacent surfaces.

4.25.1.3 Bearings in the product zone shall be readily removable, and all surfaces shall be readily accessible.

4.25.1.4 Scaling tanks shall be constructed and installed to permit complete drainage.

4.25.1.5 If liquid measuring systems are to be cleaned in place (CIP), the entire system shall be designed, constructed and installed for this method of cleaning.

4.25.1.6 Heating and cooling devices used in conjunction with liquid measuring systems shall comply with all requirements of the non-product zone.

4.26 DESIGN REQUIREMENTS FOR BULK LIQUIDS, BULK INGREDIENTS AND BULK EDIBLE FATS HANDLING AND STORAGE EQUIPMENT

4.26.1 Specific Design Requirements for Returnable Drums, Portable Tanks, Truck Tanks, Railroad Car and Storage Tanks for Liquid Ingredients

4.26.1.1 Drums with a removable head shall be sealed by an effective locking device, and shall be tamper-resistant.

4.26.1.2 Openings for reusable drums shall be void of internal threads and the closures for these openings shall be of materials conforming to the provisions of Section 3.1.

4.26.1.3 Gaskets required for closure of drum openings shall be single service.

4.26.1.4 Tanks should be constructed of corrosion-resistant material or shall have a protective coating on product zone surfaces. Tanks of mild steel shall have a protective coating on product zone surfaces when ingredients may cause corrosion.

4.26.1.5 Storage tanks, truck tanks, and railroad car tanks shall be of welded or seamless construction.

4.26.1.6 There shall be no bracings, baffles, or heating coils inside the tank unless made of stainless steel and wash down design.

4.26.1.7 Tanks shall be completely drainable, and constructed to prevent buckle or sag.

4.26.1.8 Tanks shall be provided with an emptying port or discharge valve located to permit complete drainage. The valve or port shall be capped with a fitting, which complies with the requirements of Section 3.1. This

port/valve shall be close-coupled and located below the lowest point in the tank.

4.26.1.9 Port or valves shall be of material and of internal design conforming to the provisions of Section 3.1, and shall be completely drainable and accessible.

4.26.1.10 All openings to the product zone, except air vents, including air connections and outlet valves, shall be sealed or provided with readily removable dust-tight closures or covers which will prevent entry of foreign material.

4.26.1.11 Access openings shall be provided for all tank compartments. Such openings shall be not less than 18 inches (460mm) in diameter, or not less than 15 inches by 20 inches (380mm by 500mm) if oval, and shall have external rims raised not less than 1 inch (25mm). Covers without raised internal reinforcing shall be provided, and shall be hinged and equipped with a quick-opening device. Any angular depression in the rim or cover shall be self-draining to the outside. Access openings shall not be encumbered by the installation of screen holders or fittings for any accessory, which would interfere with accessibility. If the covers are of the swing-in type, they shall also swing outside and be readily accessible.

4.26.2 Specific Design Requirements for Piping and Hose for Liquid Products

4.26.2.1 Discharge piping and unloading hoses shall be fabricated from materials which are non-toxic, non-absorbent, corrosion-resistant and smooth, and shall not affect or be affected by product and/or ordinary cleaning compounds. All surfaces shall be accessible. Unloading hoses shall have a 3-inch (75mm) minimum diameter and shall not exceed 10 feet (3 meters) in length. Multiple sections may be used.

4.26.2.2 Unloading hose couplings shall be of corrosion-resistant material and shall be of the threadless clamp-type or other sanitary-type fitting.

4.26.2.3 Unloading hose shall have the ends closed when not in use, and shall be stored in an enclosed space which is readily accessible and completely drainable. This enclosure shall be open at both ends for cleaning and inspection. These openings shall be equipped with readily removable dust-tight covers.

4.26.2.4 Piping from single or multiple compartment tanks shall be installed with take-apart or threadless flange connections, to and from pump, valves or other accessories.

4.26.2.5 Pipe connections shall be welded into place and ground flush on the interior, and shall contain no internal threads.

4.26.2.6 Distribution piping should be designed so that it may be continuously filled with the product, and shall comply with Sections 3.1 and 3.2

4.26.2.7 Piping shall be designed and arranged so that no traps, pockets, laterals or take-offs are formed which may retain the product or cleaning compounds.

4.26.2.8 Pipe runs shall be provided with wash-out openings so located as to permit effective cleaning, unless pipe runs are part of the C.I.P. cleaning system.

4.26.2.9 The emptying outlet shall be located at the lowest point in the piping system so that the system may be completely drained.

4.26.2.10 Tank filling pipes shall be provided with locking-type caps and the pipes and caps shall be made of corrosion-resistant material.

4.26.2.11 Pressure control tanks shall not be used.

4.26.2.12 Piping running through walls, ceilings or floors shall be installed so that all joints are located at least 12 inches (300mm) from the surface opening through which it runs.

4.26.2.13 Slip-on flanges shall be welded at the neck and at the flange surface, then finished to provide a smooth surface.

4.26.2.14 Screwed flanges shall have the pipe thread extend through the flange and then finished flush with the flange surface.

4.26.2.15 Welded joints shall have weld penetration through the joint wall so that there will be no crack or crevice at the interior of the joint. The interior of the joint shall be smooth.

4.26.2.16 Mechanical joints with or without gaskets shall be so designed and constructed that the joint will form a flush interior.

4.26.2.17 Piping which connects the terminal valve to the point of use shall be readily removable, and constructed of corrosion-resistant material.

4.26.3 Specific Design Requirements for Agitators and Shafts

4.26.3.1 Agitators permanently mounted through a bridge are not required to be removable if they do not interfere with drainage from the tank and are accessible. Drip protection shall be provided to prevent lubrication from entering the product zone.

4.26.3.2 Agitator motors should be equipped with permanently lubricated bearings. Where lubrication is required, the design and construction shall be such that

lubrication cannot leak, drip, or be forced into the product zone.

4.26.4 Specific Design Requirements for Pumps

4.26.4.1 All product zone surfaces shall meet the requirements of Section 3.1.12 except those angles which are required for proper mechanical functioning, provided those angles are not less than 1/32 inch (0.8mm) radius and are cleanable.

4.26.4.2 Pressure relief valves used with pumps shall vent to the atmosphere or back to the pump suction.

4.26.4.3 Wing nuts or similar quick-opening devices should be used.

4.26.4.4 Pump ports shall be accessible.

4.26.4.5 Pumps shall be completely drainable when face plate is removed.

4.26.5 Specific Design Requirements for Accessory Equipment

4.26.5.1 Protective devices, such as strainers, filters, check valves and pressure control valves shall be accessible.

4.26.5.2 Thermometer or control openings in the cover or bridge to which connections are not permanently attached, shall be flanged upward at least 4 inches (10mm). All sanitary pipelines entering through cover or bridge shall be fitted with a sanitary umbrella deflector that overlaps edges of openings through cover. Thermometer connections shall conform to Section 4.26.2.5.

4.26.5.3 The product zone surfaces of heat exchangers shall be accessible for cleaning.

4.26.5.4 Meters shall conform to the requirements of Section 4.25.

4.27 DESIGN REQUIREMENTS FOR ELECTRIC MOTORS AND ACCESSORY EQUIPMENT

4.27.1 Definitions

4.27.1.1 Electric Motor: A device, which converts electrical energy into mechanical energy, imparting torque to a mechanical power transmission drive system.

4.27.1.2 Accessory Equipment: For the purpose of this standard, accessory equipment are those mechanical torque converting devices which are attached (closed) to the electric motor, such as a gear head, speed changing device, clutch, or brake.

4.27.1.3 Totally Enclosed Motor: A motor that prevents the free exchange of air into or out of the motor housing.

4.27.1.4 Totally Enclosed Non-ventilated Motor (TENV): A motor without an integral fan or fans, external to the housing.

4.27.1.5 Totally Enclosed Fan-cooled Motor (TEFC): A motor cooled with a fan or fans, integral with the motor but external to the housing.

4.27.1.6 Explosion-proof Motor: A totally enclosed motor capable of withstanding an explosion within the motor housing and one that cannot cause ignition of external gas, vapor, or dust through sparks, flashes or internal housing explosions.

4.27.1.7 Wash Down Motor: An electrical motor that is designed to be washed with water without any changes in operating characteristics.

4.27.1.8 Easy Clean Motor: An electric motor that has been designed and built to reduce obstructions to cleaning, as far as operation and economics allow, but not meeting the standard completely. Easy clean can be washed down, if caustic solutions are not used.

4.27.2 Specific Design Requirements

4.27.2.1 Covers for cooling fans of totally enclosed fan-cooled motors and accessory equipment shall be securely fastened and removable for cleaning.

4.27.2.2 The conduit box shall be sealed to, or integral with, the frame.

4.27.2.3 Mounting feet shall be designed and constructed so that all joints of the support to the frame shall be free of crevices. Non-toxic, permanently bonded filler material may be used to eliminate crevices.

4.27.2.4 Breather assemblies shall be removable and readily accessible and shall prevent the passage of foreign material.

4.27.3 Application Requirements for Motors and Accessory Equipment

4.27.3.1 TEFC and TENV motors and accessory equipment shall be specified.

4.27.3.2 In hard to reach areas, wash-down or easy clean motors should be considered.

4.28 DESIGN REQUIREMENTS FOR DISTRIBUTION CABINETS AND CONTAINERS

4.28.1 Definitions

4.28.1.1 Distribution Cabinet: A fully enclosed container or device used for the storage or distribution of bakery products carried in a distribution container.

4.28.1.2 Distribution Container: A basket, tray, rack or other device, which may or may not be totally enclosed, which is used for the storage or distribution of bakery products.

4.28.1.3 The product zone for unwrapped bakery products shall include all interior surfaces of distribution cabinets and all surfaces of distribution containers, such as baskets, trays and racks.

4.28.2 Specific Design Requirements for Distribution Cabinets

4.28.2.1 Permanently joined metal surfaces of distribution cabinets shall be butted and welded or brazed, or shall be closed and sealed.

4.28.2.2 Raised projecting screws, threaded bolts or bolt heads shall not be used. Where low profile solid head rivets and bolts or similar devices are used at main structural joints, they shall be closed and sealed.

4.28.2.3 All tray slides that are permanently joined shall be closed and sealed. All other tray slides shall be readily removable.

4.28.2.4 A clearance of at least 1½ inches (40mm) shall be provided between the lowest shelf support and the bottom of the distribution cabinets.

4.28.2.5 Shelf supports of distribution cabinets shall be spaced so that the vertical clearance shall be at least a distance equal to the width of the horizontal lip.

4.28.2.6 Shelves in distribution cabinets shall be readily accessible or readily removable.

4.28.2.7 Identification card holder shall be constructed with the bottom open except for the minimum number of points required to hold the card, or shall be readily removable.

4.28.3 Specific Design Requirements for Distribution Containers

4.28.3.1 Permanently joined surfaces of distribution racks or racks permanently installed or used in trucks or trailers which handle unwrapped bakery products shall conform to Section 3.1 except 3.1.11 and 3.1.12 but shall comply with Sections 4.29.2.1, 4.29.2.2 and 4.29.2.3.

4.28.3.2 Permanently joined surfaces of distribution racks or racks permanently installed or used in trucks or trailers which exclusively handle wrapped bakery products shall conform to Section 3.1 except Section 3.1.5, 3.1.11 and 3.1.12. Rails, rail supports, braces and other permanent structural supports shall be closed.

4.28.3.3 Latches and hinges of trucks or trailers shall be exempted from provisions of Section 3.1.17.

4.28.3.4 Distribution containers for wrapped bakery products shall be exempted from Section 3.1.5.

4.28.3.5 The distribution containers shall be self-draining and easily cleanable.

4.28.3.6 Wires and/or rods of metal distribution containers shall be joined wherever they meet each other by continuous welding, the length of which shall not be any greater than the diameter of the larger wire or rod.

4.28.3.7 Handles, swing-over stacking bars, cover hinges and/or bails of distribution containers shall be free enough so that all surfaces are readily accessible.

4.28.3.8 When solid frames and wire grids are used in distribution containers, the solid frames shall be so constructed that the underside and corners shall be readily accessible or, if closed, shall be sealed by welding or by other suitable means, and shall be formed to the outside of the container. Where horizontal wires are attached to the frames, the space between the end of the wire and the vertical member of the frame shall be at least 1/8 inch (3mm). The wire must be fastened to the bottom horizontal member or have 1/4 inch (6mm) space between this bottom member and the wire. Distribution containers of this type are designed for wrapped bakery products only.

4.28.3.9 Reinforcing ribs of distribution containers shall not form horizontal surfaces and shall be external.

4.28.3.9.1 Horizontal elevations may be used as structural members on plastic distribution containers provided they are elevated no more than 1/2 inch (12mm) and spaced no less than 3 times the width of such member, and inclined or sloped to facilitate drainage.

4.28.3.10 Locking channels must be constructed so that the depth of the channel does not exceed its width or length, and shall be readily accessible and self-draining in the upright or inverted position. The channel shall not be continuous in length. The length of the channel segments shall not exceed 2 inches (50mm) and shall not be closer together than its length.

4.28.3.11 Shelves in distribution containers shall be readily accessible or readily removable.

4.28.3.12 Permanently molded surfaces of plastic containers with totally included internal angles less than 135 degrees shall have a radius of not less than 1/8 inch (3mm) tangential to both adjacent surfaces.

4.29 DESIGN REQUIREMENTS FOR PIE MAKE-UP EQUIPMENT

4.29.1 Definitions

4.29.1.1 Pie Make-Up Equipment is that equipment used for dividing, dusting, sheeting, lapping, depositing, conveying and trimming pie dough or materials, and includes depositors or pumps for fillings and washes, and spray equipment.

4.29.2 Specific Design Requirements

4.29.2.1 All components of the system shall be constructed and installed to properly handle materials used. Potentially hazardous ingredients used in pie make-up require special handling to prevent product deterioration. The hopper or reservoir capacity for eggs, milk or similar ingredient washes shall be limited to 2 gallon (7.5 liters). All equipment and components shall be accessible and easily cleanable.

4.29.2.2 Filling hoppers shall be removable or readily accessible.

4.29.2.3 Pie pan carriers shall be readily removable or readily accessible.

4.29.2.4 Pie pan carrier chains, dogs, indexing mechanisms and related equipment shall be accessible.

4.29.2.5 Dough sheeting roll surfaces shall be smooth but may be grooved. The bottom and end radius shall be a minimum of 1/16 inch (1.5mm). Groove depth shall not exceed one-half groove width. Surface faces of grooves shall be smooth.

4.29.2.6 Dough lapping devices shall be removable or shall be accessible. Driving mechanisms should not be over the product zone.

4.29.2.7 Pumps, including piston fillers and vane types, shall be of sanitary take-apart design at least equal to 3-A Standards for Pumps, and shall be readily accessible.

4.29.2.8 Filling depositor piping, nozzles, hoppers and valves shall meet 3-A Standards for Piping and Fittings.

4.29.2.9 Trimmer heads, marking devices, cutters, decorators and similar accessories contacting the product shall be removable.

4.29.2.10 Part numbers, where required, such as on rolls or pistons, shall not be in the product zone.

4.29.2.11 Systems, which apply an ingredient to the product, or product contact surfaces of the equipment, shall have a reservoir readily accessible, or removable and accessible, and any distribution lines shall be removable.

4.29.2.12 Attached covers shall be provided for dough hoppers and ingredient reservoirs. Covers shall be of the overlapping type and if they are in two or more parts,

they shall be designed with drip protectors. When covers or doors are in the open position, any liquid from the inner or outer surfaces shall not drain onto the product or product zone.

4.29.2.13 Equipment used for applying dusting ingredients shall be removable, and the product zone components shall be accessible. The hopper of this equipment shall be supplied with an attached cover.

4.29.2.14 Structural members in the non-product zone shall be so designed and arranged as not to form traps, recesses or pockets.

4.29.2.15 Means shall be provided to collect product and ingredient spillage. This collecting equipment shall conform to requirements of Section 3.1.

4.29.2.16 Conveyors used as parts of the machines shall conform to the requirements of Section 4.7.

4.30 DESIGN REQUIREMENTS FOR ICING AND GLAZING MACHINES

4.30.1 Specific Design Requirements

4.30.1.1 All equipment and components shall be accessible and easily cleanable.

4.30.1.2 The icing and/or glazing reservoir shall be readily accessible and self-draining.

4.30.1.3 Self draining pumps valves, piping and fittings, such as those used to insert thermometers and pressure gauge bulbs, shall be of the sanitary type and shall be readily accessible or removable.

4.30.1.4 Flow pans or systems for distributing or depositing icing and glazing materials shall be removable and readily accessible. Flow pan screens shall be readily removable.

4.30.1.5 Icing and glazing return pans shall be provided and shall be readily accessible or removable.

4.30.1.6 Icing and glazing reservoir return pans or systems shall be accessible without cutting the conveyor belt or dismantling the conveyor.

4.30.1.7 Drip or catch pans shall be provided under all product transfer points, as well as under cleaning attachments, and shall be readily removable.

4.30.1.8 Blowers, which remove excess icing and glazing materials from the product, shall be readily accessible.

4.30.1.9 Air distribution horn or cone shall be of stainless steel and removable. Horn adjusting devices shall be readily accessible.

4.30.1.10 Blower intake hoods shall be readily removable. Blower blades, motor mounts and related parts shall be readily accessible.

4.30.1.11 Product conveying surfaces shall be readily accessible and removable, and shall be designed for minimum product retention and complete cleaning.

4.30.1.12 Icing and glazing machines connected to continuous conveyor cooling and blowing systems shall be removable or provided with facilities for in-place cleaning.

4.30.1.13 Drive and take-up shaft assemblies shall be removable.

4.30.1.14 Rollers, pulleys, sprockets and wheels shall be free of end recesses, and shall be spaced on the shaft so as to be readily accessible.

4.30.1.15 Wire belt rollers shall be readily accessible.

4.30.1.16 Shaft seal rings shall be readily accessible and readily removable or retractable, to permit cleaning of all product zone surfaces thereon, including the face of the agitator hub.

4.30.1.17 Attachments used to prevent accumulations of materials on aprons or belts shall be readily accessible and removable.

4.30.1.18 Heater units installed under icing or glazing return sections shall be readily accessible.

4.30.1.19 Sensing devices used in the product zone shall be metal enclosed, and shall have shatter-resistant faces.

4.31 DESIGN REQUIREMENTS FOR COOLERS FOR BAKERY FOODS

4.31.1 Definitions

4.31.1.1 Cooler: A rack, tray or conveying device used to reduce the temperature of baked, fried or similarly prepared foods.

4.31.1.2 Product zone, as defined in Section 2.12, includes the surfaces of such adjuncts as side guides and fittings, with which unwrapped bakery foods may have contact during the course of cooling. Any support contacting the product carrying surface shall be considered as product zone.

4.31.2 Specific Design Requirements for Coolers

4.31.2.1 The equipment and components shall be readily accessible and easily cleanable. Product carrying surfaces shall be readily accessible, or space shall be provided to accommodate installation of facilities for in-place cleaning.

4.31.2.2 Wires and/or rods, when joined permanently to produce a rigid grid-type carrying surface, shall be butt welded, and the length of the weld shall not be smaller than the diameter of the smaller wire or rod. Rods may also be coupled by means of a sleeve with a fit such that the joint is sealed to prevent harborage. The spacing between parallel wires or rods shall not be less than 1/4 inch by 2 inches (6mm by 50mm).

4.31.2.3 Drip or catch pans shall be readily accessible or readily removable.

4.31.2.4 Drip or catch pans shall be provided between overhead trolleys and the product zone, on suspended monorail-type coolers.

4.31.2.5 Drip or catch pans shall be provided under all cleaning devices, which contact the product zone surface.

4.31.2.6 All structural members shall provide a minimum amount of flat horizontal surface. All surfaces and areas where crumbs, carbonized particles, flour dust or foreign material accumulate shall be readily accessible and easily cleanable.

4.31.2.7 Rollers, pulleys, sprockets and trolley wheels shall be free of end recesses, and shall be closed if hollow.

4.31.2.8 The joints between rollers, pulleys and sprockets, and the shafts, on which they are mounted and tightly fitted, do not have to meet the requirements of Section 3.1.11.

4.31.2.9 Housings and hoods shall be accessible or removable.

4.31.2.10 Drive mechanisms should be mounted below or at the side of the product zone and off the floor. Drive mechanisms above the product shall have drip pans, which are readily removable or readily accessible.

4.31.2.11 Wire mesh-type belting shall be removable or provided with facilities for in-place cleaning.

4.31.2.12 Conveying surfaces shall be supported by the minimum amount of carrying surface or bed as required. Rods, slats, rollers or like supports shall be used where practical.

4.31.2.13 The spaces between slats on slat conveyor shall be wide enough to facilitate cleaning, and shall be not less than one-half the depth of the slats, with a minimum of 1/2 inch (12mm) between slats.

4.31.2.14 Fabric belts shall comply with Section 3.1.15, and raw edges and ends shall be sealed. Belt lacing should be free of pockets.

4.31.2.15 Any cleaning device that contacts the product zone surface shall be readily removable.

4.31.3 Specific Design Requirements for Cooler Enclosures

4.31.3.1 All internal and external framework, bumpers, guides, tracks or supports resting on the floors or attached to ceiling or walls shall be sealed at the point of contact. Hollow supports and braces shall be sealed.

4.31.4 Specific Design Requirements for Cooler Air Conditioning Equipment

4.31.4.1 Materials shall be non-absorbent, non-toxic, odorless, and shall be either corrosion-resistant or have a protective coating.

4.31.4.2 The interior surfaces of the air conditioning unit housing and the exterior surfaces of the air conditioning unit therein shall be accessible.

4.31.4.3 Fans shall be accessible.

4.31.4.4 Complete drainage shall be provided for water reservoirs and points where water may collect.

4.31.4.5 Water used for air scrubbing and evaporative cooling, and moisture introduced into conditioned space for humidification, shall meet EPA's drinking water standards..

4.31.4.6 Ducts shall be provided with openings or removable sections so located and installed that they will permit visual inspection and cleaning by vacuum or other suitable methods.

4.31.4.7 Joints occurring where walls, ceiling or floor surfaces form one or more sides of a duct shall be sealed, or the duct shall be removable.

4.31.4.8 Ducts shall be constructed and assembled so that the joints are sealed or the sections are removable.

4.31.4.9 Ducts, wherein water may accumulate, shall be pitched to provide complete drainage, and arranged so that water shall not leak or drip on the product.

4.31.4.10 Ductwork that is not removable, but adjacent to a fixed surface, shall either be sealed thereto, or the duct shall be spaced away from the fixed surfaces to allow for proper and thorough cleaning. Round ducts shall be spaced from fixed surfaces so that duct and adjacent surfaces shall be readily accessible.

4.31.4.11 Corrosion-resistant screening with openings not to exceed 1/4 inch (6mm) shall be used to protect outside air openings of ducts. Outside lights shall not be located within 15 inches (380mm) of intake duct openings.

4.32 DESIGN REQUIREMENTS FOR PORTABLE INGREDIENT CONTAINERS

4.32.1 Definitions

4.32.1.1 The product zone includes all surfaces of any container exclusive of casters and mounting bolts.

4.32.2 Specific Design Requirements

4.32.2.1 All portable containers shall be equipped with covers and be easily cleanable.

4.32.2.2 Hinged covers of molded material shall be of one-piece construction or the hinge shall be of the simple, take-apart type and shall be so constructed that when taken apart no cracks or crevices exist. The covers shall be of the overlapping type and, if made of two or more parts, shall be designed with drip protectors. Hinged covers shall pivot outboard.

4.32.2.3 Caster or dolly assemblies or forklift pockets, when provided for portable small batch and/or ingredient containers, shall be welded or sealed to the container, or be readily removable.

4.32.2.4 Containers designed for elevated dumping shall not be equipped with attached casters if, when raised, the casters are over the product zone.

4.32.2.5 Valves, when provided, shall be of a material and of internal design conforming to Section 3.1, and shall be completely drainable and accessible for cleaning.

4.32.2.6 Reinforcing ribs shall not form horizontal surfaces, and shall be external.

4.32.2.7 All rims, locking channels or angles shall be self-draining.

4.32.2.8 Dollies or carts, when provided with any of this equipment, but not attached thereto, shall conform to the requirements of Section 4.23.

4.33 DESIGN REQUIREMENTS FOR BAKING PANS

4.33.1 Definitions

4.33.1.1 Baking Pan: A container, of single or multiple compartments, with or without a lid, designed and constructed for use in the baking of bakery foods.

4.33.1.2 Product Zone: The product zone of baking pans shall include all inside surfaces and those portions of the outside of the pan that may come in contact with the inside surfaces of an identical pan.

4.33.1.3 Reinforcing Member: A separate component added to the basic pan for the purpose of strengthening the individual pan unit.

4.33.1.4 Pan Assembly: Separate individual pan units joined through the attachment of one pan unit to another, or through the use of additional components.

4.33.2 Specific Design Requirements

4.33.2.1 All baking surfaces shall be cleanable and of a material that is corrosion-resistant under normal conditions of use. All pan release coatings shall fall under the U.S. Food and Drug Administration's definition of "food".

4.33.2.2 All individual components of baking pans shall not have sharp edges.

4.33.2.3 Top rim edges shall be smooth and the bead shall be curled and cleanable. They shall be self-draining based on the conditions in which the pan will be used.

4.33.2.4 The corners of the reinforcing members attached to non-product zone of pans or assemblies shall be required to have a radius.

4.33.2.5 Top rim edges constructed with a reinforcing member in the rim should be sealed or provided with a minimum of 1/8 inch (3mm) space between the pans and the reinforcing member.

4.33.2.6 The exterior pan assembly shall not have protruding wires or metal appendages other than handles or lips for racks.

4.33.2.7 All welding shall be free of burrs, slag or sharp edges.

4.33.2.8 Exposed welds from wire welding must be corrosion-resistant under normal conditions of use.

4.33.2.9 Reinforcing members should be wrapped with a maximum opening of 1/16 inch (1.5mm) and maximum space (gap) of 1/64 inch (0.4mm) between two materials.

4.33.2.10 Areas of baking pans that tend to trap contaminants shall allow for efficient cleaning and drainage.

4.33.2.11 When notching is required to form corners and the sheet metal is wrapped over non-corrosive resistant materials, the non-corrosive resistant materials shall be totally concealed.

4.33.2.12 All exposed fasteners shall be of corrosion resistant materials under normal conditions of use.

4.33.2.13 Pans with lids that require latching shall be constructed such that they do not generate debris that may contaminate product or otherwise fall into the pan.

4.34 DESIGN REQUIREMENTS FOR PACKAGING AND PACKAGE HANDLING EQUIPMENT

4.34.1 Specific Design Requirements for Packaging Equipment

4.34.1.1 The product-contact surface of the packaging material shall be protected from contamination within the equipment.

4.34.1.2 Machines incorporating conveying equipment shall conform to the pertinent provisions of Section 4.7.

4.34.2 Specific Design Requirements for Package Handling Equipment.

4.34.2.1 The packaging equipment structure and food contact areas shall be accessible for cleaning.

4.34.2.2 Portable transportation equipment is excluded from this standard.

4.35 DESIGN REQUIREMENTS FOR PARTICLE SIZE REDUCTION EQUIPMENT

4.35.1 Specific Design Requirements

4.35.1.1 Reducing mechanisms, such as knives, blades, hammers, etc., shall be accessible or removable for cleaning.

4.35.1.2 Reducing mechanism hubs and spacing collars shall have matching diameters and faces to afford a tight fit and to eliminate the formation of shoulders. Setscrews shall not be used. Exposed keys, keyways or splines shall not be used in the product zone.

4.35.1.3 Shaft seal assemblies and seal rings shall be either accessible or removable for cleaning.

4.35.1.4 Bearings in the product zone shall be self-lubricating and readily removable.

4.35.1.5 Augers or other pre-feed devices shall be accessible or removable for cleaning.

4.36 DESIGN REQUIREMENTS FOR DOUGH FORMING EQUIPMENT

4.36.1 Definitions

4.36.1.1 Dough Forming Equipment is all equipment that is used for preparing a finished dough or batter for baking or freezing, including but not limited to, dough feeding, laminating, sheeting, gauging, dusting, topping, cutting, moulding, extruding, depositing of batter and wire cutting of doughs and/or similar materials.

4.36.2 Specific Design Requirements

4.36.2.1 Conveyors which are part of the equipment and which carry the product through a filling, icing, glazing,

cutting, topping or dusting application shall be removable or accessible for cleaning.

4.36.2.2 Drive components shall be accessible.

4.36.2.3 Hoppers shall conform to the requirements of Section 4.20.

4.36.2.4 Cutters, dies and die rolls may be fabricated from brass or bronze as long as edible oils, liquid shortening, chocolate liquor and other fatty food products do not come in contact with the metal.

4.37 DESIGN REQUIREMENTS FOR COOKIE AND CRACKER SANDWICHING EQUIPMENT

4.37.1 Definitions

4.37.1.1 Product zone, as defined in Section 2.12, shall include such accessory equipment as filler tanks, pumps, valves, and fittings.

4.37.2 Specific Design Requirements

4.37.2.1 Catch pans shall be readily accessible or readily removable, and shall not rest on the floor.

4.37.2.2 Skirts and/or aprons shall be readily removable for cleaning.

4.37.2.3 Pumps, valves, piping and fittings in the product zone shall be of the sanitary take-apart type, and shall be readily accessible and removable for cleaning.

4.37.2.4 Joint surfaces between portable sandwiching equipment and related equipment (base cake conveyors, package loaders, wrappers, etc.) shall be removable.

4.37.2.5 Roller chains in the product zone should be avoided.

4.38 DESIGN REQUIREMENTS FOR PRETZEL EQUIPMENT

4.38.1 Definitions

4.38.1.1 Dough Handling Systems: The dough handling system comprises all machinery that carries, transports, shapes, or manipulates the dough between the discharge of the mixer and the hopper of the forming machine. This includes all chunkers, conveyors, and carts that are used in an automatic or manual mode to transport the dough between the mixer and the forming machine.

4.38.1.2 Dough Forming Systems: Dough forming systems include extrusion, rolling and twisting machines.

4.38.1.3 Pretzel Cookers: A stainless tank containing a wire conveyor belt transporting pretzels under a caustic

waterfall or through a caustic bath, or a stationary rack for small cookers. The cooker includes the tank, the conveyor system, and the circulation system.

4.38.1.4 Salt Systems: Salt systems shall include all portions of the salt storage, reclaiming and distribution equipment.

4.38.1.5 Pretzel Ovens and Kilns: Pretzel ovens and kilns include the baking and drying chambers and the roll stands that drive the belts through the chambers. Ovens and kilns may be stacked or inline.

4.38.2 Specific Design Requirements for Dough Handling Systems

4.38.2.1 Conveyors transporting dough shall adhere to the requirements of Section 4.7.

4.38.2.2 Dough chunking and sizing apparatus shall be built for wash down duty. The hoppers and chutes on the dough sizing apparatus shall adhere to the requirements of Section 4.21. All sizing and chunking mechanisms should not have bearings, cylinders or gearboxes over the product zones, or if so, shall be designed such that lubricant cannot leak, drip or be forced into the product zone. The mechanisms shall be cleanable without having to mechanically disassemble the apparatus.

4.38.3 Specific Design Requirements for Dough Forming Equipment

4.38.3.1 Dough forming equipment including extrusion machines, rolling machines, and twisting machines shall be capable of being cleaned in place. Hoppers on these machines must adhere to the requirements of Section 4.20.

4.38.3.2 Extrusion screws or flights must be readily removable from the machine. The flights should be capable of being cleaned. The gearbox that drives the screws shall be designed to prevent contaminants from entering the product zone.

4.38.3.3 Any mechanisms needed to form the pretzel must be shielded to prevent contaminants from entering the product zone.

4.38.4 Specific Design Requirements for Proofing and Finished Product Conveyors

4.38.4.1 Proofing conveyors shall comply with the requirements of Section 4.7.

4.38.5 Specific Design Requirements for Pretzel Cookers

4.38.5.1 The bottom of the cooker tank(s) shall slope to provide complete drainage. The interior surface of all tank bottoms shall be smooth and designed with a drain so located to ensure complete drainage, for cleaning.

4.38.5.2 Submerged heating coils bolted to the tanks shall be of welded construction. Submerged finned coils shall not be used. There shall be a minimum clear distance of 1½ inch (40mm) between outer coil surfaces and adjacent bottom or side tank walls.

4.38.5.3 Discharge tables shall be self draining.

4.38.5.4 The tank shall have a minimum of a 2 inch (50mm) drain line on tanks with volumes less than 100 gallons (375 liters). Tanks having a volume of 100 gallons (375 liters) or more shall have a minimum of a 3 inch (75mm) drain line.

4.38.6 Specific Design Requirements for Salt Systems

4.38.6.1 The product zone for the salt system, as defined in Section 2.11 shall include all interior surfaces with which the salt can come in contact including, but not limited to, the salt reservoir, the housing and buckets of a bucket elevator, the air passages of a pneumatic system, the housing and flights of a screw elevator and the salt distributing mechanism. The product zone shall be constructed from non-corrosive materials and protected from foreign material contamination.

4.38.6.2 Flow pans and distribution rollers shall be accessible, and cleanable.

4.38.6.3 Distribution rollers shall not have recessed ends.

4.38.6.4 Salt reservoirs shall be fitted with covers.

4.38.7 Specific Design Requirements for Ovens

4.38.7.1 Pretzel ovens and post heating equipment, such as kilns and dryers, shall comply with the requirements of Section 4.14.

4.38.7.2 Oven construction should have corrosion-resistant internal components and ducting to prevent corrosion caused by the salt and water vapor within the zones.

4.38.7.3 Ovens should have access to the baking chambers via doors.

4.38.7.4 All internal plenums and duct work should have access for cleaning.

4.38.7.5 The oven design should allow for cleaning access using a vacuum system.

4.39 DESIGN REQUIREMENTS FOR SUGAR WAFER, WAFER AND SUGAR ROLLED CONE BATTER SYSTEMS

4.39.1 Definitions

4.39.1.1 Sugar Wafer, Wafer, and Sugar Rolled Cone Batter Systems is that equipment used in the manufacture of the stated products and includes mixing, batter holding and batter distributing systems.

4.39.2 Specific Design Requirements

4.39.2.1 The batter holding and distributing systems shall use sanitary pipe and fittings, and be designed for cleaning in place (CIP), as defined in section 3.3, or take-apart cleaning.

4.39.2.2 Tank bridges shall be pitched to the outside of the tank for drainage, and shall have a raised rim of at least 3/8 inch (10mm) where edges meet covers. Bridges shall be installed so that the underside is readily accessible from outside the tank.

4.39.2.3 If the lip or edge of a tank, cover or bridge is rolled, the arc of roll shall not exceed 180 degrees, and the returned edge shall be at least 3/4 inch (20mm) from the adjacent surfaces.

4.39.2.4 Inlet, agitator shaft or instrument openings in the cover or bridge to which connections are not permanently attached shall be raised at least 3/8 inch (10mm). Pipelines, agitator shafts or accessories entering through cover or bridge shall be fitted with a sanitary umbrella that overlaps edges of openings.

4.39.2.5 Discharge openings of the water inlet shall be located at least 1 inch (25mm) or twice the diameter of the inlet pipe, whichever is greater, above the flood level rim.

4.39.2.6 Permanently installed inlet or outlet lines, or instrument wells, through equipment sidewalls, shall be welded. Level sensors installed on the bottom or side shell shall be constructed to avoid contamination and shall be cleanable.

4.39.2.7 Agitators permanently mounted are not required to be removable if they do not interfere with drainage from the tank and are readily accessible. If a support in the product zone is necessary for the operation of an agitator it shall be of a packless bearing type, and the agitator or support shall be self-draining, and shall be readily accessible or removable.

4.39.2.8 Tanks other than those equipped with access covers shall be provided with a manhole. The manhole shall be provided at the drainage end or side of a tank. The cover shall be of the inside-outside swing type and shall be readily removable.

4.39.2.12 Pumps for wafer or cone batter shall meet the following requirements:

4.39.2.12.4 Either single service gasket or readily removable multi-use gaskets shall be used.

4.39.2.12.5 Inlets, outlets and impeller fastenings shall conform to the applicable 3-A Sanitary Standards.

4.39.2.13 Liquid meters for liquid ferment shall conform to the requirements of Section 4.26.

4.39.2.14 Unless sealed to the floor, cylindrical tanks standing on end with a diameter greater than 72 inches (1.75 meters) shall have sufficient clearance from the floor to provide adequate access to all areas for inspection and cleaning.

4.39.2.15 Pumps and pump mountings shall provide full access for external cleaning and complete disassembly for internal cleaning.

4.39.2.16 All exterior seams of the outer shell of tanks shall be sealed by welding. Tanks located outdoors should have overlapped cladding and should not be continuously welded to handle thermal expansion.

4.40 DESIGN REQUIREMENTS FOR ELECTRICAL CONTROLS AND WIRING PRACTICES

4.40.1 Specific Design Requirements

4.40.1.1 The electrical system, including conduit and enclosures (excluding transformers), shall be constructed so that dust shall not enter (NEMA 12 [IP52] minimum standard). When located in a wet or washdown area, the electrical system shall be constructed so that liquids shall not enter (NEMA 4 [IP65] minimum standard).

4.40.1.2 Operator control enclosures, and enclosures receiving frequent touches from operators, shall be made of non-corrosive materials and shall not be painted.

4.40.1.3 All enclosures with penetrations must have those penetrations made and sealed in such a manner as to maintain the original rating of the enclosure used.

4.40.1.4 Operator interface devices, including but not limited to, computer and PLC interfaces, push buttons, potentiometers and other actuators, shall be rated a minimum of NEMA 4 (IP65).

4.40.1.5 All electrical enclosures shall be sealed to the mounting surface and any adjacent surface, or shall be spaced away at a distance equal to one-fifth of the shortest dimension of the electrical enclosure parallel to the surface, whichever is greater, with a minimum distance of 3/4 inch (20mm) and not necessarily more than 18 inches (460mm). The distance the enclosure is spaced

away from adjacent surfaces shall allow adequate access for cleaning.

4.40.1.6 Conduits shall be installed so that hard-to-clean areas or crevices are not formed, and shall be spaced away from adjacent surfaces at least 1 inch (25mm) to allow for cleaning.

4.40.1.7 All exposed cords must be rated for water contact or enclosed in conduit. Entry points to devices and enclosures shall be sealed.

4.40.1.8 Flexible conduit and fittings shall be liquid-tight and should not be bundled. Basket-style wireways should not be used.

4.40.1.9 Free-standing enclosures shall be sealed to the floor or mounted on sanitary legs.

4.40.1.9.1 Sanitary legs used with control enclosures shall be easy to clean and inspect, or enclosed and sealed to the floor when installed. Enclosed members, such as tubing or fully welded structures, shall not have penetrations unless the penetrations are sealed.

5.0 REFERENCES

The previous standard contains provisions which, though referenced in this text, constitute the provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated above.

ANSI Z50.1-2006, Bakery Equipment Safety Requirements

ASME/ANSI F2.1-1986, Food, Drug and Beverage Equipment.

Baking Industry Sanitation Standards Committee (BISSC) Sanitation Standards – 2002.

3-A Sanitary Standard for Stainless Steel Automotive Transportation Tanks for Bulk Delivery and/or Farm Pick-Up Service, No. 05-15-2002

3-A Sanitary Standard for Forms, Fillers, and Sealers of Containers for Fluid Milk and Fluid Milk Products, No. 17-10-2002

3-A Sanitary Standard for Centrifugal Separators and Clarifiers, No. 21-00-2002

3-A Sanitary Standard for Equipment for Packaging Viscous Products, No. 23-4-2002

3-A Sanitary Standard for Non-Coil Type Batch Processors, No. 25-03-2002

3-A Sanitary Standard for Equipment for Packaging Dry Milk and Dry Milk Products, No. 27-05-2002

3-A Sanitary Standard for Bag Collectors, No. 40-02-2002

3-A Sanitary Standard for Refractometers and Energy-Absorbing Optical Sensors for Milk and Milk Products, No. 46-03-2002

3-A Sanitary Standard for Sanitary Fittings, No. 63-03-2002

3-A Sanitary Standard for Italian-Type Pasta Filata Style Cheese Cookers, No. 70-01-2002

3-A Sanitary Standard for Italian-Type Pasta Filata Style Cheese Moulders, No. 71-01-2002

3-A Sanitary Standard for Italian-Type Pasta Filata Style Moulded Cheese Chillers, No. 72-01-2002

3-A Sanitary Standard for Sensors and Sensor Fittings and Connections Used on Milk and Milk Products, No. 74-02-2002

3-A Sanitary Standard for Pulsation Dampening Devices, No. 82-00-2002

3-A Accepted Practices for Sanitary Construction, Installation, Testing, and Operation of High-Temperature Short-Time and Higher-Heat Shorter-Time Pasteurizer Systems, No. 603-07-2002

3-A Accepted Practices for Design, Fabrication, and Installation of Milking and Milk Handling Equipment, No. 606-05-2002

6.0 APPENDIX

6.1 Installation Guidelines

These guidelines are provided to enable the purchaser to derive the full benefit of sanitary design and construction.

6.1.1 Equipment shall be installed with sufficient clearance. Sufficient clearance shall mean designed and installed to permit adequate access to all areas for inspection and cleaning.

6.1.2 Sufficient clearance shall be provided for the use of access and inspection openings and to permit the convenient removal or full opening of covers, doors and panels, as well as catch pans and drop pans.

6.1.3 All joints created during installation shall be sealed.

6.1.4 Surfaces adjacent to the installed equipment shall be readily accessible or the equipment shall be sealed to the adjoining surfaces.

6.1.5 Where equipment passes through walls, ceilings or floors, the equipment must be easily removable or sufficient clearance shall be provided between the equipment and the wall, ceiling or floor, and the opening shall be finished to permit cleaning or the equipment shall be sealed to the adjoining surface.

6.1.6 Accessory equipment shall be CIP or shall be installed as to permit removal of parts for cleaning.

6.1.7 Fixed equipment resting on floors or pads shall be supported by sanitary legs and shall be sealed to the floor or pads, where possible. Legs shall have no exposed threads.

6.1.8 Equipment shall be installed on hard, even-surfaced foundations or floors which are easily cleanable and non-absorbent.

6.1.9 Structural bracing and hanger brackets shall be fabricated from rounded, rectangular or equivalent shaped stock, which minimizes horizontal surfaces and recessed areas. Such bracing and brackets shall be sealed at points of attachment and the ends. Hanger rods shall have a maximum thread length of 4 inches (100mm) on each end. Continuous thread rods shall not be used over or in the product zone. Unistrut support brackets are not permitted.

6.1.10 Overhead hanger rails shall be installed so that all parts of trolleys and rails are readily accessible.

6.1.11 Insulation surfaces, unless enclosed and sealed, shall be non-absorbent and readily accessible.

6.1.12 Product chutes at floor level shall be installed that the rim is a minimum of 4 inches (100mm) above floor level. Such chutes shall be provided with overlapping covers.

6.1.13 Pans used to collect spillage or drip shall be readily accessible or readily removable, and shall be large enough to catch all spillage or drip, or shall have drains and be pitched to ensure complete drainage away from the product zone.

6.1.14 Exhaust stacks, ducts, hoods and canopies shall be so designed, constructed and installed as to be accessible for inspection and cleaning. Stacks shall be installed with a minimum of horizontal sections.

6.1.15 Inlet or exhaust openings shall be provided with a suitable means to exclude foreign materials.

6.1.16 Proper venting shall be provided for pan, rack, and utensil washers.

6.1.17 All water and steam, which may constitute or contact food products, shall be potable.

6.1.18 The potable water system shall be installed to preclude the possibility of back flow.

6.1.19 All drains from equipment shall be installed with an air gap.

6.1.20 Liquid ingredient inlet pipes, vales, and fittings shall be sanitary take-apart type, unless designed for in-place cleaning, and shall be pitched for self-draining, back to the point where the line is continuously filled.

6.1.21 Utility piping and supports shall be installed so that all exterior surfaces are readily accessible and cleanable. Sufficient clearance shall be provided between pipe runs and adjacent surfaces so that both the pipe and the adjacent surfaces are readily accessible.

6.1.22 Equipment shall not be installed under sewage or drainage lines unless provision has been made to prevent leakage thereon.

6.1.23 All fixed piping carrying products that would cause condensation shall be insulated.

6.1.24 Gaskets shall be flush with the inside edges to avoid ledges and crevices.

6.1.25 Fixed washing equipment and equipment requiring wet cleaning should be installed in an area with a floor drain.

6.1.26 A concrete curb should be built around all floor-mounted washing equipment to confine leakage.

6.1.27 Drainage facilities shall be provided for equipment with in-place cleaning systems.

6.1.28 Floor drains shall be trapped and shall be so located, and the floor so pitched as to effect complete drainage.

6.1.29 All light bulbs, lamps and tubes shall be protected against falling, and shall be shatter-resistant, housed in shatter-resistant fixtures or otherwise protected against breakage.

6.1.30 Non-contained electric cords, hoses and air lines shall be pendant without touching the floor.

6.1.31 The electrical wiring system shall be constructed so that dust shall not enter. When located in a wet or washable area, the electric system shall be constructed so that liquid shall not enter.

6.1.32 All electrical enclosures shall be sealed to the mounting surface and any adjacent surface, or shall be spaced away at least $\frac{3}{4}$ inch (20mm) or a distance equal

to one-fifth of the shortest dimension of the electrical enclosure parallel to the surface, whichever is greater, but not necessarily more than 18 inches (460mm). Sanitary legs should be used for floor-mounted panels.

6.1.33 Conduits shall be installed so that hard-to-clean areas or crevices are not formed, or shall be spaced away from adjacent surfaces at least $\frac{3}{4}$ inch (20mm) to allow for cleaning. Flexible conduit and fittings shall be liquid-tight.

6.1.34 Motors and accessory equipment should be mounted on the driven unit and off the floor.

6.1.35 A minimum of 2 inches (50mm) clearance between the lowest part of the assembly of the motor or accessory equipment and the mounting surface shall be provided.