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STANDARD PROCEDURES FOR THE MANUFACTURE AND FINISHING OF STAINLESS STEEL EQUIPMENT

PURPOSE:

The purpose of this procedure is to define the requirements for the manufacturing of stainless steel equipment, and to define “standards” for specifying and communicating stainless steel finishes.

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OVERVIEW:

Procedures for handling stainless steel materials, parts and equipment are defined in order to achieve the highest possible standard for quality. Design considerations are included as guidelines for the manufacture of stainless steel equipment for sanitary applications. Stainless steel equipment will generally fall into one of four finish grades:

- Stainless Steel Commercial (SSC-I) – Stainless steel product contact surfaces; Exterior is painted
- Stainless Steel Commercial (SSC-II) – Stainless steel construction; Exterior is not painted
- Sanitary Stainless Steel (SSS) – Sanitary 80 grit finish
- Ultra- Sanitary Stainless Steel (USSS) – Sanitary 120 grit finish

While these procedures address the standard definition of each grade, occasionally, there will be exceptions. These exceptions should be clearly identified and communicated in the sales quotation and on the fabrication drawings.

GENERAL HANDLING OF STAINLESS STEEL:

- A. ALL stainless steel materials and parts will be handled as though the finish will be sanitary.
- B. Stainless steel work in process shall be brought inside before the end of the last shift.
- C. Storing and handling of stainless steel materials, drops, parts and finished product will be in such a manner as to minimize surface scars and damage.
- D. Stainless steel materials, parts and finished products will be handled with suction cups or straps, NOT CHAINS. If chains are absolutely necessary, protect the stainless steel from direct contact with the chain or metal hooks.
- E. If possible avoid moving stainless steel materials or parts by fork lift. If it is necessary to use a fork lift, protect the stainless steel from direct contact with the forks by pallets or protective covering on the forks.
- F. A laser PVC protective adhesive coating will be applied to one side of all stainless steel sheets. The material can be ordered with the protective coating or it can be applied after arrival at H&S.
- G. Stainless steel will be cut by laser or water jet (no shearing without approval by supervision).
- H. When cutting by water jet the stainless steel must be protected from direct contact with the slats on the cutting bed.
- I. Machinery used to form and manufacture stainless steel will be clean and clear of mild steel residue. Protective paper will be used when rolling or bending stainless steel.
- J. Do not use grinding discs, hand tools, clamping devices, etc. that have previously been used on mild steel materials.
- K. Sanitary finished product shall be stored inside until shipped.
- L. Finished products shall be loaded so that they do not come in contact with other products.
- M. All sanitary equipment will be shipped by enclosed trailers (preferred), or tarped for shipping.
- N. All material received for stainless steel products shall be inspected before unloading and rejected if it does not meet requirements. If it is questionable that the materials meet requirements as specified, contact production management for decision.

DESIGN CONSIDERATIONS FOR SANITARY STAINLESS STEEL:

The following shall be considered for the design of all sanitary stainless steel equipment:

- A. Incorporate bent corners instead of welds as much as possible.
- B. All tubular frame members shall have welded caps at all ends to prevent entrapment of foreign matter.
- C. Channels, angles and other structural members shall be installed with the web on top (legs down) to prevent entrapment of dust, where possible. "T" section members shall not be used.
- D. Ledges that may entrap dust shall be eliminated or easily accessible for cleaning.
- E. There shall be no exposed threads, Allen head or slot head bolts in the product contact zone.
- F. Easy access should be considered for cleaning the interior and components in the product contact zone. Wing, "T", or palm nut style fasteners are preferred to facilitate access except where safety is a concern.
- G. Gaskets and seal packing materials shall be of FDA approved materials.
- H. Gaskets shall be either removable or continuously bonded in a manner that, when exposed to the conditions encountered in the environment of intended use and in cleaning, the gasket does not separate from the base material.
- I. Shaft seals for liquid applications shall be packless type, of sanitary design. Stacked or nested "V" rings seals are not considered as packing and may be used.
- J. Shaft seals for dry applications shall be of sanitary design. Woven or braided packing materials may be used for dry product applications so long as the packing material is FDA approved and is discarded when the unit is dismantled for cleaning.
- K. Covers for dry product equipment shall be dust-tight or shall include means for dust removal and control.

STAINLESS STEEL COMMERCIAL (SSC I)

Used primarily when “*stainless steel product contact surfaces*” is specified. Commercial design shall be the same as for standard carbon steel units except as noted below in specific equipment features. Interior and exterior commercial finish shall be as-fabricated. Exterior of SSC-I equipment **WILL BE** painted.

A. Construction Materials

1. Stainless steel product contact surfaces (surfaces in direct contact with the material being processed or handled and/or exposed to material dust or residue).
2. Mild steel externals (stiffeners, brackets, supports, drive guards, etc.)

B. Welding

1. Product contact zone - Standard, MIG weld (continuous welds not required except as required for dust-tight or liquid-tight).
2. Exterior - MIG skip-weld with seams caulked between welds.

C. Finishes

1. Welds in the Product Contact Zone – Remove slag only.
2. Exterior Welds – Remove slag and prep for paint.
3. Surfaces in the Product Contact Zone – Mill finish, as-fabricated.
4. Exterior Surfaces – Mill finish as-fabricated and prep for paint.
5. Interior and exterior to be thoroughly cleaned prior to shipping to remove soil, fabrication debris and hand prints

D. Paint

1. Complete exterior to be cleaned and painted with industrial polyurethane topcoat over stainless-compatible primer. Standard color is SW Pillar White.

E. MIXERS – SSC-I FEATURES

1. End Plate Design – (Same as standard mild steel) Full end plate with support feet and gusseted shelf type bearing brackets. The bearings mount on the tops of the brackets.
2. End Plate Attachment – Bolted on both ends. (Same as standard mild steel)
3. Mixer Support – Mixer shall be supported by the end plates – no legs. (Same as standard mild steel)
4. Ribbon Shaft Assemblies - Cross arm collars to be eliminated. Cross arms to be continuously welded to the main shaft. Ribbon “wraps” or backing straps shall not be used. Ribbons to be continuously welded to the cross arms. Seal mounting plates to be bolted and slotted to the end plates for adjustable tub wall clearance.
5. Paddle Shaft Assemblies - Keyed and bolted cross arms shall be standard commercial design of stainless steel materials. Paddles shall be bolted to cross arms with slotted holes for adjustable tub wall clearance.

6. On drop bottom mixers, the extent of stainless steel in the door actuating zone shall be determined and defined by the project manager. Any mild steel components in the door zone shall be primed or protected with rust inhibitive coating (grease).

F. CONTINUOUS BLENDERS – SSC-I FEATURES

1. All construction shall be the same as standard mild steel except with stainless steel in the product contact zone.

G. BUCKET ELEVATORS – SSC-I FEATURES

1. Stainless steel materials in product contact zone only. External stiffeners, drive base, bearing supports, etc. to be mild steel.
2. Jib booms, platforms, ladders, cages, etc. to be painted mild steel or galvanized.
3. Head and boot shafts to be mild steel protected with rust inhibitive coating
4. Throat plate to be of abrasion resistant (A/R) steel

H. ROTARY DISTRIBUTORS – SSC-I FEATURES

1. Stainless steel materials in product contact zone only. Drive housing, drive base, switch tub and components, etc. to be mild steel.
2. Shaft to be mild steel

STAINLESS STEEL COMMERCIAL (SSC II):

Used primarily when “*stainless steel construction*” is specified. Commercial design shall be the same as for standard carbon steel units except as noted below in specific equipment features. Interior and exterior commercial finish shall be as-fabricated. The exterior of SSC-II equipment **WILL NOT BE** painted.

A. Construction Materials

1. Stainless steel product contact surfaces (surfaces in direct contact with the material being processed or handled and/or exposed to material dust or residue).
2. Stainless steel externals (except as noted below in specific equipment features; or as determined and defined by the project manager; or where stainless is cost prohibitive and mild steel has been approved). Use only plated (preferred) or stainless fasteners; no unfinished carbon steel (black) fasteners.

B. Welding

1. Product contact zone - Standard, MIG weld (continuous welds not required except as required for dust-tight or liquid-tight).
2. Exterior – MIG skip-weld (paying special attention to quality of weld considering that exterior will not be painted).

C. Finishes

1. Welds in the Product Contact Zone – Remove slag only.
2. Exterior Welds – Remove slag weld spatter and discoloration. Special care shall be taken to avoid grinder and tool marks.
3. Surfaces in the Product Contact Zone – Mill finish, as-fabricated.
4. Exterior Surfaces – Mill finish as-fabricated and cleaned. Special care shall be taken to avoid grinder and tool marks.
5. Interior and exterior to be thoroughly cleaned prior to shipping to remove soil, fabrication debris and hand prints

D. Paint

1. Exterior stainless steel is not painted. Exterior fabricated mild steel to be caulked between skip welds, cleaned, masked and painted with industrial enamel topcoat (standard color is H&S gray) over rust inhibitive primer.
2. Purchased components (bearings, reducers, motors, cylinders, solenoid valves, limit switches, etc.) to have factory applied coatings with no additional paint required unless factory finish has been scratched or damaged. Mild steel shafts and exposed unfinished mild steel components on motors, reducers, etc. shall be protected with rust inhibitive coating (grease).

E. MIXERS – SSC-II FEATURES

1. On drop bottom mixers, the extent of stainless steel in the door actuating zone shall be determined and defined by the project manager. Any mild steel components in the door zone shall be primed or protected with rust inhibitive coating (grease).
2. End Plate Design – U-Shaped end plate with legs and gusseted, C-Shaped horizontal bearing brackets. Bearing to be mounted in suspension on brackets.
3. End Plate Attachment – Drive end plate to be bolted. Tail end plate to be welded.
4. Mixer Support – Square tubing legs mounted on the end plates. Locate so as not to interfere with discharge gate or take-away conveyor system. Discharge height to be specified by the project manager.
5. Ribbon Shaft Assemblies - Cross arm collars to be eliminated. Cross arms to be continuously welded to the main shaft. Ribbon “wraps” or backing straps shall not be used. Ribbons to be continuously welded to the cross arms. Seal mounting plates to be bolted and slotted to the end plates for adjustable tub wall clearance.
6. Paddle Shaft Assemblies - Keyed and bolted cross arms shall be standard commercial design of stainless steel materials. Paddles shall be bolted to slotted cross arms for adjustable tub wall clearance.

F. CONTINUOUS BLENDERS – SSC-II FEATURES

1. All construction shall be the same as standard mild steel except with stainless steel throughout.

G. BUCKET ELEVATORS – SSC-II FEATURES

1. The following fabricated items will not be stainless unless specified:
 - a) Structural tubing for motor base (mask and paint)
 - b) Head and boot shafts (protect with rust inhibitive coating)
 - c) Jib booms, platforms, ladders and cages (painted or galvanized)
 - d) Throat plate (A/R steel)

H. ROTARY DISTRIBUTORS – SSC-II FEATURES

1. The following fabricated items will not be stainless unless specified:
 - e) Shaft
 - f) Switch tub and limit switch trigger (to be primed)
 - g) Complete drive base assembly (to be primed)

SANITARY STAINLESS STEEL (SSS):

Used primarily when *sanitary construction* is specified for food, chemical and pharmaceutical industries requiring stainless steel product contact surfaces and a finish with no cracks or crevices, but not requiring the highest degree of interior polish. Interior is polished to 80 grit final finish. Because of strict requirements for sanitary applications, SSS construction is generally limited to mixing and blending equipment.

A. Construction Materials

1. Stainless steel product contact surfaces (surfaces in direct contact with the material being processed or handled and/or exposed to material dust or residue).
2. Stainless steel externals (except as noted below in specific equipment features; or as determined and defined by the project manager; or where stainless is cost prohibitive and mild steel has been approved). Use only stainless (preferred) or plated fasteners; no unfinished carbon steel (black) fasteners.

B. Welding

1. Product contact zone – Continuous TIG welds free of overlaps, cracks and surface pores.
2. Exterior – Continuous MIG welds free of overlaps, cracks and surface pores.

C. Finishes

1. Special care shall be taken to avoid grinder and tool marks during manufacturing processes.
2. Welds in the Product Contact Zone – Grind and polish to remove weld spatter and heavy ripple only and finish with 80 grit final media.
3. Exterior Welds – Remove slag and weld spatter.
4. Surfaces in the Product Contact Zone – Grind all surface imperfections and manufacturing “scars” smooth and power tool polish to 80 grit final finish with a uniform “grained” appearance.
5. Exterior Surfaces – Exterior to be “sugar” blasted to a uniform finish.
6. Interior and exterior to be thoroughly cleaned prior to shipping to remove dirt, fabrication debris and hand prints.

D. Paint

1. Exterior fabricated mild steel (to be kept to a minimum) to be cleaned, masked and painted with Steel-It stainless topcoat over rust inhibitive primer.
2. Purchased components (bearings, reducers, motors, etc.) to be painted with Steel-It stainless topcoat over factory applied coatings. Mild steel shafts and exposed unfinished mild steel components on motors, reducers, etc. shall be protected with FDA compliant rust inhibitive coating (grease).

E. MIXERS – SSS FEATURES

1. Drop bottom mixers do not meet the strict requirements for sanitary applications.

2. End Plate Design – U-Shaped end plate with legs and gusseted, C-Shaped horizontal bearing brackets. Bearing to be mounted in suspension on brackets.
3. End Plate Attachment – Drive end plate to be bolted and interior seam sealed with small, continuous fusion weld at final assembly. Weld discoloration to be removed. Tail end plate to be welded.
4. Mixer Support – Square tubing legs mounted on the end plates. Locate so as not to interfere with discharge gate or take-away conveyor system. Discharge height to be specified by the project manager.
5. Ribbon Shaft Assemblies - Cross arm collars to be eliminated. Cross arms to be continuously welded to the main shaft. Ribbon “wraps” or backing straps shall not be used. Ribbons to be continuously welded to the cross arms. Shaft location to be determined at assembly for proper tub wall clearance and the seal mounting plates to be welded-in-place to the end plates (non-adjustable).
6. Paddle Shaft Assemblies - Keyed and bolted cross arms shall be replaced with welded-in-place cross arms. Paddles placement shall be determined at assembly for proper tub wall clearance and paddles fully welded to the cross arms (non-adjustable).

F. CONTINUOUS BLENDERS – SSS FEATURES

1. End Plate Attachment – Drive end plate to be bolted and interior seam sealed with small, continuous fusion weld at final assembly. Weld discoloration to be removed. Tail end plate to be welded.
2. Shaft Assemblies – For strictest of sanitary applications paddle stems to be welded to the mainshaft eliminating pitch adjustment and paddle replaceability. Proper ribbon to tub wall clearance to be determined at assembly and the seal mounting plates welded-in-place to the end plates (non-adjustable). Paddles may be bolted with cap nut (acorn nuts) to minimize exposed threads in the product contact zone allowing for pitch adjustment and replaceability. However, cracks and crevices between the paddle stem and the shaft will not be eliminated and will require frequent cleaning.

ULTRA-SANITARY STAINLESS STEEL (USSS):

Used primarily when *sanitary construction* is specified for food, chemical and pharmaceutical industries requiring stainless steel product contact surfaces and a finish with no cracks or crevices and a high degree of interior polish. Interior is polished to 120 grit final finish. Because of strict requirements for sanitary applications, USSS construction is generally limited to mixing and blending equipment.

A. Construction Materials

1. Stainless steel product contact surfaces (surfaces in direct contact with the material being processed or handled and/or exposed to material dust or residue).
2. Stainless steel externals (except as noted below in specific equipment features; or as determined and defined by the project manager; or where stainless is cost prohibitive and mild steel has been approved). Use only stainless (preferred) or plated fasteners; no unfinished carbon steel (black) fasteners.

B. Welding

1. Product contact zone – Continuous TIG welds free of overlaps, cracks and surface pores.
2. Exterior – Continuous TIG welds free of overlaps, cracks and surface pores.

C. Finishes

1. Special care shall be taken to avoid grinder and tool marks during manufacturing processes.
2. Welds in the Product Contact Zone – Grind and polish welds smooth to 120 grit final finish.
3. Exterior Welds – Remove slag and weld spatter.
4. Surfaces in the Product Contact Zone – Grind all surface imperfections and manufacturing “scars” smooth and power tool polish to 120 grit final finish with a uniform “grained” appearance.
5. Exterior Surfaces – Exterior to be “sugar” blasted to a uniform finish.
6. Interior and exterior to be thoroughly cleaned prior to shipping to remove dirt, fabrication debris and hand prints.

D. Paint

1. Exterior fabricated mild steel (to be kept to a minimum) to be cleaned, masked and painted with Steel-It stainless topcoat over rust inhibitive primer.
2. Purchased components (bearings, reducers, motors, etc.) to be painted with Steel-It stainless topcoat over factory applied coatings. Mild steel shafts and exposed unfinished mild steel components on motors, reducers, etc. shall be protected with rust inhibitive coating (grease).

E. MIXERS – USSS FEATURES

1. Drop bottom mixers do not meet the strict requirements for sanitary applications.
2. End Plate Design – U-Shaped end plate with legs and gusseted, C-Shaped horizontal bearing brackets. Bearing to be mounted in suspension on brackets.

3. End Plate Attachment – Drive end plate to be bolted and interior seam sealed with small, continuous fusion weld at final assembly. Weld discoloration to be removed. Tail end plate to be welded.
4. Mixer Support – Square tubing legs mounted on the end plates. Locate so as not to interfere with discharge gate or take-away conveyor system. Discharge height to be specified by the project manager.
5. Ribbon Shaft Assemblies - Cross arm collars to be eliminated. Cross arms to be continuously welded to the main shaft. Ribbon “wraps” or backing straps shall not be used. Ribbons to be continuously welded to the cross arms. Shaft location to be determined at assembly for proper tub wall clearance and the seal mounting plates to be welded-in-place to the end plates (non-adjustable).
6. Paddle Shaft Assemblies - Keyed and bolted cross arms shall be replaced with welded-in-place cross arms. Paddles placement shall be determined at assembly for proper tub wall clearance and paddles fully welded to the cross arms (non-adjustable).

F. CONTINUOUS BLENDERS – USSS FEATURES

1. End Plate Attachment – Drive end plate to be bolted and interior seam sealed with small, continuous fusion weld at final assembly. Weld discoloration to be removed. Tail end plate to be welded.
2. Shaft Assemblies – For strictest of sanitary applications paddle stems to be welded to the mainshaft eliminating pitch adjustment and paddle replaceability. Proper ribbon to tub wall clearance to be determined at assembly and the seal mounting plates welded-in-place to the end plates (non-adjustable). Paddles may be bolted with cap nut (acorn nuts) to minimize exposed threads in the product contact zone allowing for pitch adjustment and replaceability. However, cracks and crevices between the paddle stem and the shaft will not be eliminated and will require frequent cleaning.