



Hygienic Design for Food Process Equipment in Asia

Design Codes for Use of Stainless Steels

3-A Education Program – Bridge to Hygienic Design
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Outline

- **General comments**
- **Australia**
- **New Zealand**
- **Japan**
- **China**

General comments

- Organizations from various countries were asked to complete a survey on standards for the food and beverage industry, and the use of stainless steel in that industry, especially with respect to minimum alloy permitted and surface roughness requirements. Several of the organizations discussed further with food equipment producers in their country.
- Standards in general are often very general and not very specific about what is allowed and not allowed.
- Disclaimer – these comments should be considered as opinions and not official statements of the requirements of each country's standards

Australia

- There are several Australian standards of importance to the Food Industry
 - Australia New Zealand Food Standards code 3.2.3 Food Premises and Equipment
 - AS4674-2004 Design, Construction, Fit-out of Food Premises(Both are similar, but the latter is said to be more prescriptive than the former.)

These standards are administered by either state or local government Health Dept.

 - AS2382-1981 gives surface finish comparisons, not specific to food industry
 - AS/NZS 1554.6 deals with welding of SS that is not for pressure equipment.
- The ASSDA* Food Code of Practice**, a 43 page booklet, is applied by most fabricators and large food products manufacturers. It covers only stainless steels.
- Large food products manufacturers may write their own additional specifications

* ASSDA – Australian Stainless Steel Development Association

**Subtitle: Code of Practice for the fabrication and Installation of Stainless Steel Process Plant and Equipment in the Food and Beverage Industries



Australia

- Materials

- AS4674 gives very general guidelines about various materials for food contact and non-food contact surfaces; for SS, it says “Stainless steel of grade appropriate for use.”, “To be used where the surface is in direct contact with food.”

- ASSDA Food Code of Practice

Discussion on materials selection and general rules on how to select

- generally 304/304L or 316/316L (L-grade for thickness > 3mm)

- mentions duplex 2205 SS for Cl- containing hot water systems

- mentions stabilized ferritic SS, but indicates limitations in use and fabrication

- mentions hardened martensitic SS and limitations

- in practice, 304/304L is the minimum SS grade for most food product contact surface applications

Australia

- SS Surface finish
 - ASSDA Food Code of Practice
 - Food product surfaces
 - Ra < 0.5 μm for aseptic and UHT processes
 - Ra < 1.0 μm for post pasteurization (= HACCP)
 - Ra < 1.0 μm for pre pasteurization
 - note that < 1.0 μm corresponds normally to 180 grit finish and <0.5 μm corresponds normally to a 320 grit finish
 - 2B for tanks (~0.5 μm for 3mm thick sheet)
 - BA (note about being about 30% smoother than 2B)
 - embossed surfaces for chutes to avoid adhesion of sticky solids
 - in practice several food product producers specify < 0.8 μm instead of <1.0 μm
 - a fine glass bead blast finish is also sometimes applied

Australia

- Standardized corrosion tests to determine whether a material is suitable
 - AS4020 applies to potable water, but apparently not to water used in the food industry.
 - no standardized corrosion tests are otherwise used to qualify suitability of SS grades.

- Acceptance of other standards from other countries
 - 3-A standard is readily accepted (subject to any other company specific criteria)
 - equipment to other standards (or equipment not built to any particular standard) may be acceptable if approved by the purchaser and not in contradiction to the Australian standard. In general, details of the equipment may not be examined for compliance by government authorities.

New Zealand

- Standards

- “Operational Guidelines for design & construction of dairy premises and equipment” by New Zealand Food Safety Authority (NZFSA). Latest edition: 2006 Previously called NZCP-6. Mandated by the NZ government through NZFSA and NZ Ministry of Primary Industries, the latter providing inspectors to carry out inspections on a routine basis.
- NZ relies heavily on 3-A Sanitary Standards for dairy and meat industry. Other NZ food producing industries take their lead from the NZ dairy industry.
- since most equipment contact surfaces are stainless steel, the NZSSDA* publication “Code of Practice for the Fabrication of Stainless Steel Plant and Equipment”** which has been adopted by most of the food industries in NZ as a Quality Assurance manual to meet the NZPSA guidelines.
- AS/NZS 1554.6 deals with welding of SS that is not for pressure equipment.

*NZSSDA – New Zealand Stainless Steel Development Association

** commonly referred as the Blue Book due to the color of its cover. It is not specific to the Food Industry

New Zealand

- Materials

- the NZFSA Operational Guidelines gives general guidelines for food product contact surfaces, e.g. “Metals should be corrosion-resistant, non-toxic, non-contaminating and cleanable under the conditions of use.”
- for wet food product contact surfaces, generally 304L is recognized as the lowest alloyed stainless steel acceptable. 316L and duplex 2205 are also widely used.
- hardenable martensitic stainless steels are used for special applications where high hardness, high wear resistance or high strength are needed.
- some small use of 430 and stabilized ferritic grades for food product contact surfaces, slightly greater use in other food applications.

New Zealand

- SS Surface finish
 - max. surface roughness permitted is 180 grit polish, but desired primarily on welds
 - 2B mill finish on sheet and plate is preferred over the 180 grit finish
 - a standard #4 finish is usually permitted, but not encouraged.

- Standardized corrosion tests to determine whether a material is suitable
 - no standardized corrosion tests are used to qualify suitability of SS grades.

- Acceptance of other standards from other countries
 - 3-A is generally acceptable
 - equipment from Europe, even without a specific standard, is generally acceptable
 - equipment from other parts of Asia may or may not be acceptable

Japan

- Standards
 - the Food Sanitation Act is the national standard for Food Safety. As with most regulations of its type, it is very general. It does not mention materials for food contact surfaces.
- Materials
 - generally 304 is the minimum grade of stainless steel for food contact surfaces. Higher alloyed SS such as 316L and 6%Mo grades are also used for more demanding services.
- SS Surface finish
 - there does not seem to be a specification for max. surface roughness, but equipment is generally of a very high polish

Japan

- Standardized corrosion tests to determine whether a material is suitable
 - no standardized corrosion tests are otherwise used to qualify suitability of SS grades.

- Acceptance of other standards from other countries
 - all imported equipment used in Japan must be inspected by the Health Dept. and a permit must be obtained.

China

- Standards
 - there are various standards produced by the Ministry of Health
 - the standard regulating the use of stainless steel is GB9684-2011 “National Food Safety Standard – Stainless Steel Products”.
- Materials
 - no specific grades are mentioned. The standard says “standardized austenitic, duplex and ferritic” grades should be selected, referring to the Chinese stainless steel standard.
 - the Chinese (and Indian) mills are major producers of what we call “low chromium 200 series” austenitic stainless steels, where the Cr content can be as low as 14% (versus 17.5% min. Cr for 304 and 16.0% min. for 430. These grades have lower corrosion resistance than 430 which has lower corrosion resistance than 304. Some of these “low chromium 200 series” are in the current Chinese standards, but there is discussion about taking them out. Nevertheless, they are used in some Chinese food contact applications.
 - for exported equipment, it is known that these low Cr 200 series grades are used for non-food contact surfaces.

China

- SS Surface finish
 - there does not seem to be a specification for max. surface roughness, but in practice, equipment is generally a min. of #4 polish.
- Standardized corrosion tests to determine whether a material is suitable
 - SS alloys must be capable of meeting requirements of test method GB/T5009.81-2003 - Method for analysis of hygienic standard of stainless steel food containers and table wares. The former, e.g. requires a max. Cr and Ni release in specified tests. Some of the low Cr 200 series grades may meet this metal release criteria.
- Acceptance of other standards from other countries
 - yes, many other standards.

Conclusions

- There are many very diverse regulations on a country-to-country basis for food contact materials in Asia.
- Many of the acceptable practices related to SS have been determined through experience within the countries, with some of them documented in publications (but not standards).
- Because of the divergence of standards and guidelines, equipment being imported should undergo a rigorous inspection to determine whether it actually conforms to the specified standards.
- It would be advantageous to have a single set of common standards around the world, even if modified locally, to make food equipment quality more uniform.