

**3-A[®] Accepted Practices for
A Method of-Producing Culinary Steam,
Number 609-03**

Standard Developer
3-A Sanitary Standards, Inc. (3-A SSI)
In Collaboration With
United States Public Health Service (USPHS)/
United States Food and Drug Administration (USFDA)
United States Department of Agriculture – Dairy Programs (USDA)
European Hygienic Engineering & Design Group (EHEDG)

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Foreword

This 3-A Accepted Practice is to establish minimum sanitary (hygienic) requirements for A Method of-Producing Culinary Steam. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

This 3-A Accepted Practice is for voluntary use by directly and materially affected organizations such as equipment and machinery fabricators, processors, regulatory agencies and by 3-A SSI to assure adequate public health protection exist for the devices and covered products. 3-A Sanitary Standards, Inc. use these documents as the source for sanitary criteria as part of 3-A Symbol authorization.

This 3-A Accepted Practice was developed jointly by 3-A SSI, the United States Public Health Service (USPHS)/United States Food and Drug Administration (USFDA), the United States Department of Agriculture – Dairy Programs (USDA), and the European Hygienic Engineering & Design Group (EHEDG).

It is our purpose to encourage inventive genius and provide a forum to discuss new developments. Suggestions for improvement and new technology are welcome any time for consideration by the 3-A Sanitary Standards Committees. Please forward comments to the 3-A SSI, 1451 Dolley Madison Boulevard, Suite 210, McLean, VA 22101-3850, USA. By fax: 703-761-6284. By e-mail to: 3-ainfo@3-a.org.

A SCOPE

A1 This 3-A Accepted Practice shall pertain to the sanitary aspects of the equipment and filters used in the supplying of steam of culinary quality which comes in direct contact with food products, other comestibles, or product contact surfaces. The system shall begin with the steam inlet of the entrainment separator and terminate at the steam inlet of the process equipment.

A2 In order to conform to this 3-A Accepted Practice, equipment for supplying steam of culinary quality, as defined herein, shall conform to the following design, material, fabrication, and installation criteria.¹

A3 Normative References

Doc. No. Title (3-A Sanitary Standards for:)

- 18- Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces
- 20- Multiple-Use Plastic Materials
- 33- Polished Metal Tubing
- 53- Compression-Type Valves
- 58- Vacuum Breakers and Check Valves
- 63- Sanitary Fittings
- 64- Pressure Reducing and Back Pressure Regulating Valves
- 74- Sensors and Sensor Fittings and Connections

Doc. No. Title (3-A Accepted Practices for:)

- 605- Permanently Installed Product and Solution Pipelines and Cleaning Systems

B DEFINITIONS

B1 *Steam of Culinary Quality:* Shall mean steam that is free of entrained contaminants, is relatively free of water in liquid form and is suitable for use in direct contact with food products, other comestibles, or product contact surfaces.

B2 *Product:* Shall mean food products or other comestibles.

B3 *Safe Water:* Shall mean water from a supply properly located, protected, and operated and shall be of a safe, sanitary quality. The water shall meet the standards prescribed in the National Primary Drinking Water Regulation of the Environmental Protection Agency (EPA) as referenced in The Code of Federal Regulations² (CFR), Title 40, Parts 141, 142 and 143 (information also available from the EPA Drinking Water Hot Line: 800-426-4791), or from the requirements for water reclaimed from the condensing of milk and milk products in the Pasteurized Milk Ordinance (PMO), Appendix D. V. Category 1.

B4 Surfaces

B4.1 *Product Contact Surfaces:* Shall mean all surfaces in contact with culinary steam from the inlet of the sanitary check valve to the point of attachment at the equipment in which it shall be used.

B4.2 *Nonproduct Contact Surfaces:* Shall mean all other exposed surfaces.

B5 *Corrosion Resistant:* Shall mean the surface has the property to maintain its original surface characteristics for its intended service period when exposed to the conditions encountered in the environment of intended use, including expected contact with product and cleaning, sanitizing treatment, or sterilization compounds or solutions.

B6 *Easily or Readily Accessible:* Shall mean a location which can be safely reached by personnel from a floor, platform (fixed or moveable), or other permanent work area.

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

² For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

B7 *Easily or Readily Removable*: Shall mean quickly separated from the equipment with the use of simple hand tools.

B8 *Nontoxic Materials*: Shall mean those substances which under the conditions of their use are in compliance with applicable requirement of the Food and Drug Administration.

B9 *Simple Hand Tools*: Shall mean implements, normally used by operating and cleaning personnel, such as a screwdriver, wrench, or mallet.

C MATERIALS

C1 Metals

C1.1 Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series³ (excluding 301 and 302) or corresponding Alloy Cast Institute (ACI) types⁴ or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types and is nontoxic and nonabsorbent. (See Appendix, Section E.)

C2 Nonmetals

C2.1 Rubber and rubber-like materials may be used for gaskets and parts having the same functional purposes.

C2.1.1 Rubber and rubber-like materials, when used for the above-specified application(s), shall conform to the applicable provisions of the 3-A Sanitary Standard, Number 18-.

C2.2 Plastic materials may be used for gaskets and parts having the same functional purposes.

C2.2.1 Plastic materials, when used for the above-specified application(s), shall conform to the applicable provisions of the 3-A Sanitary Standard, Number 20-.

C3 Culinary Steam Filters

C3.1 Culinary steam filters shall consist of materials which, under the conditions of intended use, are nontoxic, nonmedia releasing, and do not release toxic volatiles or other contaminants into the steam.

C3.2 Bonding materials in the filter media, if used, shall be nontoxic⁵, nonvolatile, and insoluble under intended conditions of use.

D FABRICATION AND INSTALLATION

D1 Product contact surfaces shall be readily accessible for cleaning and inspection either when in an assembled position or when removed. Demountable parts shall be readily removable using simple hand tools, if necessary, available to operating and cleaning personnel.

D2 The system shall include the following components and shall be installed in the sequence listed below.

D2.1 An entrainment separator capable of removing particles 10 microns in size and larger, and with an associated condensate trap.

D2.2 A filter capable of removing 95% of the particles 2 microns in size or larger, and with an associated condensate trap.

D2.2.1 The system shall be provided with a method for measuring differential pressure across the filter media to indicate the need for filter replacement or for cleaning of reusable filters.

D2.2.2 Disposable type filter media shall not be cleaned and reused.

D2.3 A means of sampling the steam or condensate downstream of the filtering device.

D2.4 A sanitary check valve conforming to the applicable provisions in 3-A Sanitary Standard, Number 58-, except that the steam supply side connection may be threaded.

³ *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, Table 2-1. Available from the American Iron and Steel Society, 186 Thorn Hill Road, Warrendale, PA 15086.

⁴ Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016.

⁵ Adhesives shall comply with 21 CFR 175 - Indirect Food Additives: Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

D3 The system may include the following optional components: valves, orifices, strainers, pressure gauges, and piping for control and convenience in operation.

D4 Stainless steel pipe, fittings, and valves shall be used downstream of the filter.

D5 Tubing, fittings, valves, and instrument connections, if used, downstream of the sanitary check valve, shall be of the sanitary type.

D6 Sanitary Tubing

D6.1 All metal sanitary tubing shall conform to the applicable provisions for welded sanitary product pipelines found in Section G of the 3-A Accepted Practice, Number 605- and with the 3-A Sanitary Standard, Number 33-.

D7 Sanitary Fittings

D7.1 All sanitary fittings, connections, and throttling valves, if used, shall conform to the applicable provisions of the 3-A Sanitary Standard, Number 53, Number 63, and Number 64-.

D8 Instrument Connections

D8.1 All sanitary instrument connections having product contact surfaces shall conform to the applicable provisions of the 3-A Sanitary Standard, Number 74-.

APPENDIX

E STAINLESS STEEL MATERIALS

E1 Stainless steel conforming to the applicable composition ranges established by AISI for wrought products or by ACI for cast products should be considered in compliance with the requirements of Section C1.1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08 %. The first reference cited in C1.1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM specifications⁶ A351/A351M, A743/A743M and A744/A744M.

E2 TABLE 1

WROUGHT PRODUCTS TYPICALLY USED			
UNS #	ASTM ⁶	AISI/SAE ³	Properties
S30300	A-582	303	Free-Machining S.S.; Austenitic
S30400	A-276 A-666	304	Austenitic S.S.
S30403	A-276 A-666	304L	Low Carbon Austenitic S.S.
S31600	A-276 A-666	316	Austenitic S.S. plus Mo*
S31603	A-276 A-666	316L	Low Carbon Austenitic S.S. plus Mo*

*Molybdenum

E3 TABLE 2

CAST PRODUCTS			
UNS #	ASTM ⁶	ACI ⁴	Common Names
J92500	A-351 A-743 A-744	CF-3	Cast 304L
J92800	A-351 A-743 A-744	CF-3M	Cast 316L
J92600	A-351 A-743 A-744	CF-8	Cast 304
J92900	A-351 A-743 A-744	CF-8M	Cast 316
J92180	A-747	CB7 Cu – 1	Cast 17-4 PH
J92110	A-747	CB7 Cu –2	Cast 15-5 PH
N26055	A-494	CY5Sn BiM	Alloy 88
J92701	A-743	CF-16F	Free Machining Austenitic S.S.

⁶ ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

E4 **TABLE 3 OPTIONAL METAL ALLOYS**

Optional metal alloys having the following compositions are examples considered in compliance with Section C herein. (Percentages are maximum unless range is given.)

	UNS N08367	UNS S21800	UNS S20161	UNS N26055	UNS N26455	UNS S17400	UNS S15500	UNS S32900	UNS R20500	UNS R50400
	ASTM A743 Grade CN- 3MN	ASTM A743 Grade CF-10 SMnN		ASTM A494 Grade CY5SnBiM	ASTM A494 Grade CW-2M	ASTM A747 Grade Nb 7Cu-1	ASTM A747 Grade Nb 7Cu-2		ASTM A560 Grade 50Cr- 50Ni	ASTM B67 Grade C-2
C	0.03	0.10	0.15	0.05	0.02	0.07	0.07	0.20	0.10	0.10
Mn	2.00	7.00-9.00	4.00-6.00	1.5	1.00	0.70	0.70	1.00	0.30	
Si	1.00	3.50-4.50	3.00-4.00	0.5	0.80	1.00	1.00	0.75	1.00	
P	0.040	0.040	0.040	0.03	0.03	0.035	0.035	0.040	0.02	
S	0.010	0.030	0.040	0.03	0.03	0.03	0.03	0.030	0.02	
Cr	20.0- 22.0	16.00- 18.00	15.0-18.0	11.0-14.0	15.0-17.5	15.5-17.5	14.0-15.50	23.0-28.0	48.0-52.0	
Ni	23.5- 25.5	8.00-9.00	4.00-6.00	Balance	Balance	3.60-4.60	3.50-5.50	2.50-5.00	Balance	
Mo	6.0-7.0			2.0-3.5	15.0-17.5			1.00-2.00		
Nb						0.15-0.35	0.15-0.35			
Cu	0.75					2.50-3.20	2.50-3.20			
N	0.18- 0.26	0.08-0.18	0.08-0.20			0.05	0.05		0.30	
Fe	Balance	Balance	Balance	2.00	2.00	Balance	Balance	Balance	1.00	0.30
Sn				3.0-5.0						
Bi				3.0-5.0						
W					1.0					
Ti									0.50	Balance
Al									0.25	
Other										H = 0.015 N = 0.03 O = 0.25

E5 Metal alloys or metals other than the above may be as corrosion resistant as 300 Series Stainless steel. This may be shown when metal alloys or metals are tested in accordance with ASTM G31 Laboratory Immersion Corrosion Testing of Metals and have a corrosion rate of less than 10.0 mil per year. The test parameters such as the type of chemical(s), their concentration(s), and temperature(s) should be representative of cleaning and sanitizing conditions used in equipment. Alloys containing lead, leachable copper, or other toxic metals should not be used.

F BOILER FEED WATER

- F1 Safe water or water supplies acceptable to the regulatory jurisdiction should be used for boiler feed water.

G BOILER OPERATION

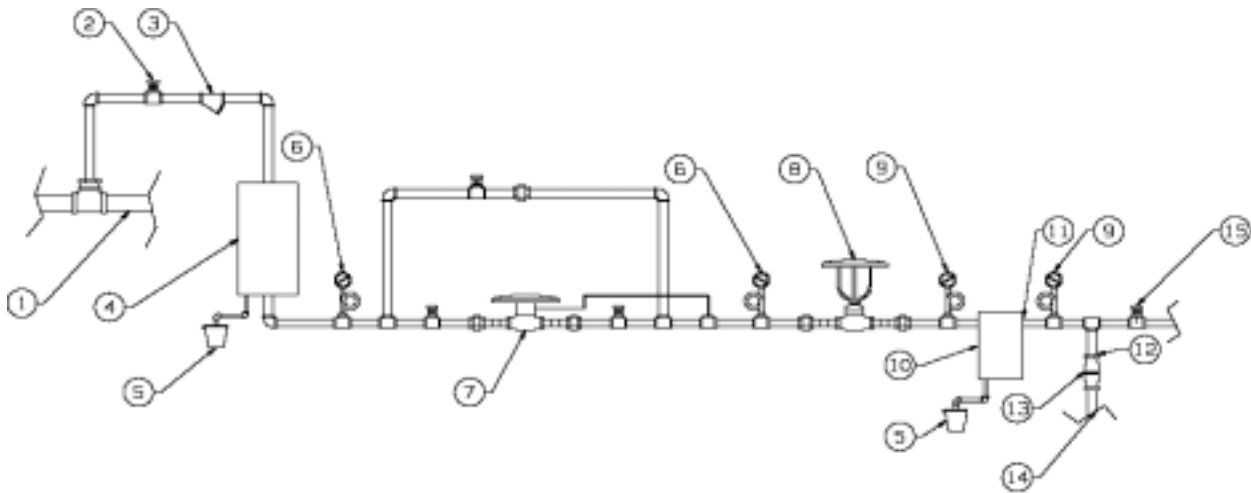
- G1 A supply of clean, dry steam is necessary for proper equipment operation; therefore, boilers and steam generation equipment should be operated in such a manner as to prevent foaming, priming, carry-over, and excessive entrainment of boiler water into the steam. Carry-over of boiler water additives can result in the production of off-flavors. Manufacturers' instructions regarding recommended water levels and blow-downs should be consulted and rigorously followed. The blow-down of the boiler should be carefully watched, so that over-concentration of the boiler water solids and foaming are avoided. It is recommended that periodic analysis be made of condensate samples. Such samples should be taken from the condensate outlet of the final steam separating equipment or the line between the final steam separating equipment and the point of the introduction into the process equipment.

- G2 Most boiler feed water must be treated to prevent corrosion and scale in boilers and to facilitate sludge removal for proper boiler care and operation. Boiler feed water treatment and control should be under the supervision of trained personnel or a firm specializing in industrial water conditioning. Such personnel should be informed that the steam is to be used for culinary purposes. Pretreatment of feed water for a boiler or steam generating system to reduce water hardness before entering the boiler or steam generator by ion exchange or by other acceptable procedures is preferable to addition of conditioning compounds to boiler water. The list of boiler water additives that may be safely used in the preparation of culinary steam will be found in the Code of Federal Regulations, Title 21, Chapter 1, Part 173, Subpart D, Section 173.310. Boiler compounds containing cyclohexylamine, diethylaminoethanol, hydrazine, morpholine, octadecylamine, trisodium nitrilotriacetate are not permitted. In addition, other compounds not allowed in the CFR reference cited above may not be used. Greater amounts of boiler water treatment compounds should not be used other than the minimum necessary for controlling boiler scale or other boiler water treatment purposes and no greater

amount of steam should be used than necessary. Tannin is also frequently added to boiler water to facilitate sludge removal during boiler blow-down. This product, although included in the list of approved boiler additives, has been reported to give rise to odor problems and for this reason should be used with caution.

H DIAGRAMS

- H1 The following diagram is intended to demonstrate general principles only, and is not intended to limit individual ingenuity. The design used should conform to the sanitary requirements set forth in this 3-A Accepted Practice.



PIPING ASSEMBLY FOR DIRECT STEAM INJECTION

- 1 STEAM MAIN
- 2 STOP VALVE
- 3 STRAINER
- 4* ENTRAINMENT SEPARATOR
- 5* CONDENSATE TRAP
- 6 PRESSURE GAUGE
- 7 STEAM PRESSURE REGULATING (REDUCING) VALVE
- 8 STEAM THROTTLING VALVE (AUTOMATIC OR MANUAL) OR ORIFICE
- 9* DIFFERENTIAL PRESSURE MEASURING DEVICE
- 10* FILTERING DEVICE
- 11* STAINLESS STEEL FROM THIS POINT
- 12* SANITARY PIPING AND FITTINGS FROM THIS POINT
- 13* SPRING-LOADED SANITARY CHECK VALVE
- 14* SANITARY PIPING TO PROCESS EQUIPMENT
- 15* SAMPLING MEANS

***REQUIRED EQUIPMENT**