Scientific Equipment & Furniture Association
Recommended Practices

SEFA 7-2010
Laboratory Fixtures

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SEFA SPELLS SAFE

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Foreword

SEFA Profile

The Scientific Equipment and Furniture Association (SEFA) is an international trade association comprised of manufacturers of laboratory furniture, casework, fume hoods and members of the design and installation professions. The Association was founded to promote this rapidly expanding industry and improve the quality, safety and timely completion of laboratory facilities in accordance with customer requirements.

SEFA Recommended Practices

SEFA and its committees are active in the development and promotion of Recommended Practices having domestic and international applications. Recommended Practices are developed by the association taking into account the work of other standard-writing organizations. Liaison is also maintained with government agencies in the development of their specifications.

SEFA's Recommended Practices are developed in and for the public interest. These practices are designed to promote a better understanding between designers, architects, manufacturers, purchasers, and end-users and to assist the purchaser in selecting and specifying the proper product to meet the user's particular needs. SEFA's Recommended Practices are periodically updated. The Recommended Practices are numbered to include an annual suffix which reflects the year that they were updated. SEFA encourages architects to specify these Recommended Practices as follows: "SEFA 7-2010".

SEFA Glossary of Terms

SEFA has developed a Glossary of Terms (SEFA 4-2010) for the purpose of promoting a greater understanding between designers, architects, manufacturers, purchasers and end users. The terms defined by SEFA are frequently used in contracts and other documents, which attempt to define the products to be furnished or the work involved. The Association has approved this Glossary in an effort to provide uniformity among those who use these terms. Where a specific Recommended Practice contains definitions which differ from those in the Glossary of Terms, then the definitions in the specific Recommended Practice should be used.

SEFA encourages all interested parties to submit additional terms or to suggest any changes to those terms already defined by the Association. The definitions should be used to help resolve any disputes that may arise or to incorporate the applicable terms in any contract or related documents.

SEFA Disclaimer

SEFA uses its best effort to promulgate Recommended Practices for the benefit of the public in light of available information and accepted industry practices. SEFA does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with SEFA Recommended Practices or that any tests conducted under its Recommended Practices will be non-hazardous or free from risk. SEFA encourages the use of third party independent testing where appropriate.

Note : ***Testing as described in this document must be performed and documented by a SEFA-approved third party testing facility. See Page 34 of the SEFA Desk Reference 5th Edition Version 2.0, or visit us at SEFALABS.COM for the most current list of SEFA-approved test labs.***

1.0 Scope

These Recommended Practices apply to (i) laboratory service fittings and fixtures, including faucets, valves and related products, and (ii) safety equipment, consisting of emergency eye washes, emergency showers and related products.

2.0 Purpose

SEFA has developed and made available these Recommended Practices as a guide for regulatory agencies, architects, engineers, consultants, specification writers, contractors, manufacturers and dealers of laboratory furniture, installers, facilities managers and users who specify, recommend for purchase, install and/or use laboratory service fittings and safety equipment. It is intended to provide the laboratory community with the most suitable products for dependable performance and safe sanitary installations. Specific construction features of the products covered by these Recommended Practices have not been considered.

3.0 References

"Plumbing Fixture Fittings", ASME A112.18.1-2005

"Standard Specification for Copper Alloys in Ingot Form", ASTM B30-04

"Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes", ASTM B124 / B124M-04

"Standard Specification for Seamless Brass Tube", ASTM B135-02

"Standard Specification for Seamless Red Brass Pipe, Standard Sizes", ASTM B43-98 (2004)

"Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines", ASTM B16 / B16M-05

"Standard Specification for Seamless Copper Water Tube", ASTM B88-03

"Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire", ASTM B211-03

"Standard Specification for Aluminum-Alloy Sand Castings", ASTM B26 / B26M-03

"Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium", ASTM B456-03

"Standard Specification for Qualitative Adhesion Testing of Metallic Coatings", ASTM B571-97 (2003)

"Standard Test Method for Chipping Resistance of Coatings", ASTM D3170-03

"Standard Test Method for Mandrel Bend Test of Attached Organic Coatings", ASTM D522-93a (2001)

"Standard Test Methods for Measuring Adhesion by Tape Test", ASTM D3359-02

"Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes", ASTM D1308-02

"Standard Guide for Testing Coating Powders and Powder Coatings", ASTM D3451-01

"Standard Specification for Polypropylene Injection and Extrusion Materials", ASTM D4101

"Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves", ANSI Z21.15-1997 / CGA 9.1-M97

"Performance Requirements for Atmospheric Type Vacuum Breakers", ASSE 1001-2002

"Performance Requirements for Laboratory Faucet Backflow Preventers", ASSE 1035-2002

Powder Coating – The Complete Finisher's Handbook, The Powder Coating Institute – 1999

"Uniform Plumbing Code", IAPMO/ANSI UPC 1-2003

4. 0 Definitions

Accessory - A component that can, at the discretion of the user, be readily added, removed, or replaced, and that, when removed, will not prevent the fitting from fulfilling its primary function. Includes outlet fittings such as serrated hose ends, aerators and aspirators.

Air Gap - The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture or other device and the mounting surface of the fitting.

Aerator - A type of outlet fitting that is designed to deliver a mixture of air and water. An aerator may incorporate an internal flow control to deliver water at a specific rate (usually specified in gallons or liters per minute).

Angle Pattern Valve - A valve that has its inlet port and outlet port at 90° to each other, with the operating stem at 180° to the inlet port.

Aspirator - A type of outlet fitting that, when water is passed through it, develops a vacuum through a side port. Also referred to as a "filter pump".

Atmospheric Vacuum Breaker - A device containing a float check, a check seat and an air inlet port. The flow of water into the body causes the float to close against the air inlet port. When the flow of water stops, the float falls and forms a check valve against back siphonage and at the same time opens the air inlet port to allow air to enter and relieve the vacuum.

Ball Valve - A type of valve used for controlling water or gases. The valve operates by means of a spherical "ball" that is positioned between two seals that are within a body housing and press against the ball to form a watertight or gastight seal. Rotation of the ball 90 degrees opens and closes the valve.

Celcon® - An acetyl copolymer.

Check Valve - A valve that permits flow in one direction only. The valve is designed to close automatically to retard or obstruct the flow in a reverse direction.

Cold Water - For test purposes, water at a temperature of 40°F to 70°F (5°C to 21°C)

Combination Fitting or Faucet - A supply fitting with more than one supply inlet delivering a mixture of hot and cold water through a single spout. May also be referred to as a "mixing faucet."

Critical Level - The level at which polluted water, entering through an outlet of the supply fitting, will flow back to the supply lines by gravity and/or any pressure below atmospheric in the supply line when the water control valve is wide or fully open.

Deck Mounted Fitting - A fitting that mounts on a horizontal surface.

Diaphragm or Bellows Valve - A type of valve that utilizes a diaphragm or bellows to separate the operating components of the valve (such as the valve stem and bonnet) from the areas through which the gas flows through the valve. The purpose of this type of valve is to prevent permeation of atmospheric impurities into the gas flowing through the valve. These valves are sometimes also referred to as "packless" valves.

Effective Waterway (Opening) - The minimum cross-sectional area at the point of water supply discharge, measured or expressed in terms of (i) the diameter of a circle, or (ii) if the opening is not circular, the diameter of a circle of equivalent cross-section area.

Fitting - A device designed to control and/or guide the flow of water, gases, vacuum or steam. Also referred to as a "service fitting".

Faucet - A device designed to control and/or guide the flow of water. A faucet generally incorporates some type of gooseneck or spout.

Fixture - In the plumbing industry, a fixture refers to a sink or receptacle that receives water or water-borne wastes and discharges into a drainage system. However, in the laboratory field, the term "fixture" has been used to describe a fitting or service fitting. Also referred to as a

"laboratory fixture", "service fixture" or "laboratory service fixture."

Flange - A type of mounting fitting generally used to hold a valve perpendicular to a wall or other vertical surface. May also be referred to as a "panel flange."

Flood Level Rim - The top edge of a receptor over which water would overflow.

Foot Operated Valve - A valve for water service that is operated by the user's foot. The valve may be either single or mixing and may be mounted on the floor, a ledge or a wall. Also referred to as a "pedal valve."

Front Loaded Remote Control Valve - A valve for use on a fume hood that is installed on the front face or post of the fume hood. The valve is usually designed so that the working components of the valve are accessible from the front exterior face of the hood. Also referred to as a "panel mounted remote control valve."

Fuel Gas - A gas that can be burned to supply heat. In laboratory applications, fuel gas generally refers to natural gas.

Gas - In laboratory applications, may refer to either fuel gas or to other substances in a gaseous state, such as nitrogen, helium, argon and oxygen. These latter gases may also be referred to as "special gases" or "cylinder gases."

Gas Purity - The purity of a gas is a function of the quantity of impurities present in a sample of the gas. A gas that is 99.999% pure has .001% impurities in it. A gas that is 99.998% pure has .002% impurities in it.

Gas purity may also be designated by a two digit code. The first digit of the code represents the "number of nines" in the percentage value designating the purity of the gas and the second digit indicates the last decimal digit, if it is smaller than "nine". For example, a gas that is 99.999% pure is referred to as being a "5.0" gas. A gas that is 99.998% pure is referred to as being a "4.8" gas.

Ground Key Cock - A type of valve used for controlling low pressure gases. The valve operates by means of a tapered cylindrical plug that fits into a matching tapered bore in the valve body. The tapered plug is ground and lapped and held in the valve body under continuous pressure to form a gastight seal in the valve body. Rotation of the tapered plug 90 degrees opens and closes the valve.

Gooseneck - A component of a faucet, usually fabricated of pipe or tubing and usually in the shape of the letter U, whose function is to direct the flow of water into a sink or receptor. Goosenecks may be of the rigid, swing or convertible rigid/swing type and may incorporate a vacuum breaker.

High Purity Gases - Any gas that has a level of purity or chemical composition that is certified as high purity by the gas manufacturer. For purposes of these Recommended Practices, high purity gases are gases with a certified purity level of 5.0 or greater (see definition of "gas purity" above).

Index Button - An indicator fitted into the top surface of the handle of a fitting that serves to identify the media or service being supplied by the fitting. For standards for color coding and symbols of services, refer to Section 6.

Manifold - A pipe or tube on which multiple fittings or outlets are mounted in parallel, relatively close together. On a typical manifold, one end is connected to a supply and the other end is plugged.

Manual Control - A type of valve mechanism wherein, once the valve is opened, the valve remains open until it is manually closed. Also referred to as "compression control."

May - When used, indicates an alternate requirement or option.

Mixing Valve, Faucet or Fitting - A valve or faucet designed to mix hot and cold water by means of automatic or manual regulation.

Mixing Valve, Single Control - A fitting with a single handle or control that shall serve to turn water on and off, and to change volume and temperature by means of a single handle.

Monel - An alloy of approximately 67% nickel, 28% copper and 5% other elements that is made by direct reduction from ore in which the constituent metals occur in these proportions.

Mounting Fitting - A fitting used to install or mount a valve on a horizontal or vertical surface. Examples of mounting fittings include turret bases, panel flanges and wye fittings.

Mounting Shank - A threaded length of pipe used for securing a fitting to a horizontal or vertical surface and to supply water, gas or other media to the fitting. The pipe should be machined with a taper pipe thread to connect to the fitting, a straight pipe thread for a locknut and either a straight or taper pipe thread to connect to the supply line. The mounting shank should be supplied by the manufacturer with a locknut and lockwasher. Also referred to as a "supply nipple" or "tank nipple."

Needle Valve - A type of valve in which an orifice is opened or closed by means of a needle or cone that is moved into or withdrawn from it.

Nipple - A short piece of pipe that is threaded at both ends.

Outlet Fitting - An accessory that is installed in the outlet end of a fitting.

Pedestal - See Turret Base.

Polyethylene (PE) - A plastic polymer of ethylene.

Polypropylene (PP) - Any of various thermoplastic plastics that are polymers of propylene.

Polyvinyl Chloride (PVC) - A water insoluble, thermoplastic material derived by the polymerization of vinyl chloride.

Polyvinylidene Flouride (PVDF) - A fluoropolymer that is chemically resistant to most acids, bases and organic solvents.

Potable Water - Water that is satisfactory for drinking, culinary, and domestic purposes, and meets the requirements of the health authority having jurisdiction.

Pressure Gauge - An instrument that measures and indicates the pressure of a liquid or gas.

Pressure Regulator - A device that regulates the pressure of a liquid or gas that is delivered through it.

Push/Turn Valve - A type of valve that has a handle that locks in the closed position and must be pushed down to permit the handle to rotate to open the valve. The internal construction of the valve shall incorporate rotating ceramic discs or other type of valve mechanism suitable for the intended use. Push/turn valves are generally used for natural and other burning gases.

Quick Connect - A fitting consisting of a body and a plug that interlock together to form a watertight or gastight connection. The body and plug may each have an internal valve to shut off the supply line when the two components are disconnected. The body and plug may also be keyed to form a matched set. Also referred to as a "quick disconnect."

Remote Control Valve - A type of valve for use in a fume hood, where the handle of the valve is located on the outside of the hood (generally on the front face or post of the hood or underneath the hood). A remote control valve is usually connected to an outlet fitting that is installed within the interior of the fume hood. A remote control valve can be either a rod-type valve or a front loaded valve (see definitions).

Renewable Unit - A cartridge or unit that contains all of the working components of a valve and can be removed from the fitting body and replaced without disturbing the fitting body. Also referred to as a "replaceable unit."

Rod-Type Remote Control Valve - A type of remote control valve where the valve is mounted within the side wall or underneath the fume hood. The valve is fitted with an extension rod that projects from the valve through the face of the hood or through the apron underneath the hood and a handle is mounted on the end of the rod.

Seat - The surface around or within an orifice in a faucet or valve through which water or gas flows and against which a closing member, such as a

disc or washer, is pressed or seated to terminate the flow. Also referred to as a "valve seat." A "renewable seat" is a seat that is separate from the valve body and can be removed and replaced, either with or without a tool.

Seat Disc - A disc or washer that, when compressed against a seat, provides a watertight or gastight seal. Also referred to as a "valve disc" or "bib washer".

Self-Closing Control - A type of valve mechanism that closes automatically when the handle is released.

Serrated Hose End - An outlet fitting that has graduated serrations that will accommodate hose or tubing. Also referred to as a "serrated nozzle" or "serrated tip."

Service - The supplying of utilities such as water, air, gas, vacuum and steam as required in a laboratory. "Service" or "media" also refers to the specific liquid or gas that is delivered by a particular fitting.

Service Fitting - Any device that controls and/or guides the flow of a service in a laboratory.

Shall - Where used, indicates a mandatory requirement.

Single Valve, Faucet or Fitting - When used with reference to a water fitting, a fitting that delivers either cold, hot or tempered water only, without the capability of mixing the water.

Significant Surface - An exposed surface that, if marred, would detract from the appearance of the fitting.

Standard Tools - Tools, such as a screwdriver, key wrench, flat jawed wrench, strap wrench and pliers, which are normally carried by plumbers for the installation and maintenance of plumbing.

Straight Pattern Valve - A valve that has its inlet port and outlet port at 180° to each other, with the operating stem at 90° to the inlet port.

Turret or Turret Base - A type of mounting fitting, usually cylindrical in shape, used to install one or more fittings on a horizontal or vertical surface. The fittings are held parallel to the surface on which the turret base is installed.

Vacuum Breaker - A device to prevent the creation or formation of a vacuum in a piping system by admitting air at atmospheric pressure. A vacuum breaker is used to prevent back siphonage. A vacuum breaker used on a laboratory faucet may be either an atmospheric vacuum breaker (as defined above) or a laboratory faucet vacuum breaker having two independent acting check valves.

Valve - A device or fitting by which flow may be started, stopped or regulated by a movable part that opens or obstructs one or more passages.

Water - The liquid that descends from the clouds as rain, forms streams, lakes and seas, and is a major constituent of all living matter and that is an odorless, tasteless, very slightly compressible liquid oxide of hydrogen which appears bluish in thick layers, freezes at 0 C and boils at 100 C, has a maximum density at 4 C and a high specific heat, is feebly ionized to hydrogen and hydroxyl ions, and is a poor conductor of electricity and a good solvent.

Wrist Blade Handle - A handle that permits the control of a faucet with the wrist or forearm.

Wye Fitting - A type of mounting fitting that is similar to a panel flange except with two outlets.

5.0 Materials and Finishes

5.1 Materials Used in Laboratory Fittings

All materials used in laboratory service fittings shall be of the highest quality, shall be suitable for the intended use and shall meet or exceed the applicable standards listed below:

Brass Castings. Red brass castings shall be made of commercial red brass alloy conforming to ASTM Specification B30-04, C/Metal alloy, having a nominal composition of 81% copper.

Brass Forgings. Brass forgings shall conform to ASTM Specification B124-74, Alloy No. 377, having a nominal composition of 59% copper.

Seamless Brass Tube. Seamless brass tubing shall conform to ASTM Specification B135-74, Alloy No. 280, having a nominal composition of 60% copper.

Seamless Red Brass Pipe. Seamless red brass pipe in standard sizes shall conform to ASTM Specification B43-74, having a nominal composition of 84 to 86% copper.

Free-Cutting Brass Rod, Bar & Shapes for Use in Screw Machines. Components fabricated of free-cutting brass rod, bar and shapes for use in screw machines shall conform to ASTM Specification B16-74, having a nominal composition of 60 to 63% copper.

Aluminum Castings. Aluminum castings shall conform to ASTM Specification B26-74, Alloy No. SG70A, having a chemical composition of 0.25% maximum copper, 0.6% maximum iron, 6.5% to 7.5% range silicon, 0.35% maximum manganese, 0.20% to 0.40% range magnesium, 0.35% maximum zinc, 0.25% maximum titanium, 0.15% maximum total other, and balance aluminum.

Aluminum Rod, Bar, Tube and Shapes. All components fabricated of aluminum rod, bar, tube, and shapes shall conform to ASTM Specification B211-74, Alloy No. 6061-T6, having a nominal composition of 1.0% magnesium, 0.6% silicon, 0.25% chromium, 0.25% copper, and balance aluminum.

Polypropylene. All components fabricated of polypropylene shall be non-pigmented and conform to ASTM Specification D4104.

5.2 Finishes for Laboratory Service Fixtures and Safety Equipment

5.2.1 Finish Types

The finish on laboratory service fittings and safety equipment shall be categorized as either a (i) chrome plated finish, or (ii) a corrosion resistant coated finish. Other types of finishes are not recommended for use in a laboratory environment.

5.2.2 Chrome Plated Finishes

5.2.2.1 Description of Chrome Plated Finishes

Chrome plated finishes shall consist of either (i) a layer of chromium applied over a layer of nickel applied over a layer of copper that is applied over all exposed surfaces of the components of the fitting itself, or (ii) a layer of chromium applied over a layer of nickel that is applied over all exposed surfaces of the components of the fitting itself. Chrome plated finishes shall be applied in conformance with "Standard Specifications for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium", ASTM B456-03. Finishes shall meet the requirements for Service Condition No. SC 4 (Very Severe Service) for nickel plus chromium coatings on copper or copper alloys.

5.2.2.2 Performance Tests for Chrome Plated Finishes

Chrome plated finishes shall meet the requirements for adhesion as specified in "Standard Practice for Qualitative Adhesion Testing of Metallic Coatings", ASTM B571-97. The applicable tests shall be the (i) burnishing test, (ii) chisel-knife test, (iii) file test, and (iv) peel test.

5.2.3 Corrosion Resistant Finishes

5.2.3.1 Description of Corrosion Resistant Finishes

Corrosion resistant finishes shall be an organic coated finish applied to all exposed surfaces of the fitting. The finish may be either colored or clear. Coating material shall be either epoxy, epoxy/polyester hybrid, or polyester. Corrosion resistant finish can be applied as either a wet finish or a dry, powder coated finish. In either case, following application of the coating material, the fitting shall be baked to cure the coating material. .

5.2.3.2 Performance Tests for Corrosion Resistant Finishes

Corrosion resistant finishes shall meet the following tests:

a. Fume Test.

Prepare samples of fittings having the corrosion resistant finish to be tested. Suspend samples in a container at least 6 cubic feet capacity, approximately 12" above open beakers, each containing 100 cc of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid, respectively. After exposure to the fumes from these reagents for 150 hours, the finish shall show no discoloration, disintegration or other effects.

b. Direct Application Test

Prepare samples of flat brass panels with the corrosion resistant finish to be tested. The test shall consist of direct application of the reagents listed below.

Test Method A — For volatile chemicals, chemical spot tests shall be made by placing a cotton ball saturated with the reagent on the surface to be tested and covering with an inverted two-ounce wide mouth bottle to retard evaporation.

Test Method B — For nonvolatile chemicals, chemical spot tests shall be made by applying five (5) drops of each reagent to the surface to be tested and covering with a 1 1/4" diameter watch glass (concave side down) to confine the reagent.

All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period and at a temperature of 77° F ±3° F. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, (i) the reagents shall be flushed from the surface with water, (ii) the surface shall be scrubbed with a soft bristle brush under running water, and (iii) the surface shall be rinsed and dried. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp towel and dried.

Note: Where concentrations are indicated, percentages are by weight

Test Evaluation: Evaluation of test results shall be based on the following rating system:

Test No.	Chemical Reagent	Test Method
1.	Acetate, Amyl	A
2.	Acetate, Ethyl	A
3.	Acetic Acid, 98%	B
4.	Acetone	A
5.	Acid Dichromate, 5%	B
6.	Alcohol, Butyl	A
7.	Alcohol, Ethyl	A
8.	Alcohol, Methyl	A
9.	Ammonium Hydroxide, 28%	B
10.	Benzene	A
11.	Carbon Tetrachloride	A
12.	Chloroform	A
13.	Chromic Acid, 60%	B
14.	Cresol	A
15.	Dichloracetic Acid	A
16.	Dimethylformamide	A
17.	Dioxane	A
18.	Ethyl Ether	A
19.	Formaldehyde, 37%	A
20.	Formic Acid, 90%	B
21.	Furfural	A
22.	Gasoline	A
23.	Hydrofluoric Acid, 37%	B
24.	Hydrofluoric Acid, 48%	B
25.	Hydrogen Peroxide, 30%	B
26.	Iodine, Tincture of	B
27.	Methyl Ethyl Ketone	A
28.	Methylene Chloride	A
29.	Monochlorobenzene	A
30.	Naphthalene	A
31.	Nitric Acid, 20%	B
32.	Nitric Acid, 30%	B
33.	Nitric Acid, 70%	B
34.	Phenol, 90%	A
35.	Phosphoric Acid, 85%	B
36.	Silver Nitrate, Saturated	B
37.	Sodium Hydroxide, 10%	B
38.	Sodium Hydroxide, 20%	B
39.	Sodium Hydroxide, 40%	B
40.	Sodium Hydroxide Flake	B
41.	Sodium Sulfide Saturated	B
42.	Sulfuric Acid, 33%	B
43.	Sulfuric Acid, 77%	B
44.	Sulfuric Acid 96%	B
45.	Sulfuric Acid, 77% & Nitric Acid, 70% equal parts	B
46.	Toluene	A
47.	Trichloroethylene	A
48.	Xylene	A
49.	Zinc Chloride, Saturated	B

Level 0 **No detectable change.**
Level 1 **Slight change in color or gloss.**
Level 2 **Slight surface etching or severe staining.**
Level 3 **Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.**

Acceptance Level: Results will vary from manufacturer to manufacturer. Corrosion resistant finishes should result in no more than four Level 3 conditions. Suitability for a given application is dependent upon the chemicals used in a given laboratory.

c. Adhesion Test

Corrosion resistant finishes shall meet the standards set forth in "Standard Test Methods for Measuring Adhesion by Tape Test", ASTM D3359-02, "Standard Test Method for Mandrel Bend Test of Attached Organic Coatings", ASTM D522-93a and "Standard Test Method for Chipping Resistance of Coatings", ASTM D3170-03.

6.0 Color Coding

The handle of each laboratory fitting (except pressure regulators) shall be marked to indicate the particular liquid or gas that is delivered by or through such fitting. The handle or the index button fastened to the handle shall be color coded, and the index button shall be marked with a symbol to designate the service. Letters used to designate the service or symbol shall be legible and easy to read. Symbols shall be in accordance with the list below:

No	Service	Color	Code	Color
1	**Cold Water**	**Dark Green**	**CW**	**White**
2	**Hot Water**	**Red**	**HW**	**White**
3	Steam	Black	STM	White
4	Air	Orange	Air	Black
5	Gas	Dark Blue	Gas	White
6	Vacuum	Yellow	Vac	Black
7	Distilled Water	White	DW	Black
8	Oxygen	Light Green	OXY	White
9	Hydrogen	Pink	H	Black
10	Nitrogen	Gray	N	Black
11	All Other Rare Gases	Light Blue	Chemical Symbol	Black

7.0 General Requirements for Laboratory Service Fittings

7.1 Workmanship

Laboratory service fixtures shall be of superior workmanship. Working parts shall be uniform and shall have smooth, even machining free of burrs, rough edges and ragged threads.

7.2 Handling

Fittings and components shall withstand normal handling and installation without damage or distortion of any part. Where special handling of a fitting is required, appropriate instructions shall either be attached to the fitting or packaged therewith.

7.3 Installation

7.3.1 Fitting Design

Fittings shall be designed to readily facilitate field installation, as follows:

a. All fittings shall be provided with suitable means to connect to a type of supply line in common use in laboratories.

b. The fitting manufacturer shall design its fittings or shall otherwise provide that fittings may be installed and connected without marring the finish or otherwise damaging the fitting or the surface on which it is to be mounted.

c. Deck mounted fittings shall be furnished with mounting shanks with sufficient length to be mounted on counter tops up to 1 1/2 inches thick. The diameter of the base of the fitting, flange or cover plate shall not be less than 1 1/2 inches.

Panel mounted combination hot and cold water faucets shall be furnished with union type inlets for ease of installation. The diameter of the flange or cover plate shall not be less than 1 1/2 inches.

e. Means shall be provided to securely mount the fitting to withstand loading normally encountered in service.

7.3.2 Field Installation

The installer responsible for the installation of laboratory service fittings shall follow good plumbing practice. Installers shall, in particular:

a. Thoroughly clean and flush supply lines prior to installing fittings, as pipe shavings, scale and other debris can be carried through a pipe and into a faucet or valve when the plumbing system is activated. Such foreign matter can damage valve components and interfere with the proper operation of the fitting.

b. Secure the fitting to a counter top or wall using the locknut and lock washer provided by the manufacturer. Tighten the locknut sufficiently to secure the fitting to the counter or wall, but care shall be taken not to over-tighten.

c. Observe the manufacturer's recommended test and working pressures for fittings. Testing or using a fitting at pressure for which it is not designed can result in leakage or failure.

d. Clean fittings using a soft cloth and soapy water. Use of abrasives, detergents or other cleaners can damage the finish on a fitting. Solvents shall not be used in or near a fitting, as solvents can dissolve lubricants used in the valve mechanism of a fitting.

7.4 Threads and Other Connections

7.4.1 Pipe Threads

a. Taper pipe threads on inlets and field assembled joints shall conform to ASME B1.20.1.

b. Threaded connections having IPS threads shall be tested with a torque wrench to apply torque load specified below without showing evidence of cracking or separation. Distortion or failure of any component part of the assembly shall constitute a failure of the assembly. Torque measurements shall be made with torque wrenches having a maximum allowable inaccuracy of 3% of the full scale reading.

Thread Assembling Torques:

Fitting Size (IPS)	Torque, Ft-Lb (N-m)
3/8	32 (43)
½	45 (61)
¾	65 (88)
1	95 (129)

7.4.2 Inlets for Sink Fittings

Shank lengths of deck mounted fittings shall be at least 1 ¾ inches (45 mm).

7.4.3 Solder Connections

The dimensions of solder joint end for connection to copper tube or copper tube fittings, except factory assembled parts, shall conform with respect to length and diameter of the joint section to the dimensions given in ASME B16.18 or ASME B16.22.

7.5 Marking

7.5.1 Product Marking

a. Each fitting shall bear permanent legible markings to identify the manufacturer. This marking shall be the trade name, trademark, or other mark known to identify the manufacturer or in the case of private labeling, the name of the customer or trademark for whom the fitting was manufactured. Such marking shall be located where it can be seen after installation. This marking shall be by means of either a permanent mark or a permanent label on the product.

b. Permanent labels shall comply with the performance requirements of UL 969. Labels shall comply with the requirements for indoor use where exposed to high humidity or occasional exposure to water, and shall have a temperature rating of at least 176 F (80 C).

7.5.2 Packaging

The package shall be marked with the manufacturer's name and model number, or in the case of private labeling, the name of the customer or trademark for whom the fitting was manufactured.

8.0 Water Faucets and Fittings

8.1 General Requirements

8.1.1 Working Pressures

All faucets and fittings for water service shall be designed to function at water working gauge pressures between 20 PSI (140 kPa) and 125 PSI (860 kPa), and for intermittent shock gauge pressures up to 180 PSI (1,240 kPa).

8.1.2 Working Temperatures

All faucets and fittings for water service shall be designed to function at supply temperatures from 40 F (4C) to 150 F (66 C) and shall withstand 180 F (82 C) for 0.5 hours without failure of the pressure envelope.

8.2 Valve Construction

a. All faucets and fittings for water service shall be designed to have either (i) a renewable unit or cartridge containing all working components subject to wear, or (ii) renewable working components, including seat, seat disc and seals. After installation of the faucet or fitting, all wearing parts shall be capable of being replaced and such replacement shall be able to be accomplished without removing the body from the piping or disconnecting the fitting from the supply pipe or surface on which it is installed.

b. Joints which may have to be taken apart to replace worn parts after the fitting is installed shall be designed so that they may be disassembled and reassembled without damaging or marring a significant surface of the fitting or a significant surface on which the fitting is installed.

c. The seat disc arrangement shall be made so that it will neither vibrate nor loosen in service and so that it can be replaced.

d. Packings shall be of such design and quality as to ensure leak-proof joints and be capable of providing satisfactory field service.

8.3 Goosenecks, Spouts and Outlet Fittings

8.3.1 General Construction

Goosenecks and spouts shall be one of the following types:

a. Rigid Construction. Goosenecks and spouts may be rigid (i.e. non-moveable) type. Rigid goosenecks shall thread directly into the faucet body and shall be constructed so as to be immobile in ordinary use. Rigid goosenecks are typically used at cup sink locations.

b. Swing Construction. Goosenecks and spouts may be swing or swivel type. Swing goosenecks and spouts shall be able to swivel around the faucet body. Swing goosenecks are typically used at laboratory sinks.

c. Rigid/Swing or Convertible Construction. Goosenecks and spouts may be rigid/swing or convertible construction. Goosenecks shall be capable of being either rigid or swing, and may be converted in the field from rigid to swing and vice versa.

8.3.2 Packings

Packings shall be of such design and quality as to ensure leak-proof joints and be capable of providing satisfactory field service.

Swing goosenecks and spouts designed to use an adjustable packing in the joint between the spout and the body shall be constructed so that the adjustments can be made without removing the gooseneck or spout.

8.3.3 Outlets

a. The outlet of all goosenecks and spouts shall have a 3/8 inch NPS or NPT female thread or be so designed as to accommodate an adapter with a 3/8 inch NPS or NPT female thread.

b. All outlet fittings and accessories, such as serrated hose ends, aerators and aspirators, shall have a 3/8 inch NPS or NPT male thread or be so designed as to accommodate an adapter with a 3/8 inch NPS or NPT male thread.

8.4 Testing

8.4.1 Strength Tests

8.4.1.1 Burst Strength Test

Fittings shall withstand a hydrostatic gauge pressure of 500 PSI (3,445 kPa) for two (2) minutes. The pressure shall be applied (i) for one (1) minute to the inlet with the valve(s) closed, and (ii) for one (1) minute to the inlet with the outlet blocked and the valve open. The fitting shall not show any permanent distortion or failure of the pressure envelope.

8.4.1.2 Bending Loads on Fittings

No cross section of a rigid waterway on the pressure side of a faucet or fitting shall be damaged when tested in accordance with the following test. A force shall be applied not closer to the cross-section being tested than twice the major diameter of that section. The bending moment shall be as specified below. This requirement shall not apply to waterways through a solder joint or equivalent.
Bending Loads on Fittings:

Nominal Size (In)	Bending Moment, Ft-Lb (N-m)
3/8	30 (40)
½	44 (60)
¾	60 (80)
1	74 (100)

8.4.1.3 Spout Strength Test

Goosenecks and spouts shall withstand a minimum bending moment of 175 in.-lbf (19.7 N-m) at the centerline of the joint between the gooseneck or spout and the body.

The faucet shall be mounted in accordance with the manufacturer's instructions. The angle of the gooseneck or spout outlet shall be measured from the vertical. Sufficient weight shall be applied to the centerline of the spout outlet to generate a 175 in.-lbf (19.7 N-m) bending moment at the centerline of the spout/body joint for three (3) minutes. One-half (.5) hours after the weight has been removed, the spout outlet angle shall be measured. The faucet shall have failed the test if the angle shall have changed from the angle measured prior to loading.

8.4.2 Handle Security Test

a. The faucet or fitting handle shall be designed so that it fits securely to the valve stem of the fitting, with no lateral movement or play, and it will not be damaged by normal use of the fitting to which it is attached. Except for faucets or fittings that are intended to be vandal-resistant (see below), the faucet or fitting handle shall be secured in such a manner that it can be removed in service using standard tools.

b. The handle shall be tested by loading an applied torque or force in the same manner required to close the valve to an amount of (i) 45 in.-lb (5.1 N-m) for rotary motion (torque), and (ii) 45 lbs (200.25 N) for linear normal motion (force). Failure shall be consist of damage or fracture of the handle or valve stem (including damage or stripping of the splines or broach in the handle).

c. The handle shall not fracture or pull off under an axial static load of 150 lbf (667 N).

8.4.3 Valve Operating Test

When closed, valves shall not leak at any test gauge pressure between 20 PSI (140 kPa) and 200 PSI (1,400 kPa) applied to the inlet for 5 minutes. The torque or force required to open or close a manually activated valve shall not exceed (i) 15 in-lb (1.7 N-m) for rotary motion (torque), or (ii) 15 lb (66.75 N) for linear normal motion (force). The force shall be applied at the extreme end of the handle. This test shall not apply to self-closing valves or nonmetallic fittings intended for use with purified water (see below).

8.4.4 Life Tests

8.4.4.1 Life Test for Valves

a. Valves shall be subjected to a life test for 500,000 cycles of operation. After completion of the life test, the valve shall control the flow of water at test pressure with an application of force or torque to the lever or handle not to exceed 50% more than the valve force or torque specified in Section 8.2.3 above.

b. The test procedure for valves shall be as follows:

1. The cold water supply shall be at ambient temperature and the hot water supply at 140 F +/- 10 F (60 C +/- 5 C). Both supplies shall be at the same flowing gauge pressure of 50 +/- 5 PSI (350 +/- 35 kPa). Manually operated fittings shall be operated from full off to three-eighths of a turn open, but not to exceed three-fourths of the maximum amount of turning from fully closed to fully open, and back to full off (one cycle) at the rate of 1,500 cycles per hour (minimum). The test apparatus shall apply sufficient load to close the valve throughout the test, but shall in no case exceed 50% greater than the load specified in Section 8.2.3 above.

2. Single control mixing valves shall be cycled alternately from off to full hot and back for 30 cycles, and from off to full cold and back for 30 cycles.

8.4.4.2 Life Test for Goosenecks and Spouts

a. Swing goosenecks and spouts shall be subjected to a life test for 50,000 cycles of operation. The swing gooseneck or spout shall (i) hold a hydrostatic gauge pressure of 125 PSI (860 kPa) for 1 minute after 25,000 cycles with the original seal in place; and (ii) hold a hydrostatic gauge pressure of 125 PSI (860 kPa) for 1 minute after 50,000 cycles. The seal may be replaced to pass once during this test.

b. The test procedure for swing goosenecks and spouts shall be as follows. The fitting shall be mounted on the life test apparatus with the axis about which the spout turns in line with the axis of the drive spindle. The forked end of the drive adapter shall be fitted loosely over the spout; the drive adapter shall be free to move vertically and shall be so weighed that a bending torque of 5 in.-lbf (0.6 N-m) shall be applied at the base of the spout; the apparatus shall be adjusted to turn the spout through a 90 degree arc, 45 degrees to each side of center. The turning mechanism shall be loaded to apply a static torque of 24 in.-lbf (2.7 N-m) to the centerline of the base of the spout. Cycle speed shall be 1,500 cycles per hour, and hot and cold water alternated every 6,000 cycles. Hot and cold water temperatures and pressures are to be as in the valve test.

8.4.5 High Temperature Extreme Test

Faucets and fittings designed for water service shall withstand a water temperature of 180 F (82 C) for 1 hour without failure of the pressure envelope. The fitting shall be connected to a hot water supply of 180 F (82 C). The cold water inlet shall be blocked. A shutoff valve shall be connected to the outlet and the hot water bled through it to maintain 180 F +/- 5F (82 C +/-3 C) within the fitting for 1 hour at a gauge pressure of 125 PSI (860 kPa). The fitting shall be considered to have failed if it leaks after the test when a gauge pressure of 125 PSI (860 kPa) is applied with the valve in a closed position.

8.4.6 Intermittent Shock Test

a. Faucets and fittings designed for water service shall withstand an intermittent shock gauge pressure to 180 PSI (1,240 kPa) from a simulated apparatus connected to the spout outlet as described below.

b. Water supply to the hot side of the fitting shall be at 140 F +/- 10 F (60 C +/- 5 C) such that the flow gauge pressure is 125 PSI at 2.0 +/-.

c. .24 GPM (860 kPa at 7.6 +/- .95 L/min) with the fitting in the full hot position. The cold side inlet shall be at a gauge pressure of 125 PSI (860 kPa) static and at ambient cold water temperature. A simulated apparatus such as rapid closing solenoid valve shall be connected downstream of the spout so as to create a shock gauge pressure of 180 PSI (1,240 kPa). The solenoid valve shall be cycled at a rate of two seconds open, two seconds closed for a duration of 30,000 cycles.

d. Any leakage shall be cause for rejection under the following conditions: (i) at the end of the test, examine the pressure envelope while still at test pressure; (ii) turn off the valve(s), disconnect the simulated appliance from the spout outlet, and examine with pressure still applied to the inlet.

9.0 Fittings for Natural Gas, Air, Vacuum, Special Gases and Steam Services

9.1 Valve Types, Applications, etc.

9.1.1 Ground Key Cock Valves

Due to the widespread use and acceptance of laboratory ball valves, ground key cock valves are no longer recommended for use in science laboratories.

9.1.2 Laboratory Ball Valves

a. Laboratory ball valves may be used for natural gas, air, vacuum and special gas services. In addition, laboratory ball valves may be used for water service. Where used for oxygen or high purity gases, valves shall be specially cleaned, lubricated and packed. Ball valves provide on/off control of the service, with a limited degree of metering or control of the service.

b. Ball valves operate by means of a spherical "ball" that is positioned between two seals that are within a body housing and press against the ball to form a watertight or gastight seal. Rotation of the ball 90 degrees opens and closes the valve. Valves have either a lever-type handle or a handle that locks in the closed position and must be lifted to open the valve. In either case, the valve handle shall visually indicate whether the valve is open or closed.

c. Ball valves shall be designed for a working pressure of at least 75 PSI.

9.1.3 Needle Valves

Needle valves may be used for control of all laboratory gases. Where used for oxygen and high purity gases, valves shall be specially cleaned, lubricated and packed. Needle valves shall not be used for water or steam services. Needle valves provide good metering of the service.

a. Needle valves shall have needle point internal construction and a replaceable seat.

b. Needle valves shall have a rated working pressure of at least 145 PSI.

9.1.4 Steam Valves

a. Valves for steam service shall be similar in construction to needle valves, except that valves shall have a renewable valve disc and replaceable seat.

b. Steam valves shall have a rated working pressure of at least 15 PSI steam pressure at 260° F maximum.

9.2 Valves for Burning Gases

9.2.1 Valve Construction

Valves for use with burning gases shall be ground key cock valves, ball valves, needle valves, push/turn valves or other valve type specifically designed for use with burning gas.

9.2.2 Certification

Valves for burning gas shall be certified to comply with ANSI Z21.15/Canadian Gas Association Standard CGA 9.1, "Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves."

9.3 Mounting Fittings

Valves for laboratory gases shall be pipe mounted or installed on a horizontal or vertical surface using a mounting fitting. Such fitting may be a turret base, panel flange, wye fitting, etc. Where required, the manufacturer shall furnish a mounting shank with a locknut and lock washer for installation. Unless field installation conditions dictate otherwise, the fitting manufacturer shall install the valve into the mounting fitting and the mounting shank into the mounting fitting, and shall test the assembly as a single, complete unit prior to shipment.

9.4 Valves and Pressure Regulators for High Purity Gases

9.4.1 General

a. Valves and pressure regulators for use on high purity gas distribution systems shall be specially designed and manufactured for such use.

b. Valves and pressure regulators shall not contain any components manufactured from materials that will off-gas contaminants into the high purity gas stream.

c. Where a pressure regulator is installed, there shall be an internal filter, located either inside the pressure regulator or upstream of the pressure regulator, to prevent particles from contacting the seat.

d. All interior surfaces of the valve or pressure regulator that will be in contact with the high purity gas stream shall be ultrasonically cleaned using cleaning agents that will not negatively affect the purity or the gas.

e. Valves and pressure regulators shall be protected during transport and storage against damage and against contamination from particles, moisture, solvents and other foreign matter that could negatively affect the purity of the gas.

9.4.2 Valves and Pressure Regulators for 5.0 Gases

a. Pressure regulators for use with 5.0 gases shall have a metal diaphragm or bellows internal construction.

b. Valves and pressure regulators shall have a maximum leak rate through the valve or regulator of (i) less than 1 x 10-5 standard cubic centimetres per minute (SCCM) of helium with an outboard leakage test, and (ii) less than 1 x 10-5 SCCM of helium with an inboard leakage test. The manufacturer of the valve and pressure regulator shall certify the above leak rates.

9.4.3 Valves and Pressure Regulators for 6.0 Gases

Valves and pressure regulators for use with 6.0 gases shall have a metal diaphragm or bellows internal construction. Ball valves, gate valves and other types of valves that have valve stem packings are not suitable for use with 6.0 gases. Valves and pressure regulators shall have a maximum leak rate through the valve or regulator of (i) less than 1 x 10-6 standard cubic centimetres per minute (SCCM) of helium with an outboard leakage test, and (ii) less than 1 x 10-7 SCCM of helium to the atmosphere with an inboard leakage test. The manufacturer of the valve and pressure regulator shall certify the above leak rates.

10.0 Valves and Outlets for Use in Fume Hoods

Fittings for use in fume hoods consist of two primary components: (i) a remote control valve installed outside of the interior fume hood working area or chamber, and (ii) an outlet fitting installed within the fume hood chamber. The valve is controlled by a handle located outside of the fume hood chamber. The outlet fitting is connected to the valve (either directly or by a supply line from the valve), and the service or media is delivered through the outlet fitting within the fume hood chamber.

10.1 Valve Types

Remote control valves for use in fume hoods may be either rod-type or panel mounted, as follows:

10.1.1 Rod-Type Valves

Rod-type valves are installed either within the side wall or underneath the horizontal work surface of the fume hood. Valves may be either straight or angle pattern. Valves are fitted with an extension rod connected to the valve stem that projects through the front face or apron of the fume hood, and a handle is installed on the exposed end of the rod.

10.1.2 Panel Mounted Valves

Panel mounted valves are installed on either the side wall or front apron of the hood. The valve body is mounted on the panel using a locking ring or other locking mechanism. The valve is mounted so that all of the working components of the valve are accessible from the front exterior face of the hood, without accessing the internal side wall of the hood or disturbing the plumbing connections to the valve. Panel mounted valves offer two advantages over rod-type valves:

(i) All of the working components of a panel mounted valve are accessible from the front exterior face of the fume hood. Maintenance of the valve is facilitated, since the fume hood does not have to be entered or disassembled to gain access to the working components of the valve.

(ii) The extension rod used on rod-type valves may tend to twist as the valve is opened and closed. By eliminating the extension rod, panel mounted valves offer the user more precise control of the valve and thus a better ability to meter the flow through the valve.

10.2 Valve Construction

Valves for fume hood use shall have the construction set forth below:

a. Valves for water shall be similar in construction and performance to those described in Section 8 above.

b. Valves for non-burning laboratory gases shall be either ball or needle type and shall have the construction and performance described in Section 9 above.

c. Valves for burning gases shall be either ball type, needle type or push/turn type and shall have the construction and performance described in Section 9 above.

d. Valves for steam shall have the construction and performance described in Section 9 above.

10.3 Outlet Fittings

10.3.1 General Construction

Outlet fittings convey the media from the remote control valve to the interior of the fume hood chamber. They are generally mounted to the side wall or work surface of the fume hood utilizing a mounting shank with locknut and washer. Outlet fittings are available in a variety of configurations including turrets, flanges and goosenecks.

10.3.2 Corrosion Resistance

The outlet fitting installed inside the fume hood chamber will be exposed to the fumes that are generated within the hood. Accordingly, these fittings should be resistant to corrosion, either by (i) utilizing a corrosion resistant material for the outlet fitting that is suitable for the intended application, or (ii) supplying the fitting with a corrosion resistant finish in accordance with Section 5.2.3 above

10.3.3 Color Coding

The outlet fitting should be color-coded to designate the service or media delivered through the fitting. Identification can be accomplished a (i) color coding the corrosion resistant coating to match the service index color, or (ii) providing a color-coded index ring or plate. The color-coding shall match the corresponding remote control valve handle or index.

10.4 Vacuum Breakers for Use on Fume Hoods

Valves and outlet fittings for potable water service shall be equipped with vacuum breakers to prevent backflow or back-siphonage into the potable water system. Vacuum breakers shall meet the provisions of Section below. Vacuum breakers shall be installed (i) in accordance with the manufacturer's instructions and applicable plumbing codes, and (ii) in a location where they are accessible for maintenance.

10.5 Installation

Unless field conditions otherwise require, remote control valves and outlet fittings shall be installed, plumbed and pressure tested prior to shipment of the fume hood from the manufacturer's factory.

11.0 Faucets for Purified Water

11.1 General

Many laboratory processes and procedures require the availability and use of purified water. Purified water is domestic water that has been treated to reduce the concentration of impurities in it. Impurities may take the form of organic or inorganic substances, live bacteria and/or dissolved gases. Purity requirements vary depending upon the final use of the water.

However, purified water may be categorized as follows:

Laboratory Grade: water from which one or more categories of contaminants have been removed.

Reagent Grade: water from which all categories of contaminants have been removed, with sub-classifications Type IV through Type I indicating increasing quality.

Water purity is further measured in terms of resistance to electrical current. A value of 18.3 megohms-centimeter at 25 degrees C is the maximum achievable value of electrical resistivity.

Several processes to purify water are commonly used, including distillation, reverse osmosis (RO) and deionization (DI). The choice of process depends on a wide variety of factors, including the type of experimentation or research to be done in the laboratory, the type of purified water required, whether the purified water system is centralized or decentralized, and cost.

11.2 Fitting Materials and Construction

It is generally accepted that the system for treating and distributing purified water is more important to the purity of the delivered water than are the faucets or other fittings installed at the termination points of the system. However, in determining the most suitable type of fitting for dispensing purified water, care should be taken in the selection of the material and construction of the fitting. The materials and construction of fittings for purified water vary widely in the marketplace but, in general, may be divided into three categories:

a. Metallic Fittings. Faucets and fittings may have metallic construction. As such, all metal components that have contact with the purified water (such as the fitting body, gooseneck or spout and internal operating components) shall be (i) brass with an interior lining of an inert metal (such as tin), or (ii) stainless steel. All nonmetallic components (such as valve discs, seals, etc.) shall be compatible with the purified water delivered by the fitting. Metallic fittings shall have the construction and performance set forth in Section 8 above.

b. Nonmetallic Fittings. Faucets and fittings may have nonmetallic construction. As such, all nonmetallic components that have contact with the purified water (such as the fitting body, gooseneck or spout and internal operating components) shall be constructed of an inert plastic, such as PVC, non-pigmented polypropylene, polyvinylidene fluoride (PVDF) or polyethylene. All other components shall be compatible with the purified water delivered by the fitting.

c. Fittings with a Metallic Exterior and Nonmetallic Interior. Faucets and fittings may have an exterior metallic casing with an interior lining of inert plastic. All components that have contact with the purified water shall be nonmetallic and shall be compatible with the purified water delivered by the fitting.

Fittings and faucets may be supplied with manual (compression) control, self-closing control or combination manual/self-closing control. Faucets may be supplied incorporating a method of recirculating the pure water through the interior of the faucet. The recirculation shall permit the water to circulate completely to the valve mechanism, thus effectively removing any "dead leg"

12.0 Backflow Prevention

12.1 General

All laboratory fittings that deliver potable water shall be equipped with a backflow prevention device. Such device shall be either (i) an atmospheric vacuum breaker, or (ii) a laboratory faucet vacuum breaker. Atmospheric vacuum breakers shall be certified to comply with ANSI/ ASSE Standard 1001, "Pipe Applied Atmospheric Type Vacuum Breakers." Laboratory faucet vacuum breakers shall be certified to comply with ANSI/ ASSE Standard 1035, "Laboratory Faucet Vacuum Breakers."

13.0 Fittings for ADA Compliance

Pursuant to the requirements of Section 309.4 of ANSI/ICC A117.1, where a faucet or fitting will be used in an application that is intended to be ADA compliant, the maximum force required to open or close a manually activated fitting shall not exceed 5 lb. (22 N) at 80 PSI (550 kPa) static pressure.

14.0 Vandal-Resistant Fittings

Laboratory fittings are frequently installed in facilities such as high schools, junior colleges and other public facilities where they might be subject to vandalism and physical abuse. In such facilities, consideration should be given to installing service fixtures and fittings that are vandal-resistant. Vandal-resistant service fixtures shall be designed to meet the following criteria:

14.1 Resistance to Physical Abuse

Each fitting shall, so far as possible, resist turning, bending, breakage and unintended disassembly through acts of vandalism or physical abuse. Construction features shall include:

a. All threaded connections that will not require field service (including the connection between a valve and mounting fitting, and between a mounting fitting and mounting shank) shall be secured with a suitable adhesive so as to be non-removable.

b. Goosenecks and spouts shall be constructed of heavy duty pipe or tubing that is sufficient to resist bending and breakage.

c. Faucet bodies, turret bases and other mounting fittings shall be provided with locking pins or other means to prevent the fixture from being turned on the work surface, panel or wall surface.

d. Outlet fittings (such as serrated hose ends and aerators) shall either be of vandal-resistant design or shall be secured in place with an adhesive.

e. Index buttons shall be tamperproof.

14.2 Protection of Supply Lines

Each fitting shall be designed to protect against contaminants from entering the service lines by means of backflow, back-siphonage, or acts of vandalism. Accordingly, water fittings shall be furnished with vacuum breakers to prevent contamination of the potable water system through backflow or back-siphonage. Valves for laboratory gases shall be furnished with internal check valves to prevent backflow through the valve.

14.3 Maintenance

Vandal-resistant fixtures shall be designed to provide maintenance personnel with access to internal components for service requirements. Construction features shall include, but are not limited to:

Valve packing nuts shall be secured with set screws.

Vacuum breaker covers shall be secured with vandal-resistant screws that may be removed only by maintenance personnel.

15.0 Electrical Fittings

Electrical pedestal boxes may be provided on laboratory work surfaces for the installation of power and data devices and outlets. Electric pedestal boxes shall have a cast aluminum housing and shall be supplied with a mounting shank and locknut for installation on the countertop or work surface. Pedestal boxes shall have a satin (brushed) finish, polished finish or shall have a corrosion resistant coating in conformance with Section 5.2.3 above. Pedestal boxes shall be certified to comply with the provisions of ANSI/UL 514A, "Standard for Metallic Outlet Boxes."

16.0 Emergency Eye Wash and Shower Equipment

16.1 General Requirements

Emergency eye wash and shower equipment

installed in laboratory facilities shall comply with the provisions of ANSI Z358.1, "Emergency Eye Wash and shower Equipment."

16.2 Materials and Finishes

Where emergency eye wash and shower equipment is installed within the workspace of a laboratory room, the metal components used in the equipment shall be (i) brass, with either a chrome plated or corrosion resistant finish, (ii) stainless steel, or (iii) galvanized steel with a corrosion resistant finish. Where emergency equipment is installed on or immediately adjacent to a laboratory work surface or countertop, the metal components used in the equipment shall be (i) brass, with either a chrome plated or corrosion resistant finish, or (ii) stainless steel. Chrome plated and corrosion resistant finishes shall conform to the provisions of Section 5 above.

Appendix

Protection of Potable Water Systems

In recent years, there has been a great deal of concern and discussion regarding the effects of contamination of drinking water on human health. As a result of these concerns, the American National Standards Institute (ANSI) and NSF International have adopted ANSI/NSF International Standard 61, Section 9, "Drinking Water System Components – Health Effects." This standard was promulgated to establish minimum requirements for the control of potential adverse human health effects from products which contact drinking water. This standard covers mechanical plumbing devices, components and materials that are typically installed at the endpoint of a water distribution system and are intended by the manufacturer to dispense water for human ingestion. In order to comply with this standard, many manufacturers of plumbing products have changed the materials used in their products, including reducing or removing lead from the brass alloys used for their products.

As noted above, ANSI/NSF 61, Section 9 applies only to products that are intended to dispense water for human consumption. The standard specifically exempts "all commercial, industrial, and institutional devices that are not (otherwise) included, including …laboratory fittings." (emphasis added) This standard thus specifically exempts laboratory faucets and fittings.

It is the position of SEFA that laboratory fittings are not designed, manufactured, sold or installed for the purpose of delivering water for human ingestion. SEFA endorses the position of ANSI and NSF International that the provisions of ANSI/NSF 61 do not apply to laboratory faucets and fittings. Moreover, ingesting water in a laboratory raises serious safety issues beyond exposure to the contaminants that might be found in drinking water, regardless of their origin. Safe laboratory work practices should always prohibit laboratory users from eating or drinking in a laboratory work environment.