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NSF International Standard/  
American National Standard  
For Food Equipment

## **Supplemental flooring**

Standard Developer

**NSF International**

**NSF International**

**Designated as an ANSI Standard**

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## **Foreword<sup>2</sup>**

NSF/ANSI 52 establishes minimum sanitation and food safety requirements for the materials, design, and manufacture of supplemental flooring intended for use in food preparation, dry storage, and warewashing areas.

## **Issue 7**

This revision updated normative references in section 2.

This Standard was developed by the NSF Joint Committee on Food Equipment using the consensus process described by the American National Standards Institute.

Suggestions for improvement of this Standard are welcome. This Standard is maintained on a Continuous Maintenance schedule and can be opened for comment at any time. Comments should be sent to Chair, Joint Committee on Food Equipment at [standards@nsf.org](mailto:standards@nsf.org) or, c/o NSF International, Standards Department, P.O. Box 130140, Ann Arbor, Michigan 48113-0140, USA.

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<sup>2</sup> The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

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# NSF/ANSI Standard for Food Equipment

## Supplemental Flooring

### 1 General

#### 1.1 Purpose

This Standard establishes minimum public health and sanitation requirements for supplemental flooring. Included are requirements for cleanability and durability, and resistance to the use environment, microbiological growth, and vermin.

#### 1.2 Scope

Supplemental flooring covered by this Standard includes, but is not limited to, supplemental flooring for use in food preparation, dry storage, and warewashing areas.

Flooring components and materials covered under other NSF or NSF/ANSI Standards or Criteria shall also comply with the requirements therein. This Standard is not intended to restrict new supplemental flooring design, provided that such design meets the minimum specifications described herein.

#### 1.3 Alternate materials, design, and construction

While specific materials, design, and construction may be stipulated in this Standard, flooring that incorporates alternate materials, design, or construction may be acceptable when such flooring meets intent of the applicable requirements herein.

#### 1.4 Measurement

Decimal and SI conversions provided parenthetically shall be considered equivalent. Metric conversions and significant figure rounding have been made according to IEEE/ASTM SI 10.

### 2 Normative references

The following documents contain provisions that, through reference, constitute provisions of this NSF/ANSI Standard. At the time this Standard was balloted, the editions listed below were valid. All documents are subject to revision, and parties are encouraged to investigate the possibility of applying the recent editions of the documents indicated below. The most recent published edition of the document shall be used for undated references.

ASTM D256 2010. *Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics*<sup>3</sup>

ASTM D412-15. *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension*<sup>3</sup>

ASTM D624-00 (2012). *Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers*<sup>3</sup>

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<sup>3</sup> ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 <www.astm.org>.

ASTM D638-14. *Standard Test Method for Tensile Properties of Plastics*<sup>3</sup>

ASTM D792-13. *Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement*<sup>3</sup>

ASTM G21-2015. *Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi*<sup>3</sup>

IEEE/ASTM SI 10 – 2010. *American National Standard for Metric Practice*<sup>3</sup>

NSF/ANSI 2. *Food equipment*

NSF/ANSI 170. *Glossary of food equipment terminology*

### **3 Definitions**

Terms used in this Standard that have special technical meaning are defined in NSF/ANSI 170.

### **4 Materials**

#### **4.1 General**

Materials shall meet the following requirements and use environment conditions.

#### **4.2 Resistance to microorganisms**

Supplemental flooring materials shall be resistant to microbial action and shall not contribute to or support survival or growth of microorganisms when tested in accordance with 6.1.

#### **4.3 Resistance to environment**

Materials shall be resistant to deterioration when tested in accordance with 6.2 and 6.3.

##### **4.3.1 Absorption/adsorption**

Supplemental flooring shall not absorb or adsorb water or oil when tested in accordance with 6.2.

##### **4.3.2 Temperature resistance**

Supplemental flooring shall not be detrimentally unstable at use and cleaning temperature ranges when tested in accordance with 6.3.

#### **4.4 Tensile strength**

Supplemental flooring shall meet the appropriate performance test requirements of 6.4 for tensile strength and tear resistance.

#### **4.5 Specific gravity**

Supplemental flooring shall meet the appropriate performance test requirements of 6.5 for specific gravity.

## 5 Design and construction

### 5.1 General

Supplemental flooring shall be designed and manufactured to prevent the harborage of vermin and the accumulation of dust, dirt, splash, or spillage, and to facilitate maintenance, service, and cleaning. Supplemental flooring shall be designed and manufactured so as not to buckle, curl, or warp during use or following cleaning performed in accordance with the manufacturer's recommendations.

### 5.2 Cleanability

Supplemental flooring shall be easily cleanable in the use position or when removed. Single pieces or interlocking parts shall be readily removable and shall not exceed 40 lb (18 kg) in weight. Flooring shall not exceed 25 ft<sup>2</sup> (2.3 m<sup>2</sup>) in overall area, unless it can be rolled and easily carried by one person.

### 5.3 Self-draining

Supplemental flooring shall be designed and manufactured to be self-draining through and beneath. The walking surface shall be designed and manufactured to prevent the accumulation of liquids.

### 5.4 Manufacturer's instructions

The manufacturer shall provide detailed guidelines for intended end uses and instructions for installation, cleaning, and maintenance with each order and shipment. The manufacturer's cleaning instructions shall not stipulate the use of spray-type warewashing machines, or warewashing or vegetable preparation sinks, as acceptable cleaning methods.

## 6 Performance

### 6.1 Resistance to microorganisms

#### 6.1.1 Performance requirement

Supplemental flooring materials shall be resistant to microbial action and shall not contribute to or support survival or growth of microorganisms when tested in accordance with ASTM G21<sup>3</sup>.

#### 6.1.2 Test method

ASTM G21<sup>3</sup> shall be used with the following modifications:

- Test material samples shall be 1 in (25 mm). Each sample type shall be tested with each organism.
- *Bacillus subtilis* ATCC 27328<sup>4</sup> and *Aspergillus niger* ATCC 9642<sup>4</sup> will be used to detect the possibility of growth.
- Incubation shall be at 20 to 30 °C (82 to 86 °F) and 85% humidity for 28 days.

#### 6.1.3 Acceptance criteria

There shall be no more than traces of growth (Rating I) when the material is tested in accordance with item 8 of ASTM G21<sup>3</sup>.

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<sup>4</sup> American Type Culture Collection (ATCC), 12301 Parklawn Drive, Rockville, MD 20852 <www.atcc.org>.

## 6.2 Absorption / adsorption

### 6.2.1 Performance requirement

Supplemental flooring shall be resistant to the absorption or adsorption of water or oil.

### 6.2.2 Test method

#### 6.2.2.1 Water resistance

##### 6.2.2.1.1 General purpose flooring

Three test samples measuring 2 in x 2 in (50 mm x 50 mm) shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50\% \pm 5\%$  relative humidity for a period of at least 24 h. The three samples shall each be separately weighed to the nearest 0.001 g. Test samples will then be exposed to a solution of tap water and household detergent. The test solution shall have a pH between 8 and 9, a detergent concentration of  $0.3\% \pm 0.05\%$ , and a temperature maintained at  $100 \pm 2$  °F ( $38 \pm 1$  °C). Exposure shall be for a period of 6 h. The solution shall be of sufficient volume to completely submerge all of the samples. Following the exposure, samples shall be pat-dried with a paper towel to remove excess water, and individually reweighed.

##### 6.2.2.1.2 Heavy duty flooring

Three test samples measuring 2 in x 2 in (50 mm x 50 mm) shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50\% \pm 5\%$  relative humidity for a period of at least 24 h. The three samples shall each be separately weighed to the nearest 0.001 g. Test samples will then be exposed to a solution of tap water and commercial detergent. The test solution shall have a pH between 11 and 12, a detergent concentration of  $0.3\% \pm 0.05\%$ , and a temperature maintained at  $150 \pm 2$  °F ( $66 \pm 1$  °C). Exposure shall be for a period of 24 h. The solution shall be of sufficient volume to completely submerge all of the samples. Following the exposure, samples shall be pat-dried with a paper towel to remove excess water, and individually reweighed.

#### 6.2.2.2 Oil resistance

##### 6.2.2.2.1 General purpose flooring

Three test samples measuring 2 in x 2 in (50 mm x 50 mm) shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50\% \pm 5\%$  relative humidity for a period of at least 24 h. The three samples shall each be separately weighed to the nearest 0.001 g. Test samples will then be exposed to preheated vegetable shortening maintained at  $150 \pm 3$  °F ( $66 \pm 2$  °C). Exposure shall be for a period of 24 h. The vegetable shortening shall be of sufficient volume to completely submerge all of the samples. Following the exposure, samples shall be pat-dried with a paper towel to remove excess oil, and individually reweighed.

##### 6.2.2.2.2 Heavy duty flooring

Three test samples measuring 2 in x 2 in (50 mm x 50 mm) shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50\% \pm 5\%$  relative humidity for a period of at least 24 h. The three samples shall each be separately weighed to the nearest 0.001 g. Test samples will then be exposed to preheated vegetable shortening maintained at  $150 \pm 3$  °F ( $66 \pm 2$  °C). Exposure shall be for a period of 60 h. The vegetable shortening shall be of sufficient volume to completely submerge all of the samples. Following the exposure, samples shall be pat-dried with a paper towel to remove excess oil, and individually reweighed.

### 6.2.3 Acceptance criteria

#### 6.2.3.1 Water resistance

- general purpose – Change in weight of each individual sample shall not exceed  $\pm 5\%$ .
- heavy duty – Change in weight of each individual sample shall not exceed  $\pm 5\%$ .

#### 6.2.3.2 Oil resistance

- general purpose – Change in weight of each individual sample shall not exceed  $\pm 10\%$ .
- heavy duty – Change in weight of each individual sample shall not exceed  $\pm 5\%$ .

### 6.3 Temperature resistance

#### 6.3.1 Performance requirement

Supplemental flooring shall be resistant to hot liquids. Heavy duty supplemental flooring shall also be resistant to heated air.

#### 6.3.2 Test method

##### 6.3.2.1 Resistance to hot liquid

###### 6.3.2.1.1 General purpose flooring

A single test sample measuring 2 in x 2 in (50 mm x 50 mm) shall be placed on thirty-six 1 in x 1 in (25 mm x 25 mm) quarry tiles laid flat in a 6 in x 6 in (150 mm x 150 mm) pan (see figure 1). The sample, quarry tiles, and pan shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50\% \pm 5\%$  relative humidity for a period of at least 24 h. The test sample will then be exposed to  $0.5 \text{ L} \pm 30 \text{ mL}$  preheated tap water at  $200 \pm 3$  °F ( $93\text{C} \pm 2$  °C) by pouring of the water over the sample. The water shall be allowed to cool to  $100 \pm 2$  °F ( $38 \text{ C} \pm 1$  °C) prior to removal of the sample.

###### 6.3.2.1.2 Heavy duty flooring

A single test sample measuring 2 in x 2 in (50 mm x 50 mm) shall be placed on 36 1 in x 1 in (25 mm x 25 mm) quarry tiles laid flat in a 6 in x 6 in (150 mm x 150 mm) pan (see figure 1). The sample, quarry tiles, and pan shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50\% \pm 5\%$  relative humidity for a period of at least 24 h. The test sample will then be exposed to  $0.5 \text{ L} \pm 30 \text{ mL}$  preheated vegetable shortening at  $300 \pm 3$  °F ( $149 \pm 2$  °C) by pouring of the vegetable shortening over the sample. The shortening shall be allowed to cool to  $100 \pm 2$  °F ( $38 \pm 1$  °C) prior to removal of the sample.

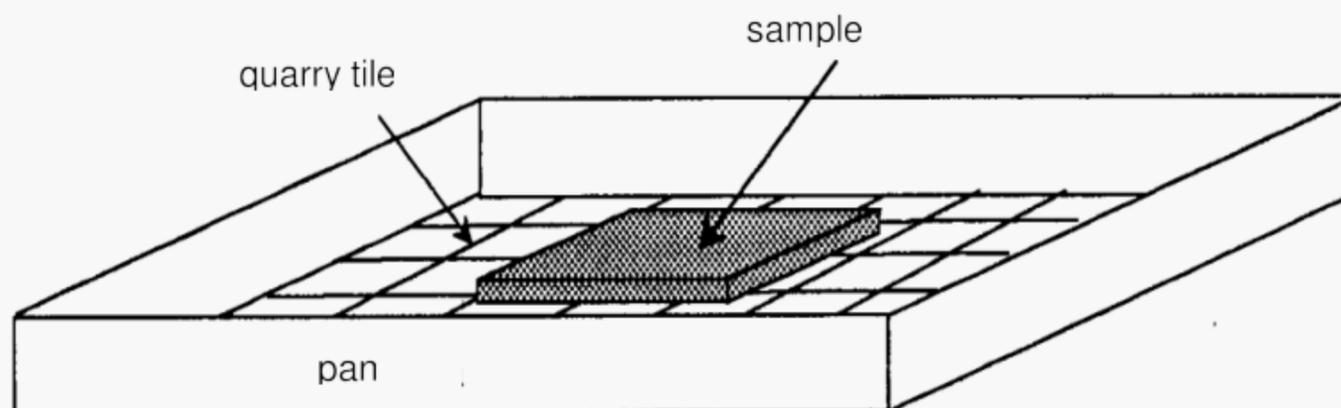


Figure 1

### 6.3.2.2 Resistance to heated air

A single test sample of heavy duty flooring measuring 2 in x 2 in (50 mm x 50 mm) shall be conditioned at  $73 \pm 3$  °F ( $23 \pm 2$  °C) and  $50 \% \pm 5 \%$  relative humidity for a period of at least 24 h. Once conditioned, the sample shall be placed in an oven that has been preheated to  $200 \pm 3$  °F ( $93 \pm 2$  °C). After  $24 \pm 1$  h of exposure, the sample shall be removed from the oven and examined for visible signs of deterioration.

### 6.3.3 Acceptance criteria

#### 6.3.3.1 Hot liquid

- general purpose – There shall be no visible evidence of blisters, stickiness, brittleness, curling, or distortion of the surface when exposed to 200 °F (93 °C) water.
- heavy duty – There shall be no visible evidence of blisters, stickiness, brittleness, curling, or distortion of the surface when exposed to 300 °F (149 °C) hydrogenated vegetable shortening.

#### 6.3.3.2 Heated air

- heavy duty – There shall be no visible evidence of blisters, stickiness, brittleness, curling, or distortion of the surface when exposed to 200 °F (93 °C) air.

## 6.4 Tensile testing

### 6.4.1 Rubber-type flooring

#### 6.4.1.1 Performance requirement

Supplemental flooring shall demonstrate sufficient tensile strength and tear resistance.

#### 6.4.1.2 Test method

Supplemental flooring shall be tested for tensile strength in accordance with ASTM D412<sup>3</sup> and ASTM D624<sup>3</sup>.

#### 6.4.1.3 Acceptance criteria

- general purpose – Tensile strength shall be 900 psi (6204.6 kPa) at a minimum. Tear strength shall be 90 lb/in (15,761 N/m) at a minimum.
- heavy duty – Tensile strength shall be 950 psi (6549.3 kPa) at a minimum. Tear strength shall be 90 lb/in (15,761 N/m) at a minimum. Elongation shall be 400% at a minimum.

### 6.4.2 Vinyl-type flooring

#### 6.4.2.1 Performance requirement

Supplemental flooring shall demonstrate sufficient tensile strength and tear resistance.

#### 6.4.2.2 Test method

Supplemental flooring shall be tested for tensile strength in accordance with ASTM D638<sup>3</sup> and ASTM D624<sup>3</sup>.

### 6.4.2.3 Acceptance criteria

- general purpose – Tensile strength shall be 1800 psi (12,409.2 kPa) at a minimum. Tear strength shall be 300 lb/in (525.3 N/m) at a minimum. Elongation shall be 300% at a minimum.
- heavy duty – Tensile strength shall be 1800 psi (12,409.2 kPa) at a minimum. Tear strength shall be 300 lb/in (525.3 N/m) at a minimum. Elongation shall be 300% at a minimum.

### 6.4.3 Rigid plastic-type flooring

#### 6.4.3.1 Performance requirement

Supplemental flooring shall demonstrate sufficient tensile strength and tear resistance.

#### 6.4.3.2 Test method

Supplemental flooring shall be tested for tensile strength in accordance with ASTM D638<sup>3</sup> and D256<sup>3</sup>.

#### 6.4.3.3 Acceptance criteria

- general purpose – Tensile strength shall be 3500 psi (24,129 kPa) at a minimum. Izod impact shall be 0.6 ft-lb/in (0.8 J/m) of notch at a minimum.
- heavy duty – Tensile strength shall be 3500 psi (24,129 kPa) at a minimum. Izod impact shall be 0.6 ft-lb/in (0.8 J/m) of notch at a minimum.

### 6.5 Specific gravity

#### 6.5.1 Performance requirement

Specific gravity of supplemental flooring shall be low enough to allow removal of flooring for cleaning purposes as required by 5.2.

#### 6.5.2 Test method

Specific gravity shall be tested in accordance with ASTM D792<sup>3</sup>.

#### 6.5.3 Acceptance criteria

Specific gravity of the rubber or plastic-type materials shall not exceed 1.50.

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**Annex A<sup>5</sup>**  
(informative)

**Food Equipment Joint Committee<sup>6</sup>**

<b>Name</b>	<b>Company / organization</b>	<b>Interest category</b>
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Perez, Michael <sup>1</sup>	Baring Industries	User
Tackitt, Steve	Barry-Eaton District Health Department	Public health / regulatory
Petersen Jr., James	C.i.i. Food Service Design	User
Bortolotti, Stefano	Carpigiani	Industry
Rodriguez, Luis, M.S.	CDC Vessel Sanitation Program	Public health / regulatory
Gagliardi, Tony <sup>1</sup>	Consultant - Public Health/Regulatory	Public health / regulatory
Burton-Zick, Sara <sup>1</sup>	DuPage County Health Department	Public health / regulatory
Liggans, Girvin	Food and Drug Administration	Public health / regulatory
Hall, Jon	Glastender Inc	Industry
Scanlon, John <sup>1</sup>	Hatco Corp.	Industry
Hipp, Joel <sup>1</sup>	Hobart Corp.	Industry
Schaefer, Stephen	Hoshizaki America, Inc.	Industry
Sickles, Willard <sup>1</sup> P.E.,	InterMetro Industries Corp.	Industry
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Brasseur, Eric	Little Caesars Enterprises	User
Bhatt, Swati	Los Angeles County	Public health / regulatory
Negandhi, Dipak <sup>1</sup> , P.E	Manitowoc Foodservice	Industry
Carotenuto, Anthony	Navy and Marine Corps Public Health Center	User
Dyer, Randy	Nestle	User
Kohler, Mike <sup>1</sup>	NSF International	User
Leonard, James MPH, LEHP	Princess Cruises	User
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Samarya-Timm, Michéle	Somerset County Department of Health	Public health / regulatory
Klouse, Paul, REHS, CP-FS	Southern Nevada Health District	Public health / regulatory
Brandt, Rex <sup>1</sup>	Taylor Co.	Industry
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McNeil, Thomas, RS	U.S. Army	User
Brania, Jonathan <sup>1</sup>	UL LLC	User
Brady, Jim <sup>1</sup>	Wawa, Inc.	User
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<sup>1</sup> Committee or task group chair		

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<sup>6</sup>Food Equipment Joint Committee members on the date of publication - subject to change 1/25/2017

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## Standards<sup>7</sup>

The following standards established and adopted by NSF as minimum voluntary consensus standards are used internationally:

- 2 Food equipment
- 3 Commercial warewashing equipment
- 4 Commercial cooking, rethermalization, and powered hot food holding and transport equipment
- 5 Water heaters, hot water supply boilers, and heat recovery equipment
- 6 Dispensing freezers
- 7 Commercial refrigerators and freezers
- 8 Commercial powered food preparation equipment
- 12 Automatic ice making equipment
- 13 Refuse processors and processing systems
- 14 Plastics piping system components and related materials
- 18 Manual food and beverage dispensing equipment
- 20 Commercial bulk milk dispensing equipment
- 21 Thermoplastic refuse containers
- 24 Plumbing system components for recreational vehicles
- 25 Vending machines for food and beverages
- 29 Detergent and chemical feeders for commercial spray-type dishwashing machines
- 35 High pressure decorative laminates (HPDL) for surfacing food service equipment
- 36 Dinnerware
- 37 Air curtains for entranceways in food and food service establishments
- 40 Residential wastewater treatment systems
- 41 Non-liquid saturated treatment systems
- 42 Drinking water treatment units – Aesthetic effects
- 44 Residential cation exchange water softeners
- 46 Evaluation of components and devices used in wastewater treatment systems
- 49 Biosafety cabinetry: Design, construction, performance, and field certification
- 50 Equipment for swimming pools, spas, hot tubs, and other recreational water facilities
- 51 Food equipment materials
- 52 Supplemental flooring
- 53 Drinking water treatment units – Health effects
- 55 Ultraviolet microbiological water treatment systems
- 58 Reverse osmosis drinking water treatment systems
- 59 Mobile food carts
- 60 Drinking water treatment chemicals – Health effects
- 61 Drinking water system components – Health effects
- 62 Drinking water distillation systems
- 140 Sustainable carpet assessment
- 169 Special purpose food equipment and devices
- 170 Glossary of food equipment terminology
- 173 Dietary supplements
- 177 Shower filtration systems – Aesthetic effects
- 184 Residential dishwashers
- 222 Ozone generators
- 223 Conformity assessment requirements for certification bodies that certify products pursuant to NSF/ANSI 60: Drinking water treatment chemicals – health effects
- 240 Drainfield trench product sizing for gravity dispersal onsite wastewater treatment and dispersal systems
- 245 Wastewater treatment systems - nitrogen reduction
- 305 Personal care products containing organic ingredients
- 321 Goldenseal root (*Hydrastis canadensis*)
- 330 Glossary of drinking water treatment unit terminology
- 332 Sustainability assessment for resilient floor coverings
- 336 Sustainability assessment for commercial furnishings fabric
- 342 Sustainability assessment for wallcovering products
- 347 Sustainability assessment for single ply roofing membranes
- 350 Onsite residential and commercial water reuse treatment systems
- 350-1 Onsite residential and commercial greywater treatment systems for subsurface discharge
- 355 Greener chemicals and processes information
- 358-1 Polyethylene pipe and fittings for water-based ground-source "geothermal" heat pump systems
- 358-2 Polypropylene pipe and fittings for water-based ground-source "geothermal" heat pump systems
- 359 Valves for crosslinked polyethylene (PEX) water distribution tubing systems
- 360 Wastewater treatment systems – Field performance verification
- 363 Good Manufacturing Practices (GMP) for Pharmaceutical Excipients
- 372 Drinking water treatment system components – Lead content
- 401 Drinking water treatment units - Emerging compounds / incidental contaminants
- 416 Sustainability Assessment for Water Treatment Chemical Products
- 418 Residential wastewater effluent filters longevity testing
- 419 Public Drinking Water Equipment Performance – Filtration
- 14159-1 Hygiene requirements for the design of meat and poultry processing equipment
- 14159-2 Hygiene requirements for the design of hand held tools used in meat and poultry processing equipment
- 14159-3 Hygiene requirements for the design of mechanical belt conveyors used in meat and poultry processing equipment

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***THE HOPE OF MANKIND rests in the ability of man to define and seek out the environment which will permit him to live with fellow creatures of the earth, in health, in peace, and in mutual respect.***