

## CHAPTER 15

# REFERENCED STANDARDS

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**User note:**

*About this chapter:* This code contains numerous references to standards that are used to provide requirements for materials and methods of construction. This chapter contains a comprehensive list of all standards that are referenced in this code. These standards, in essence, are part of this code to the extent of the reference to the standard. This chapter lists the standards that are referenced in various sections of this document.

The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.8.

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## ACCA

Air Conditioning Contractors of America  
2800 Shirlington Road, Suite 300  
Arlington, VA 22206

**Manual D—2016: Residential Duct Systems**

601.4, 603.2

**ANSI/ASHRAE/ACCA 183—2007 (reaffirmed 2014): Peak Cooling and Heating Load Calculations in Buildings Except Low-rise Residential Buildings**

312.1

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## AHRI

Air-Conditioning, Heating & Refrigeration Institute  
2111 Wilson Blvd., Suite 500  
Arlington, VA 22201

**700—2015 with Addendum 1: Specifications for Refrigerants**

1102.2.2.3

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## AMCA

Air Movement and Control Association International  
30 West University Drive  
Arlington Heights, IL 60004

**230-15: Laboratory Methods of Testing Air Circulating Fans for Rating and Certification**

929.1

**550—09: Test Method for High Velocity Wind Driven Rain Resistant Louvers**

401.5, 501.3.2

**ANSI/AMCA 210—ANSI/ASHRAE 51—07: Laboratory Methods of Testing Fans for Aerodynamic Performance Rating**

403.3.2.4

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## ANSI

American National Standards Institute  
25 West 43rd Street, 4th Floor  
New York, NY 10036

**Z21.1—2010: Household Cooking Gas Appliances**

505.2

**Z21.8—1994 (R2002): Installation of Domestic Gas Conversion Burners**

919.1

## REFERENCED STANDARDS

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# ASHRAE

ASHRAE  
1791 Tullie Circle NE  
Atlanta, GA 30329

**ANSI/AMCA 210–ANSI/ASHRAE 51—07: Laboratory Methods of Testing Fans for Aerodynamic Performance Rating**

403.3.2.4

**ASHRAE—2017: ASHRAE Fundamentals Handbook**

603.2

**15—2016: Safety Standard for Refrigeration Systems**

1101.6, 1105.8, 1108.1

**34—2016: Designation and Safety Classification of Refrigerants**

202, 1102.2.1, 1103.1

**62.1—2016: Ventilation for Acceptable Indoor Air Quality**

403.3.1.1.2.3.2

**62.2—2016: Ventilation and Acceptable Indoor Air Quality in Residential Buildings**

401.2.2, 401.2.3

**154—2016: Ventilation for Commercial Cooking Operations**

506.3, 506.4, 506.4.1.1, 506.5, 507.1.1, 507.1.2, 507.2, 508.2

**170—2017: Ventilation of Health Care Facilities**

407

**180—2012: Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems**

102.3

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# ASME

American Society of Mechanical Engineers  
Two Park Avenue  
New York, NY 10016-5990

**A112.4.1—2009: Water Heater Relief Valve Drain Tubes**

1006.6

**B1.20.1—2013: Pipe Threads, General Purpose (Inch)**

1203.3.5, 1303.3.3

**B16.3—2016: Malleable Iron Threaded Fittings, Classes 150 & 300**

Table 1202.5

**B16.5—2015: Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24**

Table 1202.5

**B16.9—2012: Factory Made Wrought Steel Butt Welding Fittings**

Table 1202.5

**B16.11—2016: Forged Fittings, Socket-welding and Threaded**

Table 1202.5

**B16.15—2013: Cast Alloy Threaded Fittings: Classes 125 and 250**

Table 1202.5

**B16.18—2012: Cast Copper Alloy Solder Joint Pressure Fittings**

513.13.1, Table 1202.5

**B16.22—2013: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings**

513.13.1, Table 1202.5

**B16.24—2016: Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500**

Table 1202.5

**B16.26—2016: Cast Copper Alloy Fittings for Flared Copper Tubes**

Table 1202.5

**B16.28—1994: Wrought Steel Butt Welding Short Radius Elbows and Returns**

Table 1202.5

**B16.51—2013: Copper and Copper Alloy Press-connect Pressure Fittings**

Table 1202.5

ASME—continued

- B31.3—2016: Process Piping Code**  
1346.0101, 704.1.2.4
- B31.5—2016: Refrigeration Piping and Heat Transfer Components**  
1107.1
- B31.9—2014: Building Services Piping**  
1346.0101, 1201.3
- BPVC—2007 Sections I, II, IV, V, VIII & IX: Boiler and Pressure Vessel Code**  
1003.1, 1009.2, 1011.1
- BPVC—2015: ASME Boiler & Pressure Vessel Code—07 Edition**  
1009.2, 1003.1, 1004.1, 1011.1
- CSD-1—2016: Controls and Safety Devices for Automatically Fired Boilers**  
1004.1

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**ASSE**

American Society of Safety Engineers  
520 N. Northwest Highway  
Park Ridge, IL 60068

- ANSI/ASSE Z359.1—2016: Requirements for ANSI/ASSE Z359 Fall Protection Code**  
304.11

**ASSE**

ASSE International  
18927 Hickory Creek Drive, Suite 220  
Mokena, IL 60448

- 1017—2010: Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems**  
1002.2.2
- 1061—2015: Performance Requirements for Push Fit Fittings**  
Table 1202.5

**ASTM**

ASTM International  
100 Barr Harbor Drive, P.O. Box C700  
West Conshohocken, PA 19428

- A53/A53M—12: Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated, Welded and Seamless**  
Table 1202.4, Table 1202.5, Table 1302.3
- A106/A106M—14: Specification for Seamless Carbon Steel Pipe for High-temperature Service**  
Table 1302.3, Table 1202.5, Table 1202.4 Table 1302.3
- A126—04(2014): Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings**  
Table 1202.5
- A234/A234M—15: Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service**  
Table 1202.5
- A254—12: Specification for Copper Brazed Steel Tubing**  
Table 1202.4, Table 1302.3
- A395/A395M—99(2014): Standard Specification for Ferritic Ductile Iron Pressure-retaining Castings for Use at Elevated Temperatures**  
Table 1202.5, Table 1302.3
- A420/A420M—14: Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-temperature Service**  
Table 1202.5
- A536—84(2014): Standard Specification for Ductile Iron Castings**  
Table 1202.5
- A539—99: Specification for Electric-resistance-welded Coiled Steel Tubing for Gas and Fuel Oil Lines**  
Table 1302.3
- B32—08(2014): Specification for Solder Metal**  
1203.3.3

## REFERENCED STANDARDS

### ASTM—continued

- B42—15a: Specification for Seamless Copper Pipe, Standard Sizes**  
513.13.1, 1107.5.2, Table 1202.4, Table 1302.3
- B43—15: Specification for Seamless Red Brass Pipe, Standard Sizes**  
513.13.1, 1107.5.2, Table 1202.4, Table 1302.3
- B68/B58M—11: Specification for Seamless Copper Tube, Bright Annealed**  
513.13.1
- B75/B75M—11: Specification for Seamless Copper Tube**  
Table 1302.3
- B88—14: Specification for Seamless Copper Water Tube**  
513.13.1, 1107.5.3, Table 1202.4, Table 1302.3
- B135—10: Specification for Seamless Brass Tube**  
Table 1202.4
- B251—10: Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube**  
513.13.1, Table 1202.4
- B280—13: Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service**  
513.13.1, 1107.5.3, Table 1302.3
- B302—12: Specification for Threadless Copper Pipe, Standard Sizes**  
Table 1202.4, Table 1302.3
- B813—10: Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube**  
1203.3.3
- B819—00(R2011): Standard Specification for Seamless Copper Tube for Medical Gas Systems**  
1107.5.3
- B828—02(2010): Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings**  
1203.3.3
- C315—07(2011): Specification for Clay Flue Liners and Chimney Pots**  
801.16.1, Table 803.10.4
- C411—11: Test Method for Hot-surface Performance of High-temperature Thermal Insulation**  
604.3
- D56—05(2010): Test Method for Flash Point by Tag Closed Cup Tester**  
202
- D93—15: Test Method for Flash Point of Pensky-Martens Closed Cup Tester**  
202
- D1527—99(2005): Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80**  
Table 1202.4
- D1693—15: Test Method for Environmental Stress-cracking of Ethylene Plastics**  
Table 1202.4
- D1785—15: Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120**  
Table 1202.4, Table 1210.4
- D2235—04(2011): Specifications for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings**  
1203.3.4
- D2241—15: Specification for Poly (Vinyl Chloride) (PVC) Pressure-rated Pipe (SDR-Series)**  
Table 1202.4, Table 1210.4
- D2282—99(2005): Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)**  
Table 1202.4
- D2412—11: Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-plate Loading**  
603.8.3
- D2464—15: Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80**  
Table 1210.5
- D2466—15: Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40**  
Table 1202.5, Table 1210.5
- D2467—15: Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80**  
Table 1202.5, Table 1210.5

**ASTM—continued**

- D2564—12: Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems**  
1203.3.4
- D2657—07: Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings**  
Table 1210.5
- D2683—14: Specification for Socket-type Polyethylene Fittings for Outside Diameter-controlled Polyethylene Pipe and Tubing**  
Table 1210.5, 1210.6.6.1
- D2737—12a: Standard Specification for Polyethylene (PE) Plastic Tubing**  
Table 1210.4
- D2846/D2846M—14: Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-water Distribution Systems**  
Table 1202.4, 1203.3.4, Table 1210.4
- D2996—01(2007)e01: Specification for Filament-wound Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe**  
Table 1302.3
- D3035—15: Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter**  
Table 1210.4
- D3261—12e1: Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing**  
Table 1210.5, 1210.6.6.1
- D3278—96(2011): Test Methods for Flash Point of Liquids by Small Scale Closed-cup Apparatus**  
202
- D3309—96a(2002): Specification for Polybutylene (PB) Plastic Hot- and Cold-water Distribution Systems**  
Table 1202.4, 1203.10.1
- E84—2016: Standard Test Method for Surface Burning Characteristics of Building Materials**  
202, 510.9, 602.2, 602.2.1, 602.2.1.6, 602.2.1.6.1, 602.2.1.6.2, 602.2.1.6.3, 602.2.1.7, 604.3, 1204.1
- E119—2016: Test Method for Fire Tests of Building Construction and Materials**  
607.5.2, 607.5.5, 607.6.1, 607.2.1
- E136—16: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C**  
202
- E814—13a: Standard Test Method for Fire Tests of Penetration Firestop Systems**  
506.3.11.2, 506.3.11.3
- E1509—12: Specification for Room Heaters, Pellet Fuel-burning Type**  
904.1
- E1998—02: Standard Guide for Assessing Depressurization-Induced Backdrafting and Spillage from Vented Combustion Appliances**  
501.4.3
- E2231—15: Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics**  
604.3, 1204.1
- E2336—16: Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems**  
506.3.6, 506.3.11.2
- F437—15: Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80**  
Table 1210.5
- F438—15: Specification for Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40**  
Table 1202.5, Table 1210.5
- F439—13: Specification for Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80**  
Table 1202.5, Table 1210.5
- F441/F441M—15: Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80**  
Table 1202.4, Table 1210.4
- F442/F442M—13e1: Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)**  
Table 1202.4, Table 1210.4
- F493—14: Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings**  
1203.3.4
- F714—13: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter**  
Table 1210.4

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## REFERENCED STANDARDS

### ASTM—continued

- F876—15A: Specification for Cross-linked Polyethylene (PEX) Tubing**  
Table 1202.4, Table 1210.4
- F877—11a: Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-water Distribution Systems**  
Table 1202.4, Table 1202.5, Table 1210.4
- F1055—13: Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Cross-linked Polyethylene (PEX) Pipe and Tubing**  
Table 1210.5, 1210.6.6.2
- F1281—11: Specification for Cross-linked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe**  
Table 1202.4
- F1282—10: Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe**  
Table 1202.4, Table 1210.4, Table 1210.5
- F1476—07(2013): Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications**  
Table 1202.5, 1203.3.7
- F1548—01(2012): Standard Specification for the Performance of Fittings for Use with Gasketed Mechanical Couplings Used in Piping Applications**  
Table 1202.5
- F1807—15: Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing**  
Table 1202.5, Table 1210.5
- F1924—12: Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing**  
1210.6.6.3
- F1960—15: Specification for Cold-expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing**  
Table 1202.5
- F1974—09(2005): Standard Specification for Metal Insert Fittings for Polyethylene/Aluminum/Polyethylene and Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene Composite Pressure Pipe**  
Table 1202.5
- F2080—15: Specification for Cold-expansion Fittings with Metal Compression-sleeves for Cross-linked Polyethylene (PEX) Pipe**  
Table 1202.5
- F2098—08: Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings**  
Table 1202.5
- F2159—14: Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing**  
Table 1202.5, Table 1210.5
- F2389—15: Specification for Pressure-rated Polypropylene Piping Systems**  
Table 1202.4, Table 1202.5, 1203.15.1, Table 1210.4, Table 1210.5, 1210.6.7.1
- F2434—14: Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing**  
Table 1210.5
- F2623—14: Standard Specification for Polyethylene of Raised Temperature (PE-RT) SDR9 Tubing**  
Table 1202.4, Table 1210.4
- F2735—09: Standard Specification for Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing**  
Table 1202.5
- F2769—14: Polyethylene of Raised Temperature (PE-RT) Plastic Hot- and Cold-water Tubing and Distribution Systems**  
Table 1202.4, Table 1210.5
- F2806—10(2015): Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (Metric SDR-PR)**  
Table 1202.4

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## AWS

American Welding Society  
8669 NW 36 Street, #130  
Miami, FL 33166

**A5.8M/A5.8—2011: Specifications for Filler Metals for Brazing and Braze Welding**  
1203.3.1, 1303.3.1

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## AWWA

American Water Work Association  
6666 West Quincy Avenue  
Denver, CO 80235

**C901—16: Polyethylene (PE) Pressure Pipe and Tubing,  $\frac{3}{4}$  in. (19 mm) through 3 in. (76 mm) for Water Service**  
Table 1210.4

**C110/A21.10—12: Standard for Ductile Iron & Gray Iron Fittings**  
Table 1202.5

**C115/A21.15—11: Standard for Flanged Ductile-iron Pipe with Ductile Iron or Grey-iron Threaded Flanges**  
Table 1202.4

**C151/A21.51—09: Standard for Ductile-iron Pipe, Centrifugally Cast for Water**  
Table 1202.4

**C153/A21.53—11: Standard for Ductile-iron Compact Fittings for Water Service**  
Table 1202.5

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## CPSC

Consumer Product Safety Commission  
4330 East West Highway  
Bethesda, MD 20814

**CPSC August 2011. Title 15 of the Federal Hazardous Substance Act**  
202, 1009.1

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## CSA

CSA Group  
8501 East Pleasant Valley Road  
Cleveland, OH 44131-5516

**B137.2—16: Polyvinylchloride (PVC) Injection-moulded Gasketed Fittings for Pressure Applications**  
Table 1210.5

**B137.3—16: Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications**  
Table 1210.5

**B137.6—16: Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing and Fittings for Hot- and Cold-water Distribution Systems**  
Table 1210.5

**B137.9—16: Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-pipe Systems**  
Table 1202.4, Table 1210.4, Table 1210.5

**B137.10—16: Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Composite Pressure-pipe Systems**  
Table 1202.4

**CSA C448 Series—16: Design and Installation of Earth Energy Systems**  
Table 1210.5

**CSA C22.2 No. 218.1—M89(R2011): Spas, Hot Tubs and Associated Equipment**  
916.1

**CSA C22.2 No. 236—11: Heating and Cooling Equipment**  
916.1

**CSA B137.1—16: Polyethylene (PE) Pipe, Tubing and Fittings for Cold-water Pressure Services**  
Table 1210.4, Table 1210.5

**CSA B137.5—16: Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications**  
Table 1210.4, Table 1210.5

**CSA B137.11—16: Polypropylene (PP-R) Pipe and Fittings for Pressure Applications**  
Table 1210.4, Table 1210.5

## REFERENCED STANDARDS

### CSA—continued

#### CSA B137.18—13: Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications

Table 1202.4, Table 1202.5, Table 1210.5

#### America FC1—2012: Stationary Fuel Cell Power Systems

924.1

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## DOL

U.S. Department of Labor  
Occupational Safety and Health Administration  
c/o Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402-9325

#### 29 CFR Part 1910.1000 (2015): Air Contaminants

502.6

#### 29 CFR Part 1910.1025 (2015): Toxic and Hazardous Substances

502.19

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## FDA

U.S. Food and Drug Administration  
10903 New Hampshire Avenue  
Silver Springs, MD 20993

#### FDA Title 15: Federal Hazardous Substances Act

1403.4

#### FDA Title 21: Code of Federal Regulations, Title 21, Food and Drugs, Chapter 1, Food and Drug Administration, Parts 174–186 (revised as of April 1, 2015)

1403.3

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## FS

Federal Specifications\*  
General Services Administration  
7th & D Streets  
Specification Section, Room 6039  
Washington, DC 20407

#### WW-P-325B (1976): Pipe, Bends, Traps, Caps and Plugs; Lead (for Industrial Pressure and Soil and Waste Applications)

Table 1202.4

\*Standards are available from the Supt. of Documents, U.S. Government Printing Office, Washington, DC 20402-9325

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## ICC

International Code Council, Inc.  
500 New Jersey Ave NW  
6th Floor  
Washington, DC 20001

#### IBC—18: International Building Code®

201.3, 202, 301.15, 301.16, 301.17, 301.18, 302.1, 302.2, 304.8, 304.11, 308.4.2.2, 308.4.2.4, 401.4, 401.5, 406.1, 501.3.1, 501.3.2, 501.10.2, 502.10, 502.10.1, 504.2, 504.10, 505.3, 506.3.3, 506.3.10, 506.3.12.2, 506.4.1, 509.1, 510.6, 510.6.3, 510.6.2, 510.7, 510.7.1.1, 510.7.2, 510.7.3, 510.8, 511.1.5, 513.1, 513.2, 513.3, 513.4.3, 513.5, 513.5.2, 513.5.2.1, 513.5.3, 513.5.3.2, 513.6.2, 513.10.5, 513.11.1, 513.12, 513.12.2, 513.20, 601.3, 602.2, 602.2.1.5.1, 602.2.1.5.2, 602.2.1.6.1, 602.2.1.6.2, 602.3, 602.4, 603.1, 603.10, 603.13, 603.18.2, 604.5.4, 607.1.1, 607.1.2, 607.3.2.1, 607.5.1, 607.5.2, 607.5.3, 607.5.4, 607.5.4.1, 607.5.5, 607.5.5.1, 607.5.6, 607.6, 607.6.1, 607.6.2, 607.6.2.1, 607.6.3, 701.2, 701.4.1, 701.4.2, 801.3, 801.16.1, 801.18.4, 801.18.4.1, 902.1, 908.3, 908.4, 910.3, 924.1, 925.1, 926.1, 927.2, 928.1, 1004.6, 1105.1, 1206.4, 1210.8.2, 1305.2.1, 1402.4, 1402.4.1

#### IECC—18: International Energy Conservation Code®

301.2, 303.3, 312.1, 401.2, 514.1, 604.1, 1204.1, 1204.2

#### IFC—18: International Fire Code®

201.3, 310.1, 311.1, 502.4, 502.5, 502.7.2, 502.8.1, 502.9.1, 502.9.5, 502.9.5.2, 502.9.5.3, 502.9.8.2, 502.9.8.3, 502.9.8.5, 502.9.8.6, 502.9.11, 502.10, 502.10.3, 502.16.2, 509.1, 510.2.1, 510.2.2, 510.5, 511.1.1, 513.1, 513.2, 513.6.3, 513.12.1, 513.12.3, 513.12.4, 513.15, 513.16, 513.17, 513.18, 513.19, 606.2.1, 606.4.1, 908.7, 924.1, 926.1, 1101.9, 1105.3, 1105.9, 1106.5, 1106.6, 1301.1, 1301.2, 1301.5



**ICC—continued**

**IFGC—18: International Fuel Gas Code®**

101.2, 201.3, 301.6, 701.1, 801.1, 901.1, 906.1, 926.1, 1101.5

**IPC—18: International Plumbing Code®**

201.3, 301.11, 307.2.2, 512.2, 908.5, 928.1, 1002.1, 1002.2, 1002.3, 1005.2, 1006.6, 1008.2, 1009.3, 1101.4, 1201.1, 1206.2, 1206.3, 1210.8.1, 1401.2

**IRC—18: International Residential Code®**

101.2

**ICC 900/SRCC Standard 300—15: Solar Thermal System Standard**

1002.1, 1401.4, 1401.4.1, 1402.1, 1402.3.1, 1402.4, 1402.8.1.1, 1402.8.1.4, 1402.8.5, 1402.8.5.3, 1403.2

**ICC 901/SRCC Standard 100—15: Solar Thermal Collector Standard**

1401.4.1, 1402.8.1.1

**IIAR**

International Institute of Ammonia Refrigeration  
1001 N. Fairfax Street, Suite 503  
Arlington, VA 22314

**IIAR 2—2014: Safe Design of Closed-circuit Ammonia Refrigerating Systems**

1101.6, 1105.6.3

**ANSI/IIAR 3—2012: Ammonia Refrigeration Valves**

1101.6

**ANSI/IIAR 4—2015: Installation of Closed-circuit Ammonia Mechanical Refrigerating Systems**

1101.6

**ANSI/IIAR 5—2013: Start-up and Commissioning of Closed-circuit Ammonia Refrigeration Systems**

1101.6

**MSS**

Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.  
127 Park Street, NE  
Vienna, VA 22180

**SP 58—2009: Pipe Hangers and Supports—Materials Design and Manufacture, Selection, Application and Installation**

305.4

**NAIMA**

North American Insulation Manufacturers Association  
11 Canal Center Plaza, Suite 103  
Alexandria, VA 22314

**AH116—09: Fibrous Glass Duct Construction Standards**

603.5, 603.9

**NBBI**

National Board of Boiler and Pressure Vessel Inspectors  
1055 Crupper Avenue  
Columbus, OH 43229-1183

**NBIC—2011: National Board Inspection Code, Part 3**

1003.3

**NFPA**

National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02169-7471

**2—16: Hydrogen Technologies Code**

502.16.1

**30A—18: Code for Motor Fuel-dispensing Facilities and Repair Garages**

304.6

REFERENCED STANDARDS

NFPA—continued

- 31—16: Standard for the Installation of Oil-burning Equipment**  
701.1, 801.2.1, 801.18.1, 801.18.2, 920.2, 922.1, 1308.1
- 37—18: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines**  
915.1, 915.2
- 45—2015: Standard on Fire Protection for Laboratories Using Chemicals**  
510.1
- 54—2018: National Fuel Gas Code**  
301.3
- 58—17: Liquefied Petroleum Gas Code**  
502.9.10
- 69—14: Standard on Explosion Prevention Systems**  
510.9.3
- 70—17: National Electrical Code**  
301.7, 306.3.1, 306.4.1, 511.1.1, 513.11, 513.12.2, 602.2.1.1, 927.2, 1104.2.2, 1106.3, 1106.4, 1402.8.1.4
- 72—16: National Fire Alarm and Signaling Code**  
606.3
- 82—14: Standard on Incinerators and Waste and Linen Handling Systems and Equipment**  
601.1
- 85—15: Boiler and Combustion Systems Hazards Code**  
1004.1
- 90B—18: Standard for the Installation of Warm Air Heating and Air-Conditioning Systems**  
301.7
- 91—15: Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids**  
502.9.5.1, 502.17
- 92—15: Standard for Smoke Control Systems**  
513.7, 513.8
- 96—17: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations**  
507.1
- 211—16: Standard for Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances**  
806.1
- 262—15: Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-handling Spaces**  
602.2.1.1
- 286—15: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth**  
602.2.1.6.2
- 704—17: Standard System for Identification of the Hazards of Materials for Emergency Response**  
502.8.4, 510.1, Table 1103.1
- 853—15: Standard on Installation of Stationary Fuel Power Plants**  
924.1

---

**NSF**

NSF International  
789 N. Dixboro Road  
P.O. Box 130140  
Ann Arbor, MI 48105

- NSF 358-1—2014: Polyethylene Pipe and Fittings for Water-based Ground-source “Geothermal” Heat Pump Systems**  
Table 1210.4, Table 1210.5
- NSF 358-2—2012: Polypropylene Pipe and Fittings for Water-based Ground-source “Geothermal” Heat Pump Systems**  
Table 1210.4, Table 1210.5

---

# SMACNA

Sheet Metal and Air Conditioning Contractors' National Association, Inc.  
4201 Lafayette Center Drive  
Chantilly, VA 20151-1219

**SMACNA 2015: Phenolic Duct Construction Standard**  
603.5.2

**SMACNA/ANSI—2016: HVAC Duct Construction Standards-Metal and Flexible 4th Edition (ANSI) 2016**  
603.4, Table 603.4, 603.9, 603.10

**SMACNA—10: Fibrous Glass Duct Construction Standards**  
603.5, 603.9

---

# UL

UL LLC  
333 Pfingsten Road  
Northbrook, IL 60062-2096

**17—2008: Vent or Chimney Connector Dampers for Oil-fired Appliances—with revisions through September 2013**  
803.6

**103—2010: Factory-built Chimneys, Residential Type and Building Heating Appliance—with revisions through July 2012**  
805.2

**127—2011: Factory-built Fireplaces—with revisions through May 2015**  
903.1, 903.3, 903.4

**174—04: Household Electric Storage Tank Water Heaters—with revisions through April 2015**  
1002.1

**180—2012: Liquid-level Indicating Gauges for Oil Burner Fuels and Other Combustible Liquids**  
1306.4

**181—05: Factory-made Air Ducts and Air Connectors—with revisions through October 2008**  
512.2, 603.5, 603.6.1, 603.6.2, 603.9, 604.13

**181A—2013: Closure Systems for Use with Rigid Air Ducts and Air Connectors**  
603.9

**181B—2013: Closure Systems for Use with Flexible Air Ducts and Air Connectors**  
603.9

**197—10: Commercial Electric Cooking Appliances—with revisions through September 2014**  
917.1

**207—2009: Refrigerant-containing Components and Accessories, Nonelectrical—with revisions through June 2014**  
1101.2

**217—06: Single and Multiple Station Smoke Alarms—with Revisions through October 2015**  
311.2.1.3

**263—2011: Standard for Fire Test of Building Construction and Materials—with revisions through June 2015**  
607.5.2, 607.5.5, 607.6.1, 607.6.2.1

**268—2009: Smoke Detectors for Fire Alarm Systems**  
606.1

**268A—2008: Smoke Detectors for Duct Application—with revisions through October 2014**  
606.1

**343—2008: Pumps for Oil-burning Appliances—with revisions through June 2013**  
1302.7

**378—06: Draft Equipment—with revisions through June 12, 2014**  
804.3, 804.3.8

**391—2010: Solid-fuel and Combination-fuel Central and Supplementary Furnaces—with revisions through June 2014**  
918.1

**412—2011: Refrigeration Unit Coolers—with revisions through September 2013**  
1101.2

**471—2010: Commercial Refrigerators and Freezers—with revisions through December 2012**  
1101.2

**499—05: Electric Heating Appliances—with revisions through November 2014**  
912.1, 923.1

M  
N  
M  
N

## REFERENCED STANDARDS

### UL—continued

- 507—2014: Standard for Electric Fans**  
505.2
- 508—99: Industrial Control Equipment—with revisions through October 2013**  
307.2.3
- 536—97: Flexible Metallic Hose—with revisions through December 2014**  
1302.8
- 555—06: Fire Dampers—with revisions through May 2014**  
607.3.1
- 555C—06: Ceiling Dampers—with revisions through December 2014**  
607.3.1
- 555S—99: Smoke Dampers—with revisions through February 2014**  
607.3.1
- 586—2009: High-efficiency, Particulate, Air Filter Units—with revisions through September 2014**  
605.2
- 641—2010: Type L Low-temperature Venting Systems—with revisions through June 2013**  
802.1
- 705—2004: Standard for Power Ventilators—with revisions through December 2013**  
504.5
- 710—2012: Exhaust Hoods for Commercial Cooking Equipment—with revisions through November 2013**  
507.1
- 710B—2011: Recirculating Systems—with revisions through August 2014**  
507.1, 507.2
- 723—2008: Standard for Test for Surface Burning Characteristics of Building Materials—with revisions through August 2013**  
510.9, 602.2, 602.2.1, 602.2.1.6, 602.2.1.6.2, 602.2.1.6.3, 602.2.1.7, 604.3, 1204.1
- 726—95: Oil-fired Boiler Assemblies—with revisions through October 2013**  
916.1, 1004.1
- 727—06: Oil-fired Central Furnace—with revisions through October 2013**  
918.1
- 729—03: Oil-fired Floor Furnaces—with revisions through October 2013**  
910.1
- 730—03: Oil-fired Wall Furnaces—with revisions through October 2013**  
909.1
- 731—95: Oil-fired Unit Heaters—with revisions through October 2013**  
920.1
- 732—95: Oil-fired Storage Tank Water Heaters—with revisions through October 2013**  
1002.1
- 737—2011: Fireplace Stoves—with revisions through August 2015**  
905.1
- 762—2010: Outline of Investigation for Power Ventilators for Restaurant Exhaust Appliances—with revisions through October 2013**  
506.5.1
- 791—06: Residential Incinerators—with revisions through November 2014**  
907.1
- 834—04: Heating, Water Supply and Power Boilers Electric—with revisions through December 2013**  
1004.1
- 842—07: Valves for Flammable Fluids—with revisions through May 2015**  
1307.1
- 858—05: Household Electric Ranges—with revisions through June 2015**  
917.1
- 867—2011: Electrostatic Air Cleaners—with revisions through August 2013**  
605.2
- 875—09: Electric Dry Bath Heater—with revisions through December 2013**  
914.2

UL—continued

- 896—93: Oil-burning Stoves—with revisions through November 2013  
917.1, 922.1
- 900—04: Air Filter Units—with revisions through April 2015  
605.2
- 907—94: Fireplace Accessories—with revisions through June 2014  
902.2
- 923—2013: Microwave Cooking Appliances—with revisions through June 2015  
917.1
- 959—2010: Medium Heat Appliance Factory-built Chimneys—with revisions through June 2014  
805.5
- 1046—2010: Grease Filters for Exhaust Ducts—with revisions through January 2012  
507.2.8
- 1240—2012: Electric Commercial Clothes—Drying Equipment—with revisions through October 2012  
913.1
- 1261—01: Electric Water Heaters for Pools and Tubs—with revisions through July 2012  
916.1
- 1453—04: Electric Booster and Commercial Storage Tank Water Heaters—with revisions through July 2011  
1002.1
- 1479—03 : Fire Tests of Through-penetration Firestops—with revisions through June 2015  
506.3.11.2, 506.3.11.3
- 1482—2011: Solid-fuel Type Room Heaters—with revisions through August 2015  
905.1
- 1563—2009: Standard for Electric Spas, Hot Tubs and Associated Equipment—with revisions through March 2015  
916.1
- 1618—09: Wall Protectors, Floor Protectors and Hearth Extensions—with revisions through October 2015  
308.4.1, 903.2, 905.3
- 1777—2007: Chimney Liners—with revisions through October 2015  
801.16.1, 801.18.4
- 1812—2013: Standard for Ducted Heat Recovery Ventilators—with revisions through April 2014  
514.1
- 1815—2012: Standard for Nonducted Heat Recovery—with revisions through April 2014  
514.1
- 1820—04: Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics—with revisions through May 2013  
602.2.1.3
- 1887—04: Fire Tests of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics—with revisions through May 2013  
602.2.1.2
- 1978—2010: Grease Ducts—with revisions through September 2013  
506.3.2, 506.3.6
- 1995—2011: Heating and Cooling Equipment—with revisions through July 2015  
908.1, 911.1, 918.1, 918.2, 1101.2
- 1996—2009: Electric Duct Heaters—with revisions through June 2014  
911.1
- 2024—2011: Standard for Safety Optical-fiber and Communications Cable Raceway—with revisions through August 2015  
602.2.1.1
- 2034—2008: Single- and Multiple-station Carbon Monoxide Alarms—with Revisions through March 2015  
311.2.1.2, 311.2.1.3, 313.2.1.2, 313.2.1.3
- 2043—2008: Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-handling Spaces—with revisions through October 2013  
602.2.1.4.2
- 2075—2013: Standard for Gas and Vapor Detectors and Sensors  
404.1
- 2158—97: Electric Clothes Dryers—with revisions through March 2009  
913.1

M  
N  
M  
N

**REFERENCED STANDARDS**

**UL—continued**

- 2158A—2010: Outline of Investigation for Clothes Dryer Transition Duct**  
504.8.3
- 2162—01: Outline of Investigation for Commercial Wood-fired Baking Ovens-Refractory Type**  
917.1
- 2200—2012: Stationary Engine Generator Assemblies—with revisions through July 2015**  
915.1
- 2221—2010: Tests of Fire Resistive Grease Duct Enclosure Assemblies**  
506.3.11.3
- 2518—05: Air Dispersion System Materials**  
603.17
- 2523—09: Solid Fuel-fired Hydronic Heating Appliances—with revisions through February 2013**  
1002.1, 1004.1
- 2846—14: Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics**  
602.2.1.7

## CHAPTER 16

# INSTALLATION AND TESTING OF OIL OR LIQUID FUEL-FIRED EQUIPMENT

### SECTION 1601 GENERAL

**1601.1 General.** Chapter 16 governs the installation, testing, or repair of: oil or liquid fuel burners, oil or liquid fuel burning systems, oil or liquid fuel burning equipment, and the oil or liquid fuel piping systems installed within, or in conjunction with, buildings or structures. The requirements of this chapter shall apply to the following equipment:

1. Equipment utilized to provide control of environmental conditions.  
**Exception:** Equipment and appliances listed and labeled to an appropriate standard by a nationally recognized testing laboratory, which is qualified to evaluate the equipment or appliance, when installed and tested according to the manufacturer's installation instructions.
2. Equipment with a fuel input of 1,000,000 Btu/hr or greater.
3. Unlisted equipment.
4. Miscellaneous equipment when required by the building official.

### SECTION 1602 EQUIPMENT PLACEMENT

**1602.1 Placing equipment in operation.** After completion of all installations, the installer shall test all safety and operating controls and venting before placing the burner in service. The correct input of liquid fuel shall be determined and the fuel-to-air ratio set. Each oil or liquid fuel burner shall be adjusted to its proper input according to the manufacturer's instructions. Overrating the burners or the appliance is prohibited. The input range shall be appropriate to the appliance.

1. For conversion burners installed in hot water (liquid) boilers or warm air furnaces, the rate of flow of the oil or liquid fuel in Btu/h shall be adjusted to within plus or minus five percent of the design load, and not to exceed the design rate of the appliance.
2. For conversion burners installed in steam boilers, the oil or liquid fuel hourly input demand shall be adjusted to meet the steam load requirements. The oil or liquid fuel input demand necessitated by an oversized boiler shall be established and added to the input demand for load requirements to arrive at a total input demand.

### SECTION 1603 PILOT OPERATION

**1603.1 Pilot operation.** Igniter or pilot flames shall be effective to ignite the oil or liquid fuel at the main burner or burners and shall be adequately protected from drafts. Pilot flames

shall not become extinguished during the pilot cycle when the main burner or burners are turned on or off in a normal manner either manually or by automatic controls.

### SECTION 1604 BURNER OPERATION

**1604.1 Burner operation.** In making tests to determine compliance with the requirements of this section, care shall be exercised to prevent the accumulation of unburned liquid fuel in the appliance that might result in an explosion or fire.

1. The flames from the burner shall freely ignite the liquid fuel when operating at the lowest firing position.
2. Burner flames shall not flash back when the liquid fuel is turned on or off by an automatic control mechanism.
3. Main burner flames shall ignite freely from the pilot when the pilot flame is reduced to a minimum point that will actuate the pilot safety device.
4. When ignition is made in a normal manner, the flame shall not flash outside the appliance.
5. Burners shall not expel liquid fuel through air openings when operating at prevailing pressure.
6. Burners shall have a proper liquid fuel air mixture to ensure smooth ignition of the main burner.

### SECTION 1605 TEST METHODS

#### 1605.1 Method of test.

1. **Operational checking.** The flue gas, venting, safety, and operating controls of the appliance shall be checked to ensure proper and safe operation.
2. **Method of test—atmospheric type/induced draft type/fan-assisted types.** The appliance shall be allowed to operate until the stack temperature becomes stabilized after which a sample of the undiluted flue products shall be taken from the appliance flue outlet. The sample taken shall be analyzed for carbon monoxide, carbon dioxide, and oxygen. Stack temperature shall be noted.

**Note:** Appliance designs incorporating induced draft assemblies may require a flue gas sample to be taken after the draft regulator or induced draft fan.

3. **Performance standards for atmospheric type.**
  - a. Minimum of 75 percent efficiency as determined by flue gas analysis method at appliance flue outlet.
  - b. Carbon monoxide concentration in flue gas not greater than 0.04 percent.

- c. Stack temperature not greater than 700°F (371°C), plus ambient.
  - d. Carbon dioxide concentration between 8 and 13 percent, inclusive.
  - e. Oxygen concentration between 4 and 10 percent.
  - f. Smoke test no higher than #2 for light oils, or #4 for oils heavier than #4.
  - g. Draft shall be in accordance with burner manufacturer's specifications.
- 3a. **Performance standards for induced draft type/fan-assisted types.**
- a. Minimum of 75 percent efficiency as determined by flue gas analysis method at appliance flue outlet.
  - b. Carbon monoxide concentration in flue gas not greater than 0.04 percent.
  - c. Stack temperature not greater than 700°F (371°C), plus ambient.
  - d. Carbon dioxide concentration between 8 and 13 percent, inclusive.
  - e. Oxygen concentration between 4 and 10 percent, inclusive.
  - f. Smoke test no higher than #2 for light oils, or #4 for oils heavier than #4.
  - g. Draft shall be in accordance with burner manufacturer's specifications.

**Note:** Induced draft and fan-assisted types of appliances may require a sample to be taken after the induced draft fan, which may cause oxygen figures in excess of the limits stated. In such cases, safe liquid fuel combustion ratios shall be maintained and be consistent with appliance listing.

4. **Method of test—power type.** The appliance shall be allowed to operate until the stack temperature becomes stabilized after which a sample of the undiluted flue products shall be taken from the appliance flue outlet. The sample shall be analyzed for carbon monoxide, carbon dioxide, and oxygen. Stack temperature shall be recorded.
5. **Performance standards for power type.**
- a. Minimum of 80 percent efficiency as determined by flue gas analysis method at appliance flue outlet.
  - b. Carbon monoxide concentration in the flue gas not greater than 0.04 percent.
  - c. Stack temperature not greater than 700°F (371°C) plus ambient.
  - d. Carbon dioxide concentration between 8 and 13 percent, inclusive.
  - e. Oxygen concentration between 4 and 10 percent, inclusive.
  - f. Smoke test no higher than #2 for light oils, or #4 for oils heavier than #4.

- g. Draft shall be in accordance with burner manufacturer's specifications.

6. **Test records filing; tag.** After completion of the test of newly installed oil or liquid fuel burner equipment as provided in this section, complete test records shall be filed with the building official on an approved form. The tag stating the date of the test and the name of the installer shall be attached to the appliance at the main valve.

7. **Oxygen concentration.**

- a. The concentration of oxygen in the undiluted flue products of oil or liquid fuel burners shall in no case be less than 3 percent nor more than 10 percent, shall be in conformance with applicable performance standards and shall be consistent with the appliance listing.
- b. The allowable limit of carbon monoxide shall not exceed 0.04 percent.
- c. The flue gas temperature of an oil appliance, as taken on the appliance side of the draft regulator, shall not exceed applicable performance standards and shall be consistent with the appliance listing.

8. **Approved oxygen trim system.** The oxygen figures may not apply when there is an approved oxygen trim system on the burner that is designed for that use, including a low oxygen interlock when approved by the building official.

9. **Supervised start-up.**

- a. Supervised start-up may be required to verify safe operation of oil or liquid fuel burner and to provide documentation that operation is consistent with this code, listing and approval. Supervised start-up is required for all liquid fuel burners listed in b, c, and d. Supervised start-up requires that the liquid fuel burner shall be tested in the presence of the building official in an approved manner. Testing shall include safety and operating controls, input, flue gas analysis, and venting. Flue gas shall be tested at high, medium, and low fires. Provisions shall be made in the system to allow firing test in warm weather. After completion of the test of newly installed oil or liquid fuel burner equipment as provided in this section, complete test records shall be filed with the building official on an approved form. The tag stating the date of the test and the name of the installer shall be attached to the appliance at the main valve.
- b. Oil and liquid fuel burners of 1,000,000 Btu/hr input or more require a supervised start-up as in a.
- c. Installation of oxygen trim systems, modulating dampers, or other draft control or combustion devices require a supervised start-up as in a.





